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NEW THEORY OF FADING

By J. E. Anderson

COIL DATA for 1926 DIAMOND

By Herman Bernard

A 3-TUBE DX REFLEX SET

RADIO WORLD

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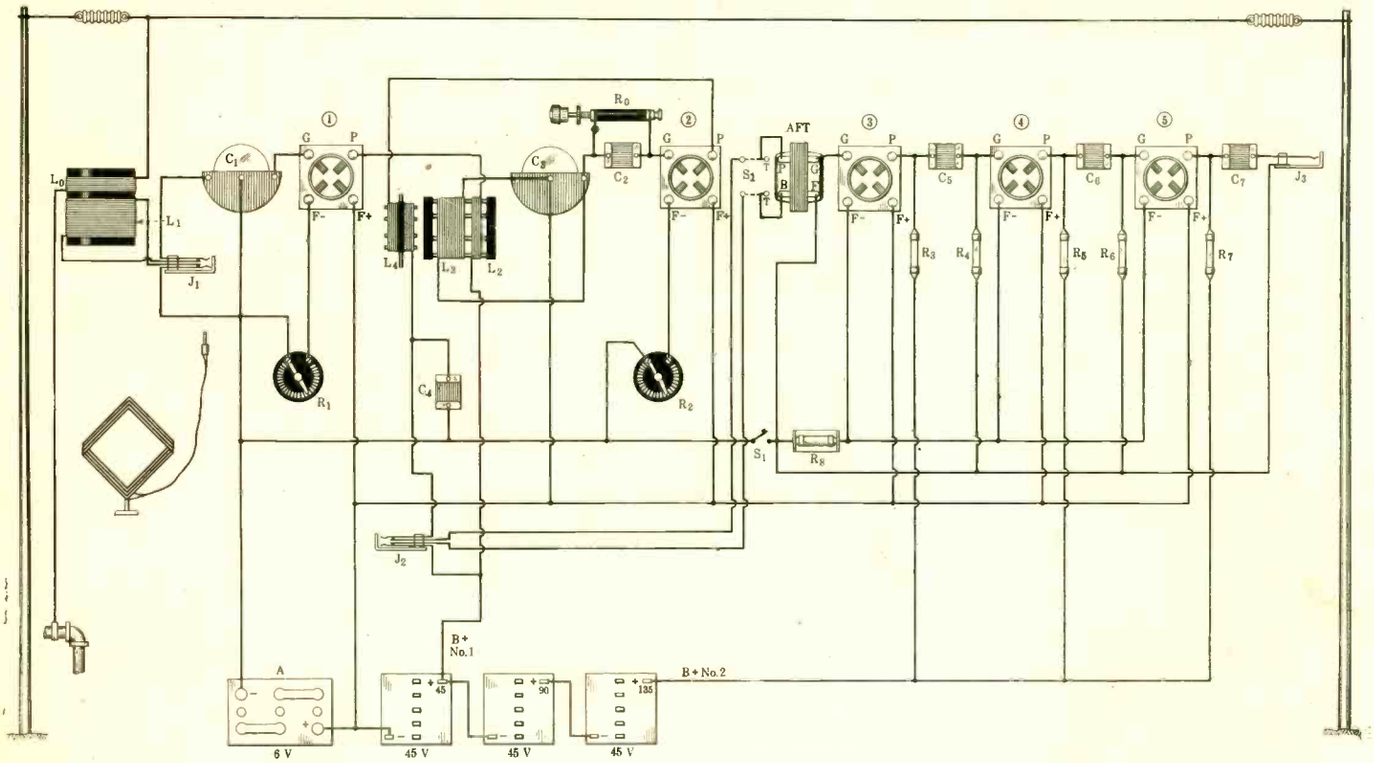
Coils for the 1926 Diamond



THE WIRING of The 1926 Model Diamond of the Air, shown in picture form (Fig. 4), with four binding posts placed where the detector output joins the audio input. By this method no switch is needed, yet the RF side may be hooked up to any external audio circuit for comparison, and also the audio amplifier of The Diamond may be used to get speaker volume on any experimental detector circuit. If earphone reception on The Diamond is desired, put the phone tips on the posts at left of S1 and disconnect the two busbar strips, called "straps," and shown in dotted lines. These straps always are used when operating The Diamond as a unit.

By Herman Bernard

Associate, Institute of Radio Engineers

PART II

THE solenoid type of winding is to be preferred for the 1926 Model Diamond of the Air. No form of winding gives more inductance for a given length of wire. For space conservation or for restriction of magnetic fields, or other reasons, a different form of winding may be used, but the best way to build this set is to allow plenty of room and to use solenoids correctly mounted. The space is ample when a 7x24" panel is used (Fig. 2).

A solenoid is a coil wound around a cylindrical form, one turn next to or slightly spaced from the next. Convenience is served and efficiency not impaired if a 2½" diameter is employed. The 2" mentioned last week was a typographical error. The Bruno No. 99 RF, used in the original model for LoL1, consists of 9 turns for L0 and 52 for L1. Each winding is separate from the other, ¼" space existing between the end of the aperiodic primary, Lo, and the beginning of the secondary, L1. The form consists of two insulation rings (hard rubber or Bakelite), one at each end of the form, these supporting quartzite rods which afford the skeleton frame on which to put the winding. The wire is No. 24 silk over cotton.

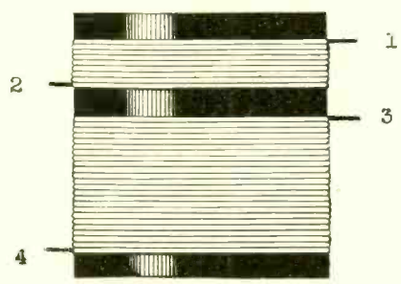


FIG. 3, detail showing respective coil terminals, discussed in the text for correct polarity observance.

A home-made coil could be wound on a purchased form of this kind, or other 2½" diameter tubing, about 3" high may be used. This may even be cardboard, but if so, dip the form in molten bees wax and let the fixer harden, for then the moisture-absorbing vice of cardboard is overcome.

The stator form L2L3 of the 3-circuit tuner, the Bruno No. 99 being used, is exactly the same as L0L1, as to windings. The form for the tickler coil is 1¼" diameter, has 18 turns of No. 26 single silk covered wire, 9 on each side of where the rotor shaft is introduced. This shaft passes through the stator ring that is at the end of the secondary and is screwed onto a flat disc (1¼" diameter) that holds eight quartzite rods in this case instead of two circular end rings. The diametrically opposite side of the tickler is secured to the adjoining point of the same ring of the stator, and pigtail connections are made to binding posts on the stator ring.

There are binding posts for all coil terminals.

The diameters given were selected because they best suited a combination of purposes. If the constructor desires to use larger-sized forms, he may do so. But he might have to make some allowance therefor on the panel, as compared with Fig. 2. The coil directions given are consonant with the panel drilling measurements shown in Fig. 2. This is the panel obtainable commercially in drilled and engraved form.

The inductances are to be tuned with two .0005 mfd. condensers, C1 and C3. Those used in the original model were Bruno No. 18, a double condenser, two sections, each .00025 mfd., the binding posts of the two stators on a given condenser being joined with a piece of busbar, called a "strap." Any other good .0005 mfd. condensers may be used for C1 and C3.

Some may possess variable condensers they desire to use in this circuit and the capacities may be other than .0005 mfd. If condensers are to be bought, get .0005 mfd., but if other capacities are on hand, use

Efficiency in Coil Wiring

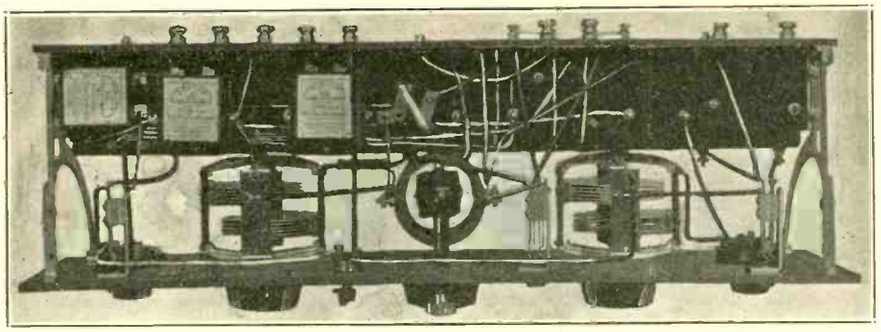


FIG. 5, the bottom view of The Diamond, showing how much of the wiring is done under the socket shelf, which is supported by brackets. The three .25 mfd. fixed condensers needed for the Bernard audio hookup are shown at left. The loop jack is at right in this photo.

them. The coils would have to possess inductance to match the condenser.

For a .00035 mfd. instrument, instead of 52 turns on the secondaries, apply 60. For .0003 put on 65 and for .00025 use 71. These account for L1 and L3.

The primary for a 60-turn secondary should consist of 15 turns and for a 71-turn secondary should have 18 turns. This refers to Lo and L2.

For the 60-turn coil a 3" length of stator will suffice, allowing enough room also for the 15-turn primary; but for the 71-turn secondary and 18-turn primary use a 4" length form. This distance is known as the "axial length" and is at right angles to the diameter.

If you have a commercially made radio-frequency transformer (LoL1) and a condenser of suitable capacity, you may use those. The same applies to C3 and L2L3L4. But watch the panel layout.

If you intend to wind your own solenoids and can not readily procure No. 24 silk over cotton wire, use No. 22 single cotton covered wire and add two more turns than those specified for secondaries, but use the same number of turns for the primaries as if No. 24 silk over cotton were used.

Basketweave coils for .0005 mfd. would have 10-turn primary, 43-turn secondary, on a 4" diameter, using No. 18 double cotton covered wire. The tickler would have 14 turns on a 2¾" diameter, using the same kind of wire, or finer wire (No. 20, 22, 24, etc.), which would be SSC.

A spider-web form 5½" outside diameter would consist of 47 feet of No. 24 S over C wire, or 50 feet of No. 22 SCC, the hub being at least 3" diameter (the inside circle). Do not use a 1" diameter hub. If you have such a form with 1" hub, punch holes in the arms 3" or 3½" from center and thread wire in and out for one turn, thus creating an artificial hub or stopping circumference, and begin winding here. The inductance resulting from turns close to a narrow hub is very low and a high-resistance coil results. The primary has 10 feet of wire, wound preferably on the outside (external rim or periphery). The tickler L4 would consist of 16 turns wound on the inside of another spider-web form (beginning 3" from center.) Use either No. 24 S ver C or No. 22 SCC, the number of turns being the same in either case. The primary, of course, would have to be wound last.

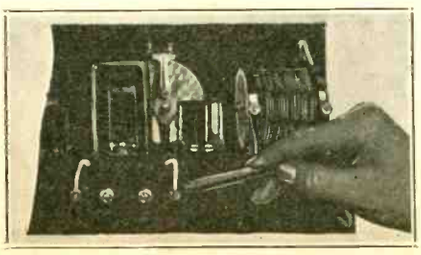


FIG. 6, showing the "straps" used at the detector output, when they are disengaged.

A toroidal coil may be used for LoL1 and preferably would be a commercial product.

The correct way to connect coil terminals was described in last week's issue. The numbers used are shown this week in Fig. 3. They apply to L0L1 and L2L3. But questions may arise concerning:

(1) markings on commercial transformers.

(2) coil terminals carried through the inside of the form.

(3) relative position of the ticklers.

(4) use of different form of winding.

(5) position of mounting.

Pay no attention whatever to the markings on commercially-made radio-frequency transformers (LoL1). These are usually A, Gd, G and F, or P, B, G and F. They are put on for good reasons or for no reason or in error. If the coil was purchased as part of a complete kit for a given set, aggregated with due regard to the number of tubes used and the phase effect produced by each tube, then the markings may be correct for that kit or set, but not for this one. Even if a kit is bought for the 1926 Model Diamond, still connect the terminals as directed, though they may conflict with the markings on commercial coils. A manufacturer's designations like as not are incorporated solely to distinguish primary from secondary for the benefit of the novice. That much done, the set may be constructed so that it will work, but out object is not only that; we want it to work with utmost and unfailing efficiency.

The coil terminals may be carried through the inside of the form for purposes of security in commerical coils, such as the Bruno line. In that case, trace the beginning and end of each winding to its proper binding post. The difference in coloring of the insulation on the wire will help you.

Some confusion may result because the tickler or rotary coil L4 in one case is placed in a different position, relative to the secondary L3, than in some other 3CT coil. Thus the coil even may seem to be wound "upside down," because the primary L2 is at bottom, and above it is the secondary, the tickler being at the end of the secondary. In that case read Fig. 3 as if it were upside down. The respective connections still are the same. Keep the low potential terminals side by side in any case (ground and A — in one instance, B plus and A — in the other) and you will be right. The relative position of the tickler is not important.

If a different form of winding is used, such as spider-web or diamond weave, by placing the primaries outside (wound last) and the secondaries inside, the rule may be followed with easy safety. Keep the low potentials together.

Under this classification of form difference comes the toroid.

Here the primary likely will be wound through part of the secondary, side by side with turns of the larger coil. Follow the order: (1) aerial, (2) ground, (3) A—, (4) grid.

But suppose the toroid is encased? You can't see through hard rubber. Connect a 1½-volt dry cell to the terminals of the secondary and put a magnetic compass in the field. See which way the needle points after it settles down. Then connect the battery instead to the primary. If the needle points in another direction then the windings are in reverse order, or your connection of the battery is the reverse of what it was in the secondary. This is as it should be. Both methods (reversal of winding direction or of connection) give the same relative result. Where A — was on the secondary is (3) in Fig. 3. Where A + was is (4). Where A + was on the second test (primary) is (1) and where A — was is (2). This assumes you so placed the battery as to get the desired conflict of direction.

A wrong position of mounting, of course, may spoil the whole effect, whatever form of coil is used. This happens when stray magnetic feedback takes place—an interchange of RF current between the transformer and the interstage coupler, or, when other strays exist. Mount the coils so that there will be zero feedback or a harmless minimum. If the mounting scheme of the original set is followed, this trouble will be avoided.

There still remains the question of how to connect the tickler. Preferably connect it so that its field aids the secondary. If it opposes that of the secondary you have reversed feedback, which is not desirable in this set.

If the secondary L3 is as shown in Fig. 3, then, when the tickler is so placed that its windings are in the same direction as those of the secondary, the top or beginning of the tickler goes to B + and the end to plate. One's way of deciding this point is to connect so that the tightest coupling (parallel position) gives most regeneration and movement of the tickler toward right-angle position in respect to the secondary decreases regeneration. With reversed feedback the looser coupling might give the greater regeneration, since the fields oppose, and the tighter the coupling the greater the opposition.

The tickler connections are nothing to worry about from a practical viewpoint, since you may make them either way and if uncontrollable oscillations result, reverse these connections.

[Part I last week; Part III next.]

Eight New Stations

WASHINGTON.

WENR, All-American Radio Corp., Chicago, Ill., has been transferred from Class A to B, and now operates on 266 meters with 1,000 watts power. Eight licenses for new Class A stations have also been issued by the Department of Commerce. They follow:

Station	Owner	Location	Meters	Watts
WAPI	Alabama Poly. Inst.	Auburn, Ala.....	248	500
KFXE	Electrical Research & Mfg. Co.	Waterloo, Iowa ..	236	10
KFXB	Bertram O. Heller,	Big Bear Lake, Cal	202.6	10
WKBK	Shirley Katz,	New York, N. Y.	209.7	500
KFXF	Pike's Peak Broad. Co.	Colorado Spgs.,Colo.	250	500
KFXC	S. Maria Valley R. Co.	Santa Maria, Cal	209.7	100
KFXD	L. H. Strong,	Logan, Utah	205.4	10
WBZA	Westinghouse Elec. & Mfg. Co.	Boston, Mass.	242	250

A 1-Dial, 2-Tube Speaker Set

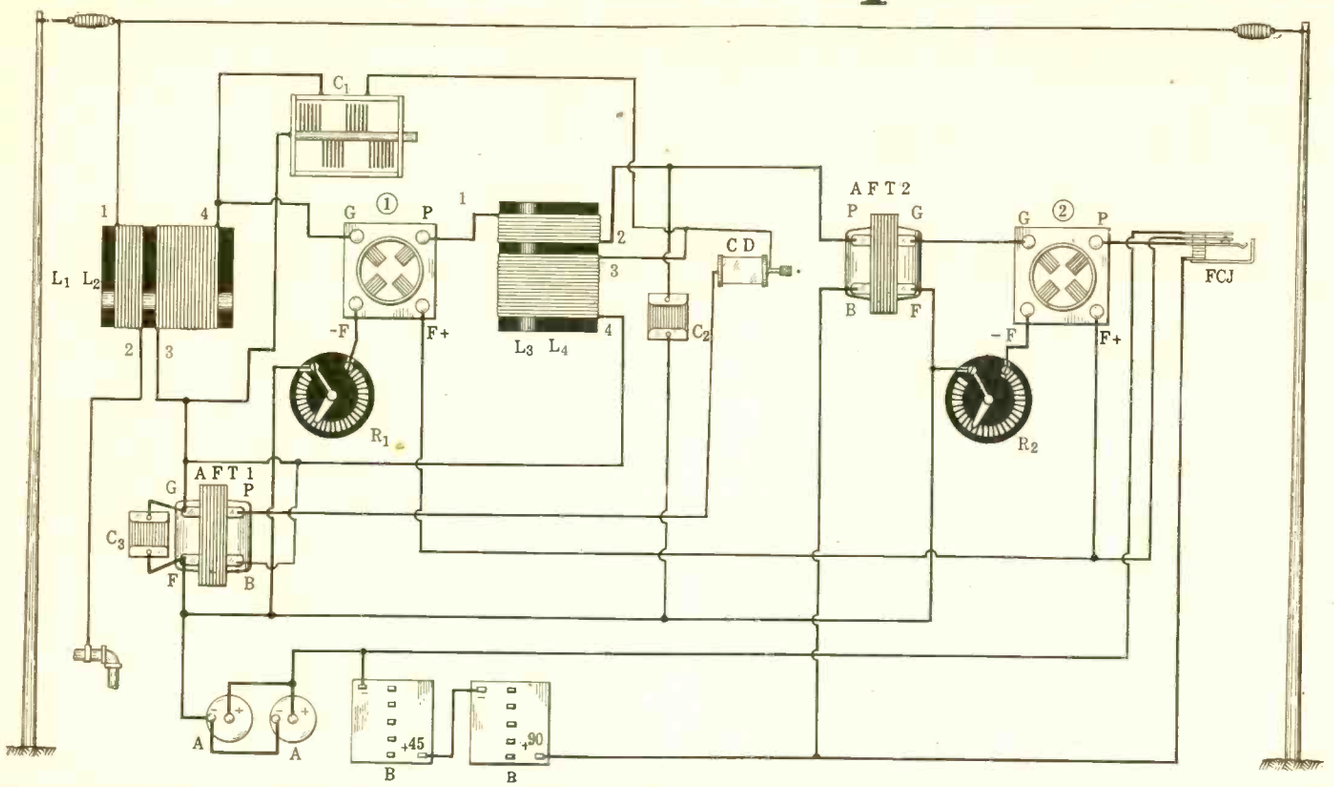


FIG. 1, a picture diagram of the wiring of the 2-tube speaker reflex that uses only one dial for tuning. The coils are marked for polarities that correspond with the explanation in the text.

By Percy Warren

THE 1-control set will be very popular this season. The 1926 models, shown in advance of the two radio shows about to open in New York City, prove that. More than 70 manufacturers have 1-dial sets.

PERCY WARREN

The most economical 1-dial receiver that will work a speaker is shown in Figs. 1 and 3. A double condenser is used. The wiring is shown in the picture diagram so that even a novice will find it easy to follow this.

Assuming that the coils are to be wound at home each of the two may be put on a separate 3½" diameter tubing, 4" high, with 10 turns for the primary and 43 turns for the secondary, No. 22 DCC wire being used. The double condenser has two sections, each .0005 mfd. capacity. It is preferable to leave ¾" space between L1 and L2, with only ¾" between L3 and L4. All windings are in the same direction. Considering L1, the terminal (1) goes to aerial, (2) to ground, (3) to the G post of AFT1 and (4) to the grid of the reflexed tube, No. 1. The plate of this tube goes to (1) of L3, while (2) is connected to the P post of AFT2. Join (3) to the catwhisker of the crystal, if an adjustable crystal is used, otherwise to the low side (G) of a fixed crystal like the Carborundum, which is quite voluminous. The other L4 terminal (4) goes to the G post of AFT1. This same lead is connected to the rotor of the tuning condenser. The stators of this condenser go to (4) of L2 and (3) of L4. The phase reversal in tube No. 1 is negatived by the reversal obtained in L1L2. Note that the coupling transformer L3L4 has fields aiding.

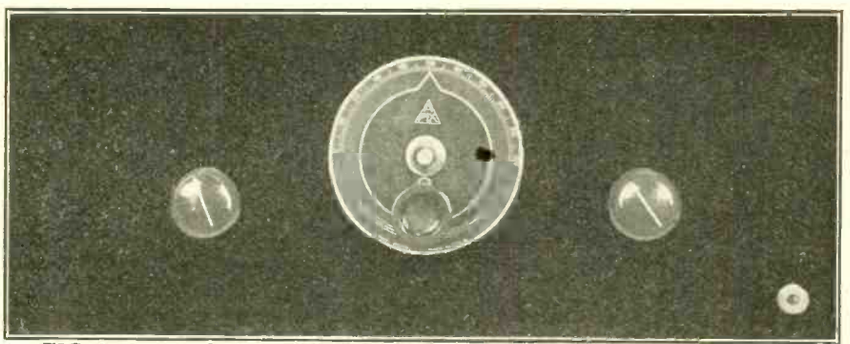


FIG. 2, the panel view of the set. The filament control jack is at right
(Kadel & Herbert)

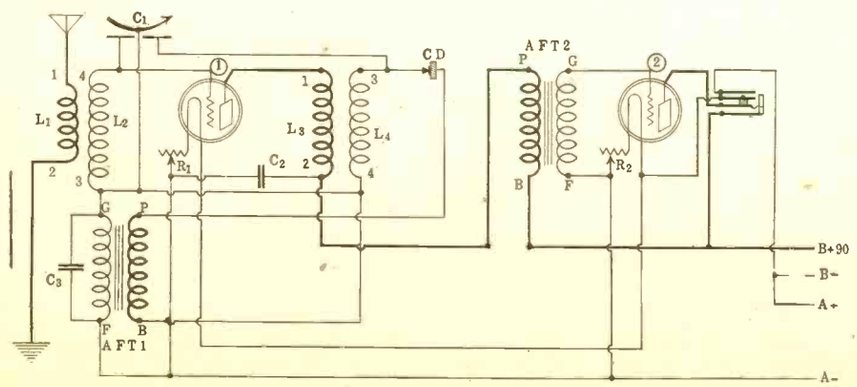


FIG. 3, the schematic diagram of the wiring of the set.

JOIN THE A. B. C.

A. B. C. stands for American Broadcast Club, an organization of fans banded together to promote the welfare of radio. There are no dues, no obligations. Address A. B. C. Editor, RADIO WORLD, 1493 Broadway, New York City. The names and addresses of new members follow:

W. J. Davis, 3 Healey St., Cambridge, Mass.
Lewis Gotthardt, 1416 Liberty St., Trenton, N. J.
Edwin Suuronen, 91 Pine St., Garner, Mass.
Charles Bernstein, Sea View Hospital, Staten Island, N. Y.
W. J. Wattendorf, 192 Sherman Ave., Jersey City, N. J.
Otto Heine, 1212 Howard Ave., Pottsville, Pa.
Paul Weeland, 97 Berry St., Doner, N. J.

Set Combines DX and Volume

Tone Quality Superb in Reflex Receiver

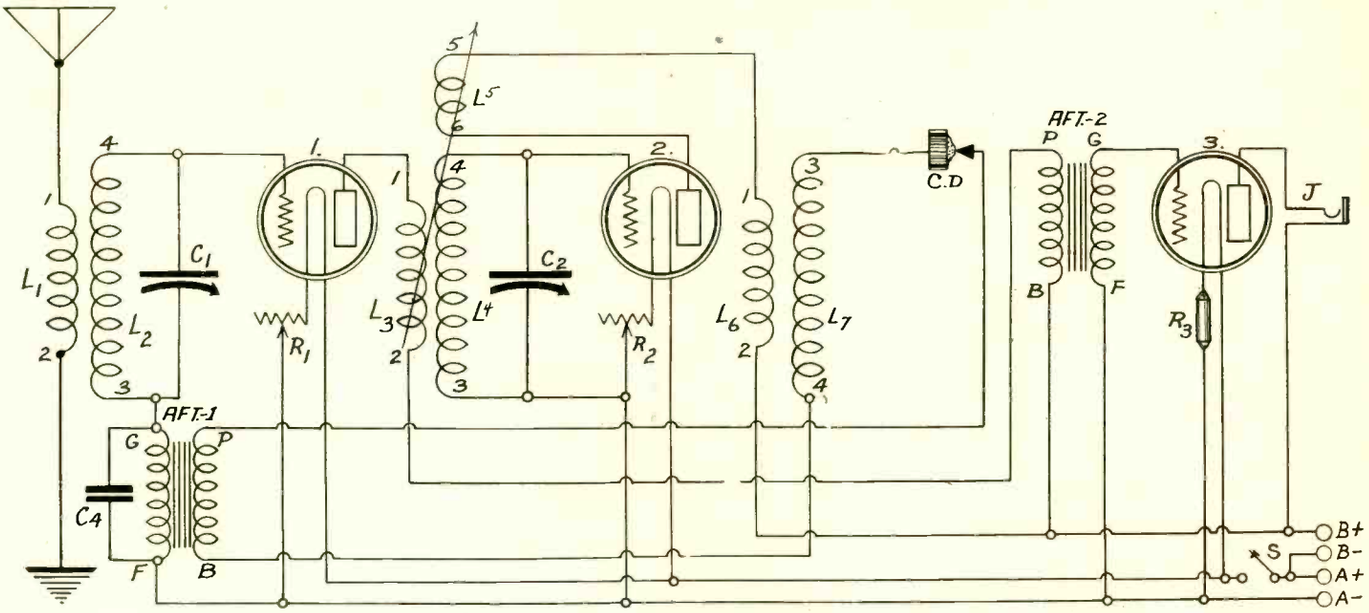


FIG. 1, showing the electrical wiring diagram of the 3-Tube Reflex. The picture diagram is on page 7.

By Bertram Pierce

TO reflex a receiver is no cinch, especially in a set where there is regeneration, that is, the plate is electromagnetically or electrostatically coupled back to the grid. However, when such a receiver is built properly, under clear guidance, the results are great. In Fig. 1 we have the circuit diagram of a 3-tube reflex, employing a crystal as a detector. In tube No. 2 we have regeneration. The antenna collects the energy, which is then transferred from the primary L1 by mutual induction to the secondary of the RFT (L2). The signals are still of a radio-frequency character. The energy coming from the plate circuit of tube No. 1 is induced in the coil L3. This is induced into L4. Still more amplification at radio frequency takes place, and with the help of the feedback coil, L5, an enormous amount of energy is transferred from the coil L6 to the RFT secondary, L7. The crystal rectifies this signal. It is now amplified by the audio-frequency transformer. The grid terminal of this AFT is tied through the coil L2 to the grid of the first tube.

The Reflex Action

Tube No. 1 acts as a radio-frequency and as an audio-frequency amplifier. By employing the crystal detector, we get the benefit of clarity of signals, i.e., tone beauty. By employing regeneration we obtain the most efficient way of getting the maximum out of a tube. Regeneration plus reflexing, properly handled, make a wonderful combination.

This receiver is not difficult to build, and yet the utmost care should be taken when doing the work, as a reflex set requires that. The set easily fits into a 7x18" cabinet. There are three controls, namely, C1, which is shunted across the secondary of the first radio-frequency transformer; C2, which is shunted across the secondary of the second radio-frequency transformer, and finally the tickler coil L5, which controls the regeneration in the second radio-frequency tube. The temperatures of the filaments of the first two tubes are controlled by rheostats.

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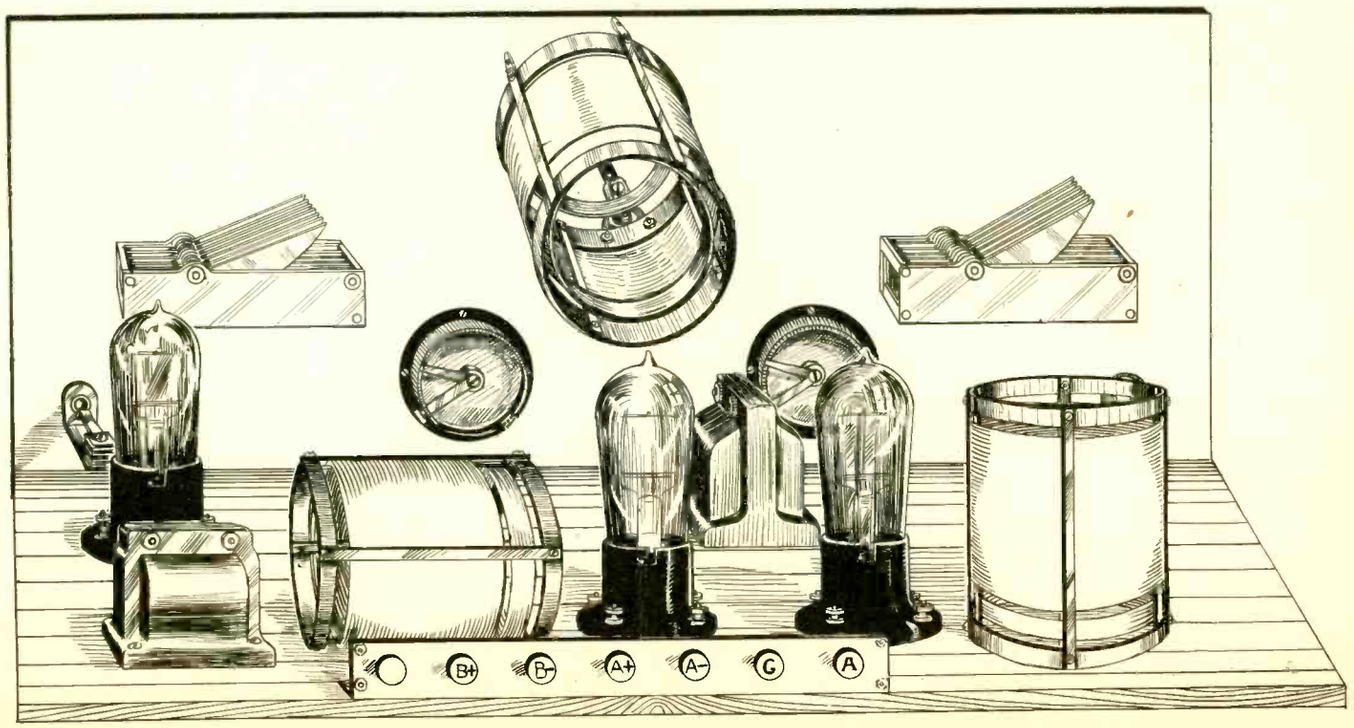
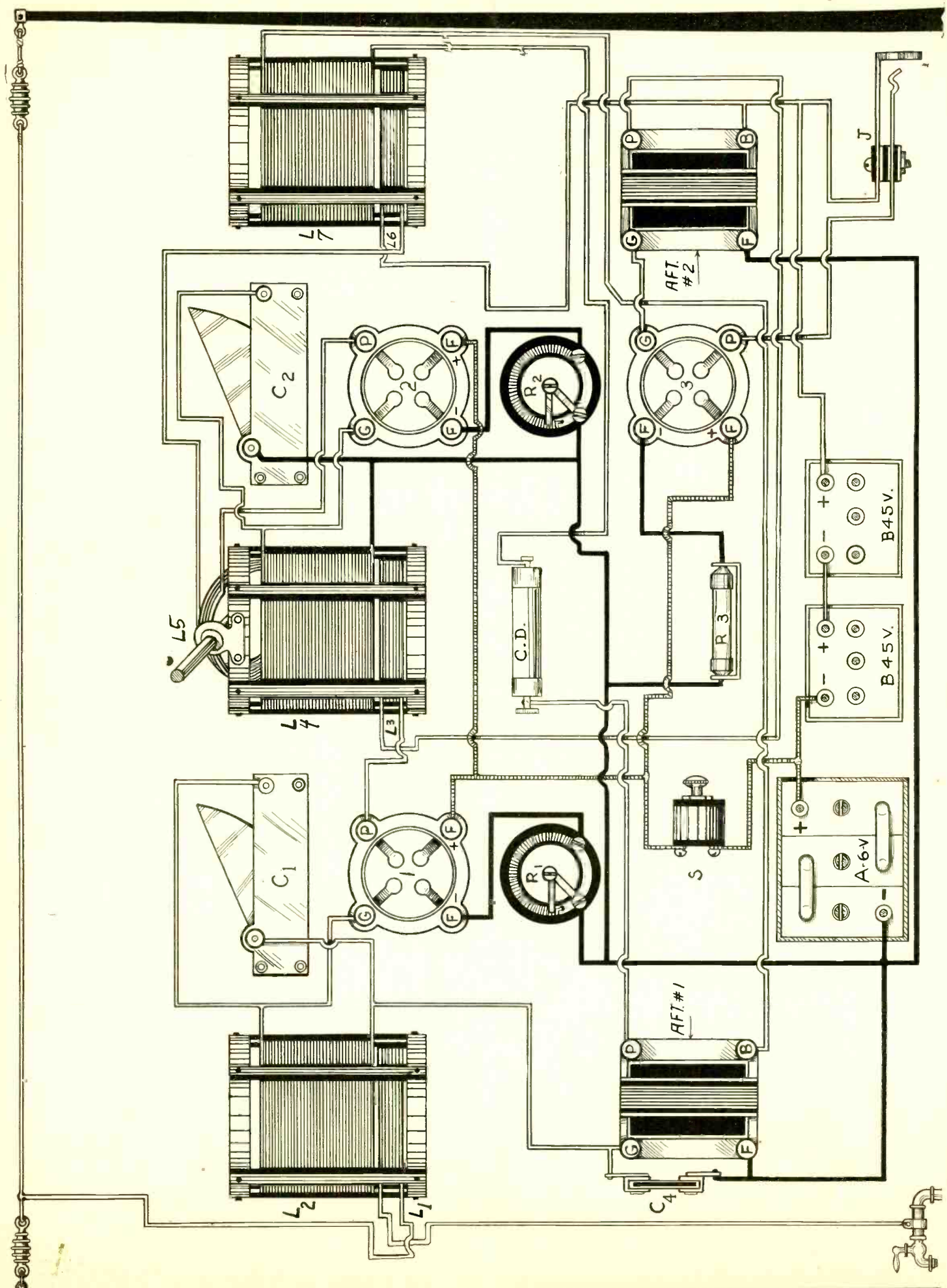


FIG. 2, showing how the instruments should be placed on the panel and baseboard.



Anderson's Theory of Fading

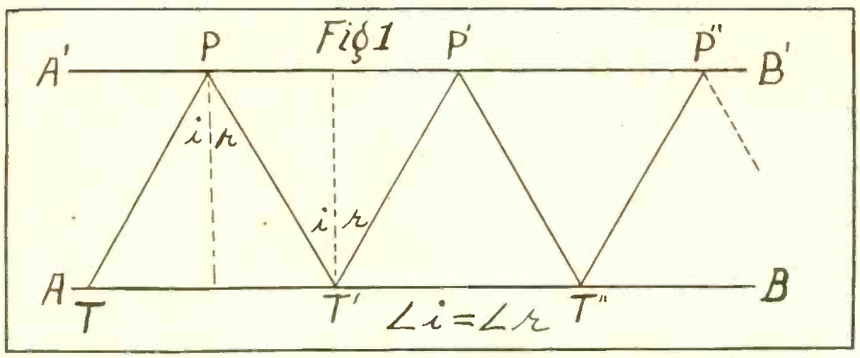


FIG. 1, representation of the action presumed when the Heaviside layer theory is applied.

Lloyd's Mirror Action Causes Phenomena, Says Noted Radio Engineer and Physicist, Disputing Alexanderson and the Navy Department in a Theoretical Discussion and Presenting This View for the First Time.

By J. E. Anderson

Consulting Engineer

ANY theory which might explain the phenomenon of fading in radio reception is of great interest to the radio fraternity. It was for this reason, as well as the eminence of its sponsor, that the "corkscrew" theory recently announced by Alexanderson received so much attention. This theory does explain fading as well as dead spots and specially favored locations for radio reception, that is, provided the necessary assumptions are in agreement with the facts.

The discovery that the wave emitted by a broadcasting station is composed of two components, an earthbound wave and a free space wave, and that the space wave turns its plane of polarization as it advances, led to the assumption that the turning continues at the observed rate indefinitely. If this be true there will be a dead spot at the point where the space wave has turned 180° and there will be other dead spots for each additional 360°. Also there will be points of specially good reception midway between any two dead spots, the first occurring at the point where the space wave has turned 360°. On this theory fading is explained on the assumption that the rate of turning of the space wave varies so that any given antenna in the field would alternately be in a dead spot or in a region of good reception.

This theory has been referred to as the "corkscrew" theory because the course of the space wave as described in the field would be that of a screw. Variation of the rate of turning would represent a change in the pitch of this screw.

Assumes Too Much

In the same announcement was a statement that the earthbound wave is quickly absorbed so that for distant points the space wave would predominate. In this region the interference between the two components of the wave does not explain fading, and there was supposed to be none. But even in this remote region the rotation of the space component of the wave would give rise to fading, to dead spots and to spots of good reception. An ordinary receiving antenna is adjusted to receive the earthbound component of the wave, in which the electric field is vertical. Such an antenna cannot receive a wave in which the electric field is horizontal. And since the rotation of the space component of the wave would make the field alternately vertical and horizontal some places will be in the vertical region and some in the horizontal. The latter would be dead spots. Again, if there is a change in the pitch of the screw there will be fading.

However, the assumptions upon which these explanations are based are not justified. Just because it is known that a certain wave turns its plane of polarization from 20 to 30 degrees in ten miles, we are not justified in assuming that it keeps on turning at that rate, not until data have been found to show that the turning keeps on turning keeps up at least 360 degrees. It is probable that the turning does not exceed 90 degrees, from perpendicularity to parallelism with the force causing the rotation. More recent reports have failed to verify the continued rotation of the space wave. But if the wave does advance like a corkscrew it must be the curl of the vector!

Another explanation of fading is the "skip distance" theory recently announced by the Navy Department. In this the supposed Heaviside layer is brought into play. The radio waves from a transmitting station strike this layer at a certain angle. They are then reflected back to earth according to the laws of reflection of light. The earth, being somewhat of a conductor and hence also a reflector, sends the wave back to the Heaviside layer, and thus the wave was tossed back and fourth between the two reflections until its energy is all dissipated. This action may be best explained by referring to Fig. 1. Let AB represent the surface of the earth and A'B' the Heaviside layer. Let T be a transmitting station and let P be the point at which the wave strikes the Heaviside layer. The wave is reflected downward along the path PT' in such a manner that the angle of incidence *i* is equal to the angle of reflection *r*. At T' the wave is sent upward along the path T'P', and the angles of incidence and reflection at the earth are the same as at the layer provided the two reflectors are parallel.

This is supposed to give an explanation of fading and of dead spots. Thus receiving stations located in the neighborhood of the T's will pick up the waves transmitted from station T and receiving stations located half way between these points will be in dead areas. Fading is explained by assuming that the effective height of the Heaviside layer varies, or that the angle between the layer and the earth varies. In ither case the location of the points T would be changed and fading thus result. The theory is called the "skip distance" because the distances between the T's are skipped by the radio wave. The Navy is supposed to have established the existence of the Heaviside layer and to have measured its effective height above the earth.

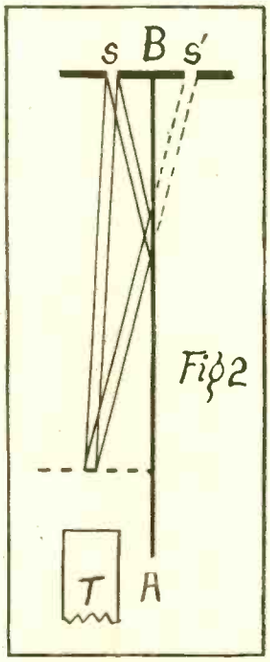


FIG. 2, the action presumed in the Lloyd's mirror theory of Anderson's.

How About Broadcasts?

Unfortunately this theory does not give a satisfactory explanation for fading of broadcasts. If the wave transmitted were a narrow beam the theory would apply, and such a beam may be arranged for experimental purposes. But a broadcasting station does not emit a narrow beam; it broadcasts; it sprays the radio "ceiling" liberally. The wave does not merely hit the point P, but every other point in the layer; and the reflector also sends the waves back to every point in the lower plane, the earth. The transmitting station may be compared to a candle sending out light. Suppose it is placed on the earth at T, and further suppose that the layer AB is a mirror of infinite extent above the head of the observer on the earth. No matter at what point on the lower plane the observer may stand he will always be able to see the image of the candle. Hence the light waves reach every point in the lower plane. Similarly, the long, invisible "light waves" from a broadcasting station will reach every point. There will be no "skip distance."

There is still another way of explaining fading and related phenomena—a way which has never before been given, as far as I know. This theory is akin to the "skip distance" theory in that it pre-supposes a reflecting Heaviside layer, and it is subject to the same objections. It is based on the principles of Lloyd's single mirror.

The Lloyd's Mirror Test

Lloyd's single mirror is one of the simplest devices used in physical optics for studying interference of light waves and for measuring the wavelength of light. Referring to Fig. 2, AB is a long mirror mounted at right angles to the plane of the paper. Near one end of the mirror, and very close to it, is a narrow slit *s*

(*Concluded on page 27*)

A Tube B Battery Eliminator

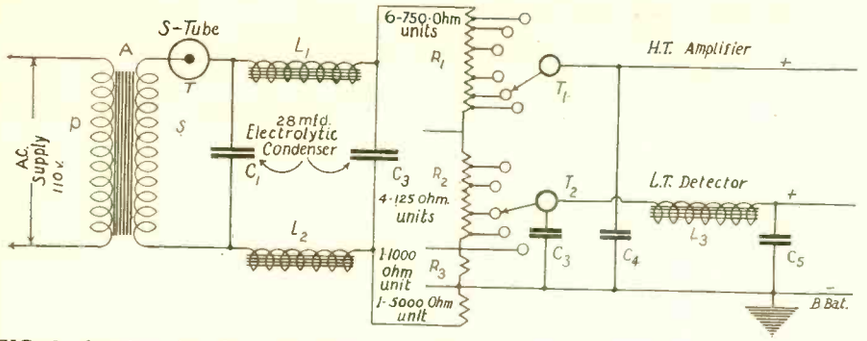


FIG. 1, showing the electrical diagram of the B battery elminator. C3 of the 28 mfd. electrolytic condensers should be C2. R4 is the 5000-ohm unit.

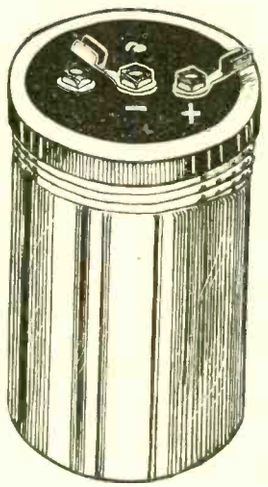


FIG. 2, showing the external appearance of the Electrolytic Condenser, which has a rated capacity of from 25 to 30 mfd.

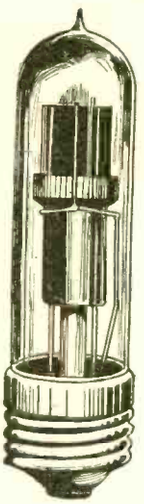


FIG. 3, the external view of the S tube.

By Lewis Winner

Associate, Institute of Radio Engineers

PART I.

ONE of the ideals for a radio set is that there should be no external A or B battery required. There is only one way of solving that problem and that is by using the house current to supply the filament (A battery) and plate potential (B battery). However, there are many obstacles. The main difficulty lies in the filtering system.

LEWIS WINNER

The A battery eliminator shall not be discussed as to construction. At present, so far as I know, there is no such an eliminator that is suitable to use to heat the filament of the detector tube. For the lighting of the filaments of the amplifier tubes there are many eliminators which can be used, as the filtering system does not have to be perfect. A slight hum may exist and still the receiver will function well. If a hum existed in the detector in the detector filament circuit it would be annoying. This hum is carried along with all the other reception and then brought to a higher amplitude of signal strength by the amplifier tubes.

As for B battery eliminators, there are several on the market, some of which are real good.

What makes the B eliminator a problem?

The fact that the inductance and capacity of the line (AC) must always equal the inductance and capacity of the eliminator is the answer. The only way to accomplish this is by employing a compensating switch, whereby special values of inductance and capacity may be switched in the circuit, so that an equilibrium may be obtained. The inductance and the capacity of the line always change. This is caused by the insertion or taking out of some electrical device, e.g., an iron, vacuum cleaner, bridge lamp, hall lamp, motor, etc.

The one that I am going to describe is not 100% perfect, either. It is the most nearly perfect that I have had the opportunity of seeing. When attached to the receiver for both detector and amplifier plate circuits the hum in the output is below audibility. If a sensitive instrument such as an milliameter, is placed in the output plate circuit only by most careful attention can one note the unsteady movement of the needl due to the small AC ripple that is present after filtering.

As for the filtering compensation there is no direct method employed. However, across the positive side of the detector output there is an added choke coil which acts as a compensator for the detector plate current. Later on in the text details regarding the filtering system will be given.

As you will note from Fig. 1 there is an HT (high tension or amplifier) and an LT (low tension or detector) plate output. The voltage of the detector output ranges from 15 to 23 while that of the amplifier output is up to 100.

How the S Tube Works

The success of this eliminator depends upon one piece of apparatus and that is the S tube. Practically every amateur in the country knows the ins and outs of the old S tube. The new S tube has many advanced adjuncts and is known as Type 4000-1.

This tube has two elements. The small or center contact of the base is connected to the anode (plate), while the screw-cut section (ferrule) is connected to the cathode. In this manner the current enters by way of the center contact and leaves by way of the ferrule. It will not flow in the opposite direction. We, therefore, obtain the rectifying action. By this connection the so-called ferrule contact of the tube is made the positive or plus lead.

This tube is of the gaseous discharge rectifier type, the purpose of which is to change alternating current to direct current.

One of the peculiarities of this tube is that there is no filament. Therefore, the life of tube is indefinite, if the tube is properly handled. There is no point obtainable when the tube is overloaded, to cause breakage, as is common with other tubes of similar type. The only thing that can happen is that the glass can become overheated and break, which very seldom happens. The following are the other advantages of this tube: (1) no starting switch or rheostat is required; (2) no parts to wear out. (3) no chemicals to spill over. (4) no noise emitted during operation. (5) no light given out. (6) as soon as the current is on the tube begins to work. When current is turned off, it immediately stops. There is no lag. (7) a 95% sine wave rectification factor is obtainable. This simplifies filtering and more pure direct current is gained thereby. (8) very low internal resistance. (9) will rectify at all commercial frequencies. (10) the output operating cost is only 12 cents per watt. (11) starting voltage is 300 AC (instantaneous). (12) it weighs 6 ounces. (13) it is 6½" long and 1½" in diameter. (14) it employs a 1½" Mogul base (600 volt type).

As you noticed, the tube will not conduct on less than 300 volts AC. This necessitates an AC step-up transformer.

In the common filament type rectifier tube the current is limited by the electron emission from the hot filament and it cannot be overloaded without burning the filament at high brilliancy. However, in the S tube, we have a different proposition. Any current will be passed by the tube, which is determined by the voltage, the resistance of the tube and the load resistance. If the voltage is increased or the load resistance decreased, the tube will be overloaded. As you decrease the load circuit resistance more rectifiable current will be obtained. This can be had, until there is such heat generated that the glass cannot stand up, resulting in breakage.

The Filter System

We use three 10 henry choke coils (L1L2L3) as the inductance part of the system. C1 and C2, the electrolytic condensers, C3 and C4, the .005 mfd. mica by-pass condensers and C5, the 1.0 mfd. paper condenser, constitute the capacity part of the system.

The choke coils can be conveniently made at home. Procure an old audio-frequency transformer. Take off all the windings, until you have only the core. Now get some No. 36 single cotton enameled wire. Wind 4,000 turns of this wire on the core in any fashion.

The electrolytic condensers should be purchased. The same company that makes the S tube makes a condenser of the above type, known as the Amrad Mershon condenser.

The following is a brief description of the condenser: The dielectric is an oxide film, formed electrically on a thin sheet of aluminum. This aluminum is called the anode, which at the same time is one element (terminal) of the condenser. The electrolyte in which the element is immersed is the other terminal.

To obtain the maximum efficiency with the condenser, the plus post must be connected to the plus post of the DC source. This is why it is not to be used on AC, as the film will be ruined. If the electrolyte evaporates only pure distilled water should be added. This should be just above the anode.

The condensers are 5" high and 3⅛" in diameter.

C3, C4 and C5 should all be bought, as it is too difficult as well as too expensive to make them at home.

The AC Transformer

The core (which the wire is wound on) is of the laminated ¾" square cross section type. A lamination is one sheet of the metal, which is silicon steel. The outside dimensions of the core is 3¼" by 3¼". Procure one-quarter pound of No. 22 single cotton enameled wire and one pound of No. 30 single cotton enameled

AC Hum Made Inaudible

wire. Obtain some 1/16" waxed paper (about 2 sheets 6x8") and one sheet of .002" paper. Wrap the 1/16" paper on both legs of the core. Wind 225 turns on each leg of the core, making a total of 450 turns, using the No. 22 SCE wire. This is the primary. Take the beginning and end of the primary winding out for leads. Now wrap the .002 paper over the primary. Take the No. 30 SCE wire and 787 turns on one leg over the primary and 788 turns on the other leg over the other be 1575 turns in the secondary winding. The voltage output of this transformer is approximately 340 volts.

The last important article to be discussed is the resistance unit. R1 is a 4500-ohm resistance unit, tapped every 750 ohms, which gives us 6 taps. This means that the voltage is divided up into 15 volts steps. R2 is a 500-ohm resistance unit. There are four 125-ohm units connected in series and a tap taken off every unit. In series with this unit is a 1000-ohm unit (R3). R4 is a 5000-ohm resistance unit.

Connect the center contact of the S tube to the beginning of the secondary winding of the step-up transformer. Connect the other terminal to the beginning of L1 and to the plus side of the electrolytic condenser C1. The negative terminal of this condenser goes to the end of the secondary winding and to the beginning of the other choke coil L2. The end of the L1 winding goes to the plus side of C2, and the negative side goes to the left off winding lead of L2.

The plus post of C2 also goes to the beginning of the resistance units, R1. The negative post of C2 goes to the end of R4. T1 goes to the HT post and to one terminal of C4. The other terminal of C4 goes to one terminal of C3, which goes to the end of R3, to one terminal of C5, to the ground and to the negative binding post. The left off terminal of C3 goes to T2, and to the beginning of the winding of L3. The end of the winding goes to the left off terminal of C5 and to the LT plus binding post. T1 connects with the taps of the 4500-ohm resistance unit (R1). T2 connects with the taps of R2, is then shunted by a condenser, C3 and connects with R3. R2 is tapped in 2-volt steps, the voltages varying from 15 to 23 volts. The Ward-Leonard Electric Co. makes these resistors. **(Part II, conclusion, next week.)**

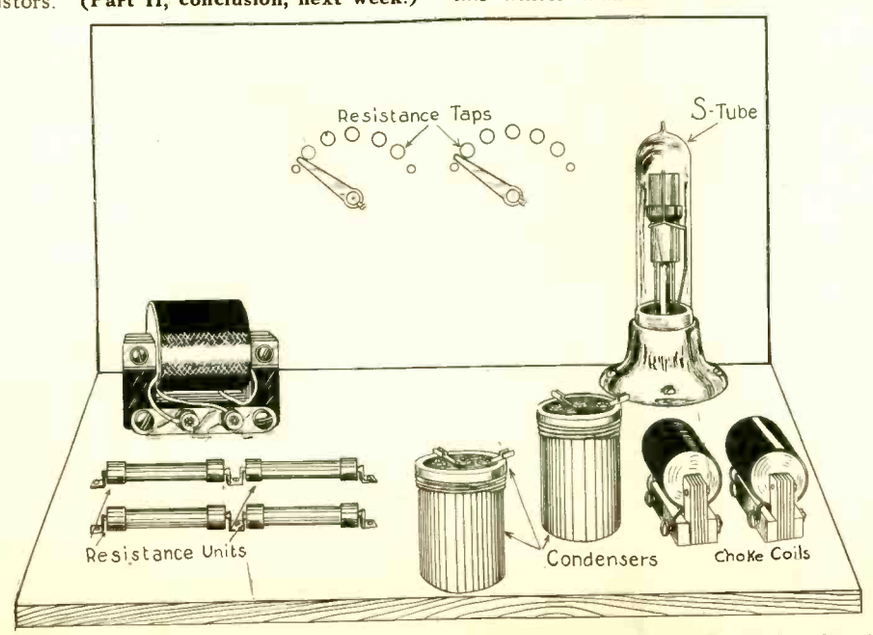


FIG. 4, showing the picture diagram of how the eliminator parts should be placed. Note that there are only 2 choke coils seen. The third one is hidden behind the others.

Foreign Stations New Mark For DX Sharpshooters

By Thomas Stevenson

Fans who seek to break distance records will have a real mark at which to aim this winter.

In addition to the increased number of higher power stations in the United States there will be super-power foreign stations. With increased power used, fans with multi-tube sets on the Eastern coast should have little difficulty bringing in several Western coast stations. Some of the stations which should be heard are:

Station	Location	Watts
KFI	Los Angeles, Cal.	5,000
KGO	Oakland, Cal.	3,000
KTCL	Seattle, Wash.	1,000
KJR	Seattle, Wash.	1,000

Fans centrally located should be able to bring in many high-power stations located at the four corners of the country. In addition to the remotely located American stations, they will have the Canadian, Mexican and Cuban stations to try for.

It is entirely possible that the next radio conference may recommend an even further increase in power for stations. Should this power increase be as high as to 10,000 watts, distance fans all over the country should be able to tune in 10 K. W. stations without diflculty during the cold weather.

Best of all perhaps to try the patience of the distance seekers are a number of foreign stations which it may be possible to bring in. During the last summer there has been a very noticeable increase in the power of a number of foreign stations which should make it possible for their transmission to reach this country.

At right are some foreign stations which American fans can try for this winter.

It is believed that there will be a greater exchange of international programs this winter than ever before. With the increased power on the part of foreign stations, it will be possible for American broadcasters to pick them up and rebroadcast their programs on a large scale.

It is reported that an American company has already concluded negotiations with several foreign stations for a wholesale exchange of programs this winter. If this plan works out, American radio fans will listen in on foreign stations even with crystal sets.

Station	Location	Meters	Watts
RAVAG	Vienna, Austria	....	5,000
BAV	Brussels, Belgium	900	4,000
....	Paris, France (projected)	1780	15,000
SFR	Paris, France	1780	10,000
FL	Paris, France	2650	5,000
LP	Berlin, Germany	330	5,000
....	Moscow, Russia (projected)	83	25,000
5XX	Daventry, England	1600	60,000
	Rio De Janeiro, Brazil	450	6,000
....	San Paulo, Brazil (projected)	....	10,000
....	Mukden, China (projected)	....	25,000

Number of Stations and Their Power Grow

The trend of broadcasting stations is toward higher power, records as the Department of Commerce indicate. It is estimated that there is 50 per cent. more power being used by stations than a year ago.

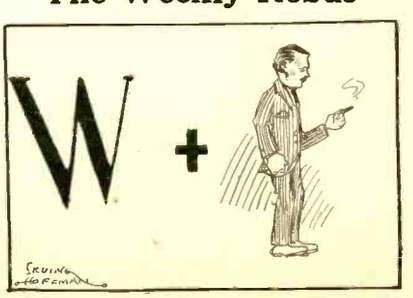
There has also been an increase in the number of stations during the past year. On September 1, 1925, there were 453 Class A, 107 Class B, 2 Class D stations, a total of 563. One year ago there were 386 Class A, 56 Class B, 89 Class C, and 2 Class D, a total of 533 stations.

NAVY DOES DX WORK

WASHINGTON.

The Navy Department and the Naval Research Laboratory at Bellevue, D. C., continue to have remarkable results from transmission on high frequencies. During the trip of the fleet to Australia, direct two-way communication on high frequencies was accomplished and an appreciable amount of traffic was handled in this manner. When the distance between Washington, D. C., and Australia is reckoned, direct two-way communication seems a very remarkable feat.

The Weekly Rebus



A Home-Made Volume Control

FIG. 1 (top), procure a piece of stiff cardboard, a tap switch, ¼ lb. No. 30 enamel covered wire and a pillbox about ½" diameter. Paste the box on the cardboard (Fig. 2). Cut the cardboard, leaving a circle around the box protruding about ¾". Do the same thing on the other side of the pillbox. The net result is a sort of reel, shown in lower right in bottom photo (Fig. 4).

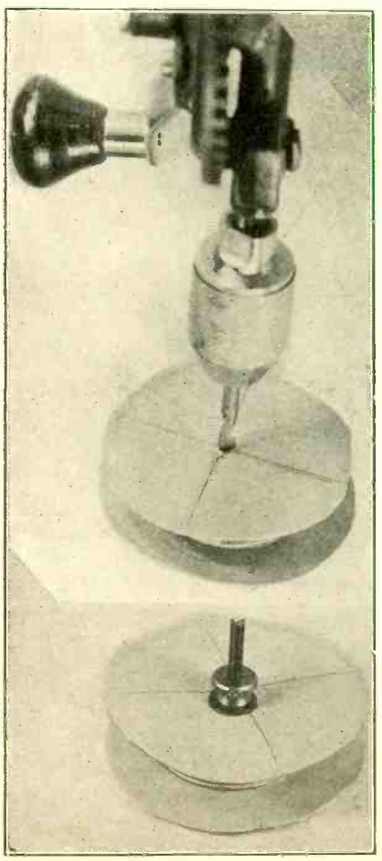


FIG. 5, center the larger circle and make a hole with a No. 27 drill. Next (Fig. 6) put a 6/32" screw in the hole and fasten tight.

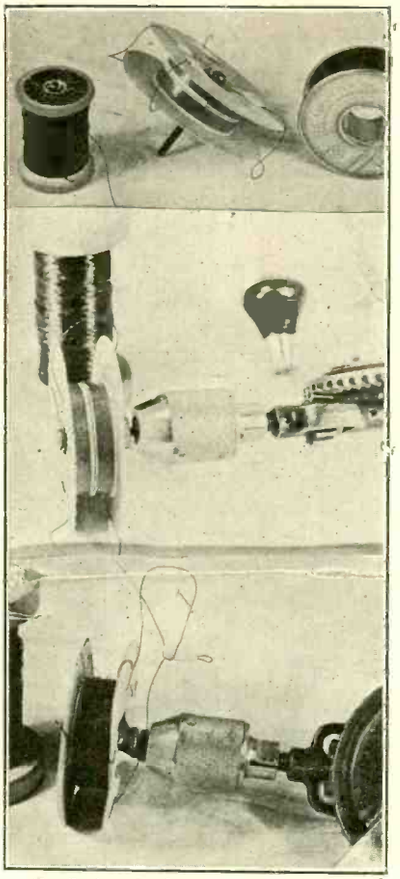


FIG. 7 (top), fasten several threads onto the pillbox with adhesive tape. These will be used later as tie threads. Fig. 8, place the little reel you have just made in the drill chuck of any hand-drill and you are ready to wind the coil. Now wind about 25 turns of the wire and take a tap. (Fig. 9). Scrape the enamel off the wire to take the tap.

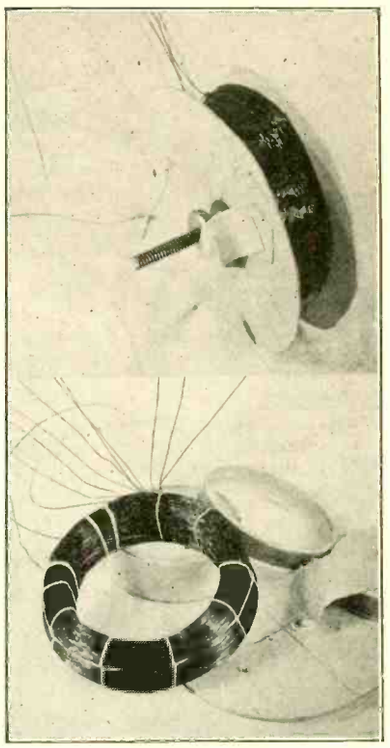


FIG. 10, continue winding, taking a tap at every 25 turns, until about 300 turns are put on. The number of taps taken will determine the closeness with which you will be able to regulate volume. But in any instance you must not have a greater number of taps than there are points on the tapswitch. Divide the number of points on the switch into 300 and tap accordingly. Fig. 11, pull apart the reel, which was the winding form. Tie the wire as shown. The tie strings will be found indispensable now, for they prevent the coil springing apart.

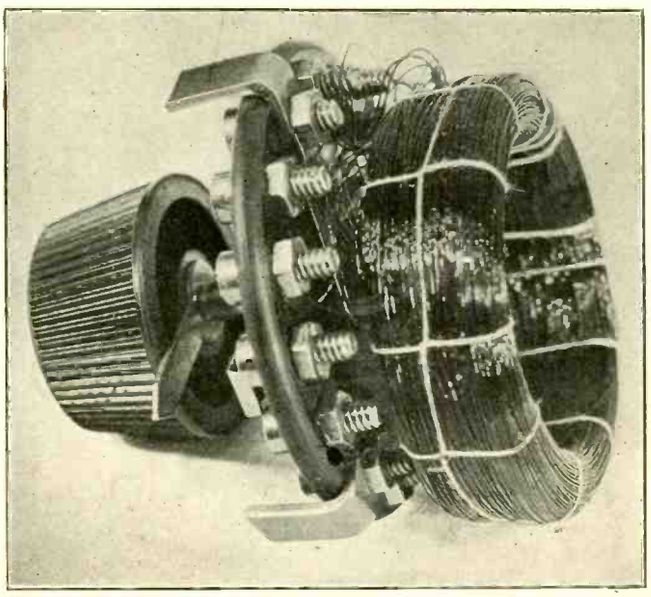


FIG. 12, the coil mounted on the back of the switch and the taps fastened to switchpoints.

By Herbert E. Hayden

Photographs by the Author

MANY desire some form of volume control because some stations come in too loud and others not quite loud enough, so that if there were some means of governing the volume, desire would be appeased in all particulars. A variable choke coil solves the problem. It is a high-frequency choke, with taps taken out, these leads being brought to points on a tapswitch. The detector plate is connected to the movable arm of the switch, the end of the winding to the last tap switch. The control afforded by this

(*Concluded on page* 25)

The Way of the Frequency Dial

By Capt. P. V. O'Rourke

THE frequency dial offers not only a solution of the overcrowding of the dial positions of low wavelength stations, but it has one advantage over a straight-line frequency condenser: it can be put on a variable coil shaft. If a tickler coil is turned to its most critical position (feedback for same low wave) then the spreading-out benefit is gained. This is true also on variometers, for they, as a rule, crowd the lower waves on an ordinary dial rather severely.

CAPT. PETER V. O'ROURKE

Where Benefit Lies

Many who purchase condensers this season will choose the SLF type, because of the resulting tuning ease on the low waves. The difficulty in properly setting the dials for delicate tuning of distant stations is not necessarily solved by the SLF condenser or the frequency dial. It is a question of frequency that is solved, i.e., benefits accruing on the higher frequencies, rather independent of distance or proximity. One of the outstanding points about the SLF condensers newly on the market is their fine construction, which is as important as the much-advertised virtue of station separation, which is no small virtue, either.

It is interesting to compare the effect of the SLF condenser, ordinary dial, and the straight-line capacity (round plate) condenser using a frequency dial.

The Test Dial

The operation of the frequency dial is on a gearing or cam system, whereby the dial itself is turned uniformly, but the condenser is turned at a varying degree or speed. Very slow motion is introduced on the low waves and as near a ratio of 1-to-1 on the high waves as is possible. This may be accomplished in a variety of mechanical ways, but the fundamental theory always is the same. It is a real engineering feat to produce a good frequency dial, still avoiding clumsiness of operation or awkward largeness of diameter. The easiest efficient frequency dial to make would have to be 5" or more in diameter, to allow room for wide gears engaged by traction, but the commercial wisdom of this is doubtful. Other problems exist, as I shall point out.

But, granting the existence of a good frequency dial, the spreadout is excellent on the lower waves. But there is a slight spreadout on the higher waves, too, where it is not needed. It may be very slight, indeed negligible, and the best types accomplish this. The spreadout is due to the difficulty in reducing a ratio that, at the opposite end, was 15- or 20-to-1 so that it gets down to 1-to-1, where the dial and condenser move at exactly the same rate of speed. Although some engineers who have been grappling with the problem may not agree with me, it is possible to produce a motion on the upper waves that is less than 1-to-1, i.e., the condenser shaft that at the unmeshed position if the rotor plates moved only 1/20 as fast as the dial now moves at a speed greater than that of the dial. The reversal must begin at some given point and this is likely to produce a slump in the curve.

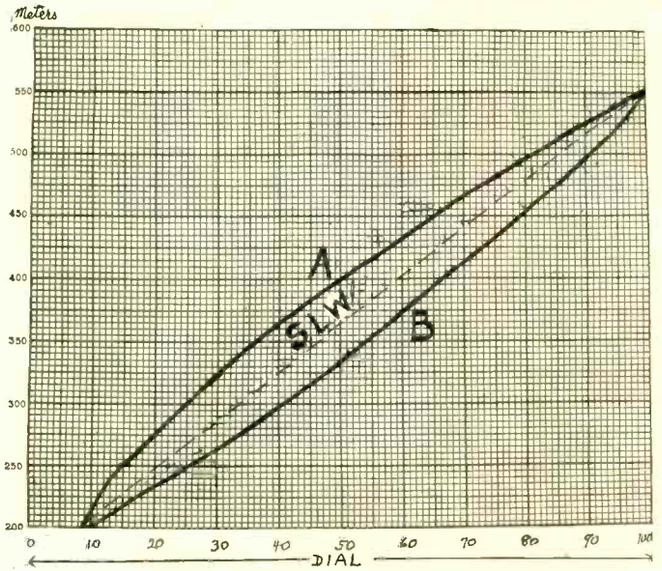


FIG. 1, a comparison of the curves of a circular-plate or straight-line capacity condenser using an ordinary dial (A) with the curve when a frequency type dial (B) is used instead on the same condenser. The dotted line shows the curve of a straight-line wavelength condenser, ordinary dial. By comparing the wavelengths, shown in meters at left, with the dial settings, shown at bottom, it can be seen that on the lower waves the stations are badly crowded on A, somewhat separated on SLW and conveniently spread out on B. The frequency type dial on a round-plate condenser is much more effective in the spreadout than the SLW condenser with an ordinary dial.

Can It Be SLF

This leads naturally to a doubt as to whether true straight-line frequency can be obtained by a dial device at all. I am not prepared to say that it can be done, but only because I have not been able to reach that exact point myself. Even an SLF condenser does not exactly and precisely follow the straight line. In the better types, such as the Amsco, the condenser comes marvelously close to it, when the proper coil is used. The Amsco is true to 1/10 of 1 per cent. Can a frequency dial come that close to perfection? Even if the answer is no, the merit of an SLF dial is not impugned.

The difficulty in SLF dial construction obviously is at the higher wavelength settings, to avoid spreadout, where it is not needed. The whole system is one of vernier, where the ratio changes. Any ordinary vernier dial spreads out the crowded stations to the extent that multiple revolutions of the vernier are necessary to turn the dial only 180°. To put it differently, the stations are spread out on the vernier knob, if not on the actual reading. It makes no difference if the entire dial is vernier or if it may be turned in normal manner and a knob alone is the vernier. An exception exists on the high waves, for then the dial itself may be moved without vernier effect, but this has the drawback that the dial has a resistance element, e.g., felt, which is against the panel, and turning the main knob, without vernier, wears out this resistance substance. When it is badly worn the dial doesn't perform properly or perhaps not at all.

Vernier Not Enough

Therefore it is fair to state that a vernier dial alone is not the best good solution, since it necessitates slow motion on the high waves. It seems strange that frequency dials had to wait until this season to make their bow. Why so bashful?

If a frequency dial is going to preserve the same disadvantage then there is not much excuse for its existence; indeed, in such a case, it would not be a frequency dial. To follow the frequency line it must approximate the results obtained by the use of an SLF condenser.

Straight-line frequency is rather a scientific target than an adamant practical necessity. Motion even more spreading in its effect on the low waves may be introduced. There is no necessity for exceeding SLF, in dial or condenser, for the spreadout is just about right on the true frequency basis, and no more is needed. A little extra will do no harm, however. The variation may be even 10 per cent, but if it is that much "to the good" it is quite acceptable. In other words, if it causes low-wave spreadout even more than SLF, it is highly acceptable, though not important. The spreadout should be as good as SLF, but should not be much less.

Of course any instance of "overdoing it" on the low waves must be made up on the high waves and even less than 1 to 1 ratio would have to be accomplished there.

Good Results of Dial

That it is not difficult to obtain good spreadout on the low waves is proven by the curve of an SLF dial constructed in RADIO WORLD's laboratories in a series of experiments on which this article is predicated. The dial was made of two pinions and two gears. A knob, the only turning element, was kept in the same relative position. The pinions were a part of the knob, or rather, were the internal mechanism attached to it. The gears were turned at different ratios: the one moving the dial always was 1-to-1, while the other gear was shaped to produce unequal motion, slow at first, fast finally. The dial divisions numbered 100, as usual, but the angle of dial rotation was 300°, instead of the common 180°. Most condensers turn through their range in 180°. The secret of the SLF dial will most likely be in the greater angle of rotation and the accurate apportionment of the surplus. If 180° represents the condenser and 300° the dial, then 120° is gained, and this is to be used in introducing the necessary slow motion. It is mechanically difficult to achieve more than 300 or 310°,

Station Separators Compared

due to space taken up by mechanism, and preventing a complete revolution; i.e., end-stops exist to defeat achievement of a complete cycle.

The Curves

It will be seen from Fig. 1 that the experimental dial on a round plate (SLC) condenser showed up better than a straight-line wavelength condenser using an ordinary dial. Of course it was far better than a round plate condenser with ordinary dial.

The dotted line shows SLW, which means an equal dial separation of stations of equal difference in wavelength. Stations are not separated, in assignments by the Department of Commerce, according to wavelength, but according to frequency. The range, 200 to 600 meters (practically 209 to 555) is separated into channels and each station is assigned to a particular frequency consistent with the preservation of the fixed channel, which is 10 kilocycles, and was established so that there would be minimum interference and sufficient leeway to allow for the carrier wave's side bands and then a little.

Frequency vs. Wavelength

Unfortunately the public thinks in terms of wavelength, but radio is on a frequency basis. The wavelengths stated in programs represent the equivalent of the frequency. As there is a constantly changing ratio the equation "1 meter = + kilocycles" is laughable impossibility on the broadcast belt and elsewhere. One meter equals a certain number of kilocycles only when it is one meter and there is no transmission on one meter (only a few experimental amateur attempts). The formula for determining the frequency is:

$$f = \frac{300{,}000}{\lambda}$$

Where f is the frequency in kilocycles, 300,000 is the speed of the wave in kilometers and λ a Greek letter, spoken "lamda" is the wavelength. Hence the wavelength always is divided into a constant.

"Not So Good"

Hence wavelength as a basis of separation can not achieve much good. It is a compromise, and a rather poor one. It is not a solution even though it is better than the capacity basis, where (as with round plate condensers) the divisions of an ordinary dial represent approximately equal capacity value. For instance 50 on the dial, where a .0005 mfd. (5000 micro-mfd.) condenser is used, represents .00025 mfd. (250 micro-mfd.) and 10 represents .00005 mfd., or 50 micro-mfd. Capacity is a poor basis of separation because a small amount of capacity produces a disproportionately large frequency change on the low waves (higher frequencies). This causes the overcrowding. If the SLC curve in Fig. 1 is read for dial settings and corresponding wavelength, below 400 meters, this fact is forcefully brought home.

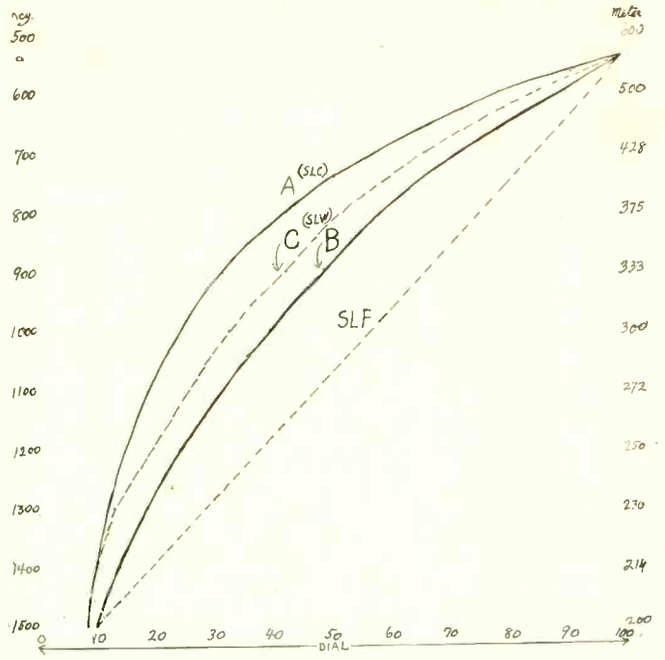


FIG. 2, a comparison of the curves of all the four specimens, (1), the SLC condenser, ordinary dial, "A"; (2), SLW condenser, ordinary dial, "C"; (3), SLC condenser, frequency type dial, "B"; and (4), a SLF condenser curve, ordinary dial. The above is a frequency chart (numbers at left are kilocycles), while Fig. 1 is a wavelength chart.

Making Comparisons

Take the same wavelengths and note the dial settings for the SLW curve. The crowding is little relieved. Make the same comparison for the frequency type dial, the bottom curve, Fig. 1. Here is substantial improvement. Relatively the curve is "twice as good" as is SLW, when both are compared with SLC. Of course it is obvious at a glance that this frequency type dial isn't SLF, but only an improvement on SLW. Some commercial frequency dials do much better than this. The curves are presented merely for purposes of comparison of an attempted SLF dial with an ordinary dial. Remember that an SLC condenser was used. If the laboratory dial were put on an SLW condenser a much better result would be obtined. It would not be a solution, only a makeshift, as the shortcomings of the SLW condenser and the frequency type dials would still exist independently, and only the union of two unsuccessful efforts would be created to balance out the inequalities. This is not to say that the particular dial plotted would not be a great help all by itself, and worth buying, were it on the market, which it is not and will not be, so far as I am concerned. I could improve on it greatly and so could a thousand others.

The Frequency Chart

Fig. 1 deals only with separation on a wavelength basis. We are striving for SLF effect, so let us look at the curves when plotted against frequency. For simplicity's sake we will use the dial settings in the same manner as in Fig. 1, where O represents the minimum capacity and 100 the maximum although a frequency reading preferably should be from 100 for minimum capacity to O for maximum. The greater the frequency the lower the wavelength, hence the higher frequencies, for theoretical reasons, should be represented by the higher numbers, and

(*Concluded on page* 30.)

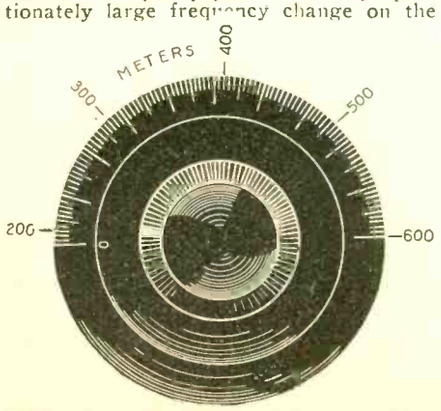


FIG. 3, how the stations are separated on the "Straight-Line Wavelength Condenser."
(Radio News.)

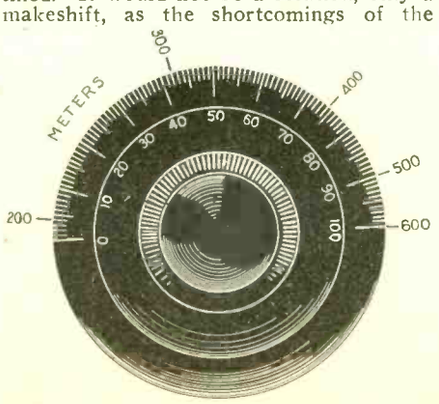


FIG. 4, showing the great separation on the lower end of the dial on a "Straight-Line Frequency Condenser." Note the crowding at the higher wavelength part of the dial.
(Radio News.)

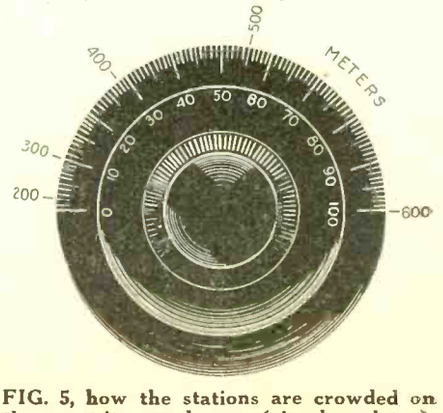


FIG. 5, how the stations are crowded on the capacity condenser (circular plates). Note the separation on the high wavelengths (low frequencies).
(Radio News.)

THE RADIO UNIVERSITY

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

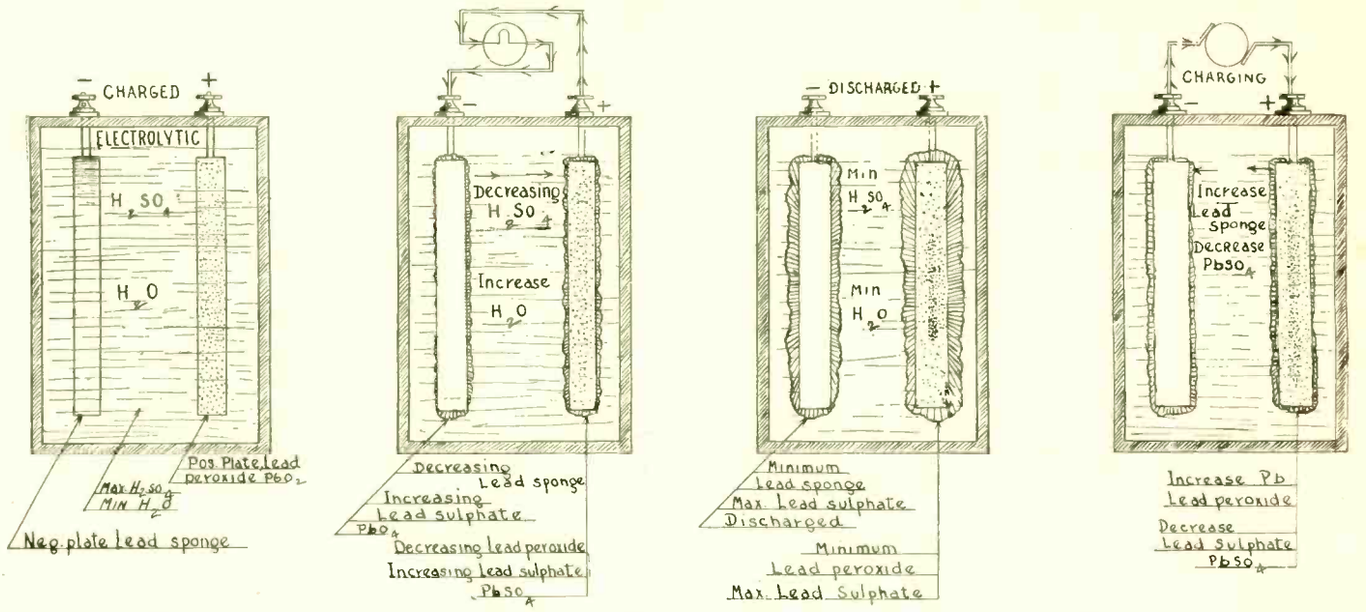


FIG. 200, showing the action which goes on inside of the storage battery. Note that in the first diagram the electrolyte is called electrolytic. This is not correct.

A SERIES of four diagrams depicting that which is going on inside of a storage battery, is requested.—P. L. Lyons, Long Island City, N. Y.

See Fig. 200.

* * *

I HAVE tried out the Marconi receiver described in July 8th issue of RADIO WORLD. (1) You call for a 3" tubing with 2" rotor 2¼" long. A 2¼" long rotor will not revolve in 3" tubing. In dimensions of tubing do you mean inside or outside. (2) I am using a 23-plate Hamerlund low-loss condenser and find that with the above coils I cannot get over 475 meters. What is the remedy?—R. Muller, 1600 Walnut St., Philadelphia, Pa.

(1) Inside diameter. (2) Put a .001 mfd. variable condenser across the antenna and ground.

* * *

I HAVE a set of Supercoils for use with the Roberts Circuit. Can I use the same for The Diamond of the Air with 23-plate condensers? (2) I also have a set of "Transcontinental Coils" for Roberts. Can I build Diamond of the Air, using them?—C. A. Spogard, 1405 F St., N. W., Wash., D. C.

(1) Yes. (2) Yes.

* * *

I HAVE built the "3-Tube Wright Reflex" as published in the May 23 issue of RADIO WORLD. I have used 3½ to 1 ratio AFT in both stages. Is this correct? (2) Will you kindly inform me what ratio and also the best suited make of transformers I ought to use for best results?—Frank W. Ekberg, 679 E. Maryland St., Saint Paul, Minn.

(1) O. K. (2) Use transformers with physically large windings.

* * *

I AM preparing to build The Diamond of the Air and would greatly appreciate your advice on the following: (1) What is the exact resistance of the 1A Amperite? Does it change? (2) I intend to use three C301A tubes with a Sodion (D-21) detector. Would 1A Amperite be all right for the amplifier tubes? (3) Since the filament voltage of D21 tube is not critical would you advise the use of amperites throughout? (4) What is the ratio of the Federal 65 AFT? (5) I have two Acme A2 audio transformers on which the terminals are not marked. As the transformers are not shielded the coil terminals are plainly visible. When I connect the inside turn (next to core) tc B+, outside (end) of primary to plate inside lead of secondary to filament minus and outside lead of secondary to grid a high pitched squeal results, but by reversing the primary connections of the first step transformer (thus making the outside turn of primary and inside turn of secondary low potential) the results are very good. (6) Does any fixed rule apply for determining the correct polarity, such as given on page 22 of the April 4th issue for radio-frequency transformers?—Burton Bailey, 2565 E. 73rd St., Cleveland, O.

(1) It is about 24 ohms. It changes automatically. (2) Yes. (3) Yes. (4) 3.7 to 1. (5) O. K. (6) No.

* * *

AFTER BUILDING the 1925 Superdyne I find that the low wavelengths come in excellent, but from 379.5 meters which comes in at 32 on the dial, signals are hardly audible.—Douglas Wixom, Fishkill, N. Y.

Insert a .001 mfd. fixed condenser across the antenna and the ground.

* * *

I WOULD like to build the Diamond of the Air. (1) Could I use the Browning-Drake Regenaformer in the Diamond circuit? (2) Would it cause the RF stage to be very unstable? (3) If so, couldn't the reverse feedback of the Superdyne principle be applied to the RF tube?—A. M. Carey, 223 Maple St., Fort Morgan, Colorado.

(1) Yes. (2) No. (3) No.

* * *

KINDLY furnish the writer the following information: I hooked up the ultra-audion reflex, submitted by Seeley Hopkins in the July 18 issue of RADIO WORLD. I used a Jefferson Star audio transformer 6 to 1 ratio, a panel mount variable grid leak across secondary of transformer and a WD12 tube with 45 volts B battery. (2) Can I use No. 22 single or double cotton covered wire in three circuit tuner of June 27 issue? (3) Will a WD12 do as detector or can I use two similar tubes in audio stages? (4) I have two .0005 variable condensers. Will they do?—Albert Molloy, care Moore, Leonard & Lynch, 11 Broadway, New York City.

(1) Disconnect the stator plates of .0005 mfd. (across the 45 turn coil) which goes to the plate and terminate it at the beginning of this coil. Bring the disconnected plate lead to the rotary plates of the same condenser. (2) Yes. (3) Yes. (4) Yes.

* * *

WILL YOU please tell me what is wrong with my 4-tube set described by Cardwell in Oct. 4th issue of RADIO WORLD. I have a 75 to 80-foot aerial, including lead-in, Bremer-Tulley low-loss condensers, low-loss wound coils as described in your magazine. I am unable to separate stations. Have tried a fixed condenser .0005 in series with antenna but it did not help. I also tried it in the ground. This helped, but made the set oscillate. (2) Can I safely make the Diamond of the Air from these parts? (3)—Has the latter set good tone? Fred M. Theis, 309-311 Jeff St., Eisfeld Clo. Co.

(1) Reverse the secondary of the RFT. (L2 and L4). (2) Yes. You will only need a tickler on the interstage coil (L3 L4). This should have 35 turns, wound on a 2½" tubing, using No. 22 DCC wire. (3) Yes.

* * *

I WOULD be glad to be advised as to the number of turns of No. 18 DCC wire on a 3-circuit tuner form, the stator being 3½" in diameter and the rotor being 2¾". A .001 mfd. condenser is to be shunted across the secondary.—G. E. Edson, 306 N. Willomet Ave., Dallas, Tex.

There are 8 turns on the primary, 35 turns for the secondary. The rotor (tickler) has 25 turns.

* * *

I AM very much interested in your diagram of the Reflex set in Dec. 6 issue of RADIO WORLD. I have Acme parts all

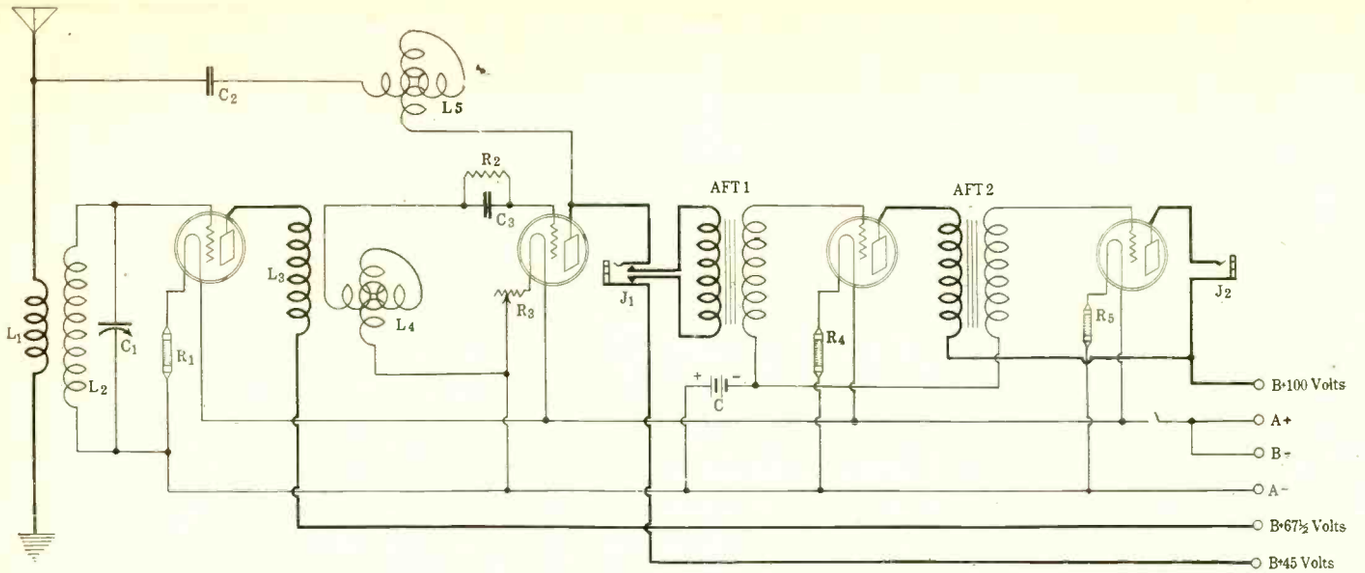


FIG. 201, showing the electrical diagram of the "2-year-old." L1 is wound on a 3½" diameter tubing 4" high and contains 10 turns of No. 22 DCC wire. L2 has 45 turns wound on the same tubing and employing the same wire. No spacing. L3 has 10 turns wound on a 3½" diameter tubing 2" high, using No. 22 DCC wire. L4L5 are both commercial variometers. C1 is a .0005 mfd. variable condenser. C2 is a .0005 mfd. fixed condenser. C3 is a .00025 grid condenser. R2 is a 2 megohm grid leak. R3 is a 6-ohm rheostat. R1, R4 and R5 are all Amperites type determined by tube used. The C battery has a voltage of 4½. AFT 1 and 2 are of the low ratio type. J1 is a double circuit and J2 is a single circuit jack.

through. Please answer the following questions: (1) Can I use Acme radio and audio-transformers in this set? (2) Can I use the Acme Pot-Rheo. (3) Can I use the Acme Variable .0005 Condenser? (4) I have a Brownlie Crystal, would a Carburundum crystal be better? (5) Would you recommend to have a loop and outside aerial so can switch to either one?—M. L. Bengston, Ash Fork, Ariz.

(1) Yes. (2) Yes. (3) Yes. (4) Yes. (5) Yes.

* * *

PLEASE GIVE me the diagram of the "2-year-old DX SET."—S. W. Watchley, Plainfield, N. J.

See Fig. 201.

* * *

I HAVE a 3-circuit tuner of the Midget type. The primary consists of 10 turns of No. 22 DCC wire, the secondary has 53 turns of same number of wire. The tickler has 38 turns. Could I use this in The Diamond? (2) Could I use the same coil in "The Midget," which was described by H. E. Hayden in the Aug. 8 issue of RADIO WORLD? (3) Could the primary and the secondary of this coil be used for the antenna coupling coil in the Diamond? I am using .0005 mfd. variable condensers. —Omer D. Baker, Lowell, Mass.

(1) Yes. (2) Yes. (3) Yes.

* * *

WOULD YOU kindly let me know if I could use any of the following low-loss variable condensers in Wright's Powerful 3-Tube Reflex published in the May 23 issue of RADIO WORLD? One 13 plate, 23 plate, 38 plate, 43 plate.—J. R. Kingsbury, Cambridge, Mass.

You can use the 23-plate condenser to shunt the secondary of L2. Use the 13-plate condenser to tune the secondary of L4 which in this case would have 65 turns. Use the 38-plate condenser to shunt the secondary of L6. L6 contains 30 turns.

* * *

IN BUILDING an aerial what kind of wire should I use? (2) I have a Superdyne at present and get good reception on high wave stations but from 360 meters down all stations seem to be bunched up. How can I remedy this? (3) Can a coil that calls for 42 turns on 3" diameter tubing as a secondary, be replaced with an air wound basket weave coil 3" diameter, the same amount of wire? (4) Is it important to ground the A negative in Superdyne? Will it work as well without being grounded?—D. J. Crotto, Sackett & Whilhelms Corp., 1013 Grand St., Brooklyn, N. Y.

(1) Use No. 14 seven stranded enameled wire. (2) Put a .001 mfd. fixed condenser in series with the antenna. (3) Yes. (4) This has to be tried out. Some times the set works better, with the negative A grounded and some times vice versa.

* * *

IS THE 8-Tube Super-Heterodyne published in the July 4 and 11 issues of RADIO WORLD worth building? (2) Can I use all American condensers (100-1 vernier)? (3) Is the set selective?—O. A. Walker, 510 73rd St., Brooklyn, N. Y.

(1) Yes. (2) Yes. (3) Yes.

* * *

I HAVE built Harkness 2-Tube Reflex with Crystal detector and it works fine. Recently, I added one stage of resistance-coupled amplification, to obtain better loud-speaker operation. The result was the set now squeals and howls continuously when I turn on the rheostat or any part of the set. What would you suggest me to do for removing this squealing?—A. Deslauriers, Sherbrooke, Quebec, Can.

There is a short in your resistance amplifier unit. Insert new resistances in both grid and plate circuit. Transformer coupling will give you more volume and will be more advisable as to positiveness of working right.

* * *

I AM going to build the Diamond of the Air. Could a 180° coupler be converted into the 3-circuit tuner? The dimensions of the coupler are as follows: The inside or tickler form is 2" high, with an inside diameter of 3". What is the number of turns to be wound on this form? (2) What kind of covering, and what size of wire? The outside form is 2½" high, the diameter is 4" inside, with a 3/32" wall. (3) What is the number and size of the wire to be wound on this form to make the secondary coil? (4) What is this space measurement?—Cyril Doyle, 2219 Annunciation Street, New Orleans, La.

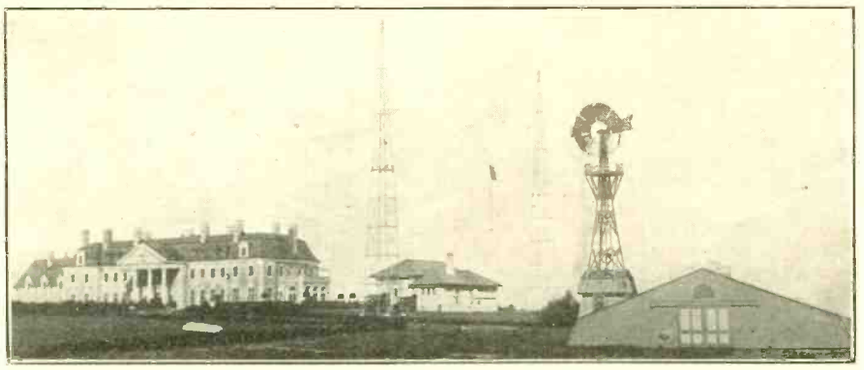
(1) Yes. There are 35 turns wound on this form. (2) Use No. 22 DCC wire. (3) The secondary contains 45 turns, using same wire as for tickler. (4) The space between the primary, which has 10 turns, is ⅛".

* * *

AS TO the Winner set published in the August 8 issue of RADIO WORLD, would a commercial radio frequency coil with a matched condenser be better or at least as good as the hand-wound coil, such as Bruno 55 and condenser, Bremer-Tulley RF coil and condenser, Aero RF coil and Lombardi condenser, Acme D coil or Erla Circloid? (2) I do not understand the necessity of placing the Variometers within 3 inches of each other. (3) In the list of material five tube sockets and four Amperites are called for although the diagram is for a four tube set. It calls for a six ohm rheostat al though the body of the article says a 20 ohm.—E. F. Wiltse, 11 West Bridge St., Oswego, N. Y.

(1) Yes. (2) To obtain maximum magnetic induction. (3) This is a typographical error. A 20 ohm rheostat is advisable. for a six ohm rheostat although the body error. A 20-ohm rheostat is advisable to use to obtain the greatest amount of efficiency.

Interconnected With WGBS



THE STUDIO and aerial of Col. E. H. R. Green, son of Hetty Green, at Round Hills, Mass., is the most elaborate private radio outfit. The station WMAF, listed at South Dartmouth, is now sending out WGBS programs, including Herman Bernard's 7 P. M. broadcast every Friday on radio technique. (Fotograms).

THE GIMBEL BROS. station, WGBS, shows its enterprise in many ways. Recently an airplane went aloft, carrying Maxine Brown, a musical comedienne. Her singing was broadcast from the plane, picked up at WGBS and rebroadcast on the regular 315.6 meter wave. The stunt was for the benefit of war veterans, but fans at large got great fun out of it. Unfortunately Maxine was "out of the picture" when this snap was taken. Instead, therefore, focus your admiring attention on Dailey Paskman, WGBS director (at right), a genius in his line.

A Handy Needle for Coil Work

ALL sewing can be done with this needle before removing a basket-weave coil from the pins.

ECONOMY EDITOR, RADIO WORLD:

After winding my first low-loss basket-weave coil as directed in issue of RADIO WORLD, Nov. 29, I found that the sewing of the coil was the herdest part of the job. Before winding the second coil a "push-pull" needle was made by flatening the end of a piece of No. 16 soft copper wire and filing a hook on one side and a notch in the end, like diagram below. Since then coils have been wound for several sets and the sewing is a small part of the work.

O. C. MILLER,
Atchison, Kans.
c/o Home Bldg. & Loan Association.

Uses Station

A SYSTEM whereby the various rad been devised by George Jacobson, of to the knob of the dial. Mr. Jacobs location of each station. The piece of covers the

New Form of Uses Broa

Radio and motion picture fans crowde Loew's State Theatre and fourteen othe West Coast Theatres the other night t see and hear an actual demonstration o movies accompanied by broadcast speech It was the first linking of its kind of th silent drama with the human voice ove the air.

The crowds which jammed the theatre sat almost bewildered at the synchroniza tion of the lip movements and the voice o Norma Shearer and Lew Cody, the prin cipal actors in the experiment.

A Movie Concern

Metro-Goldwyn-Mayer, a movie concern co-operated to have Miss Shearer and Mr Cody, give the experiment much of thei time. Most of the work came under the care of Douglas Shearer, brother o Norma. He is an electrical engineer. KF took care of the transmission.

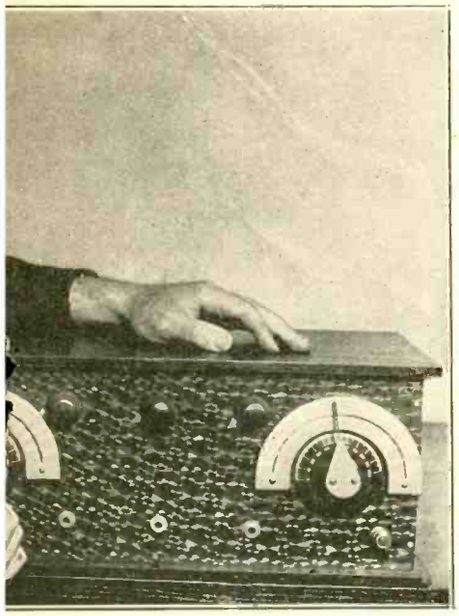
After weeks of experiment the studio and the radio mechanical experts declared that 100% synchronization of the human voice with motion pictures was possible although not yet achieved.

Sharply at 9 P. M. the radio part was put on the air by KFI.

On the stages of every theatre involved in the experiment a powerful receiving set had been installed. The operators in each of the theatre projection rooms wore head-phones, which gave them the metronome time setting cues for starting the film as well as the interval cues during the run of the picture.

Literally, the operator's duty was to beat time with the projection crank after starting his machine at the signal of the radio studio. No effort was made to present an elaborate play. As the announcer stated, the only effort was to show that it was possible to synchronize voice with the movement of the player's lips. The promoters of the project proved

Marking Dials



io stations may be marked on the dials, has New York City. The indicator is attached on is indicating by paper markers, the dial sheet copper is shown fitted into the slot and face of the dial.

Talking Movies dcasting System

l their point tolerably. With the exception of one or two instances where operators became nervous the results were successful.

Miss Shearer and Mr. Cody, actually talking from KFI, were heard in the various theatres throughout Southern California, while the audiences watched the motion pictures of them talking with the same true effect as though it were a personal appearance.

The demonstration opened the door to conjecture. Had the radio-cinema undoubtedly arrived? Preparations are already being made for repetition of the effort.

Now that inventors are announcing the control of radio waves, it may be possible soon for a group of theatres to present any length film story to their individual audiences over special tuned sets without making the same show available to others who have not paid for the service.

At the same time the doors also opened to the inventive genius who can make it possible for every home to have its own talking motion pictures.

HERE is a Super-Heterodyne that has 23 TUBES! Robert J. Sieglack, Sheepshead Bay, N. Y., is shown. (K. & H.)

An Electrolytic Detector

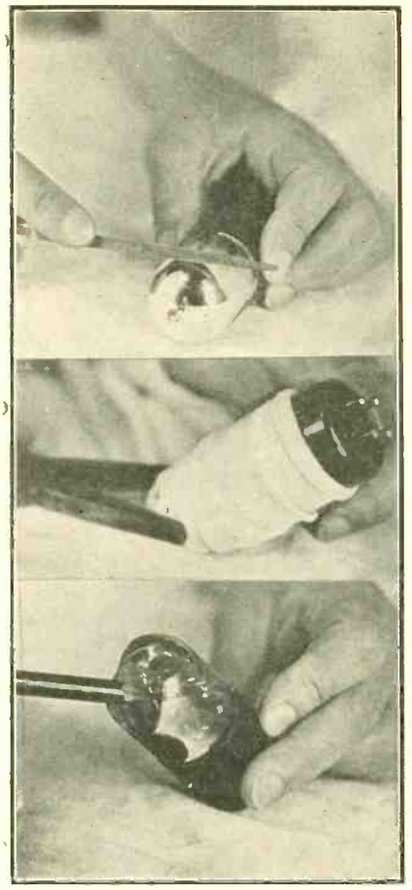


FIG. 1 (top), a circle is filed around a burnt-out tube, near the top. A piece of cloth is then wrapped around (Fig. 2). Then hit the glass with a pair of pliers. (Fig. 3). The wrapper is then removed. If the break is jagged you can make a smooth circle by breaking off the glass with pliers at the circle.

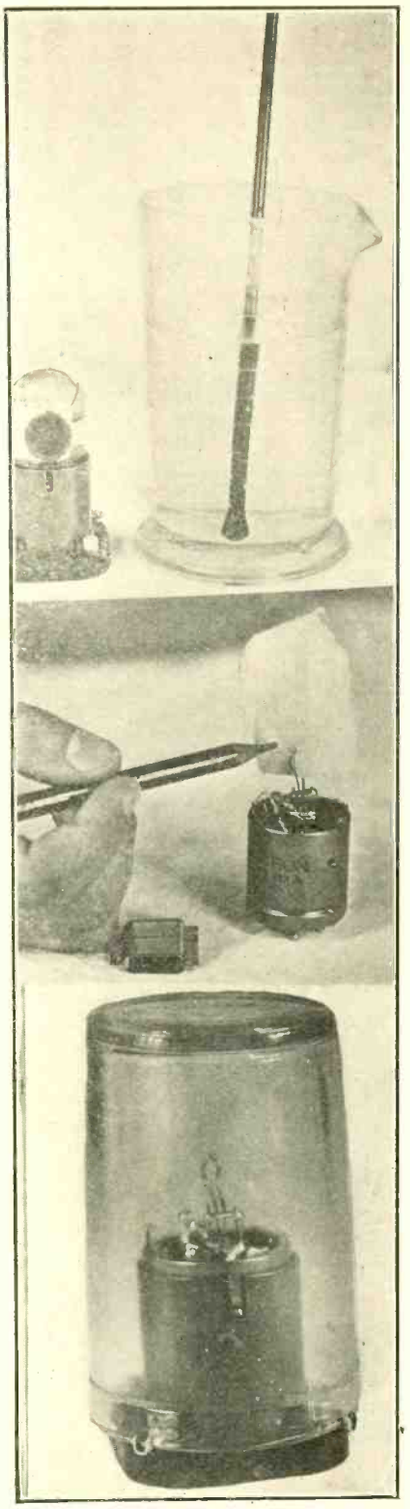


FIG. 4, a solution of dilute sulphuric acid, 10 drops chemically pure (C.P.) to 4 oz. of water, is placed in a glass. This is the electrolyte. Remove plate and grid. Fig. 5, bend the two filaments together, so that only the width of a thin piece of paper separates them. Remove the paper. Fill up the tube with the acid solution. Use the two filament terminals on the socket for circuit connection. Use an old dry cell in series with the phones. Fig. 6 shows an inverted tumbler used as a protection. Any crystal hookup can be used. (Hayden Photos).

1926 Styles

By-Pass Condensers

Types are offered molded in bakelite.

Speakers

Good speakers are offered, with a trend away from exposed horn types towards cabinet enclosures and disc or other novel shapes. Many adjustable units are appearing.

Sockets

Gang sockets on sub-bases find increasing favor. Universal contact arrangements are also offered with absence of screw connections.

Rheostats

Automatic amplifier rheostats are offered in quantity, but hand-controlled types remain about as before.

Kits

Super-heterodyne kits are offered as before, usually with a regenerative circuit combination. Reflex kits and tuned RF kits have not been much changed and must compete with quantity production low-list factory assemblies.

Beginner's Sets

Low-price 1-tube sets listing at old crystal set prices, for dry cell operation with the lower list tubes. are expected to nose out thousands of crystal sets this Fall, and are variously called, pup, junior and other names.

Summary

All in all, the radio public will get a good run for its money this season, due to a highly competitive market fed by factories on a real production basis.

THE KEY TO THE AIR

KEY

Abbrevations: EST, Eastern Standard Time; CST, Central Standard Time; MST, Mountain Standard Time; PST, Pacific Standard Time; DST, Daylight Saving Time.

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

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

If you are under DST and the station you want is under that time, too, or if both are under ST, the above table will hold.

If you are under DST, and the station operates under ST, add one hour to the table result.

If the station uses DST, and you are under ST, subtract one hour from the table result.

FRIDAY, SEPTEMBER 18

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12 to 1:05 PM; 8 to 12 PM.
WAMD, Minneapolis, Minn., 243.8 (CST)—12 to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 to 10 PM.
WBBR, New York City, 272.6 (ESTDS)—8 PM to 10.
WBOQ, Richmond Hill, N. Y., 236 (ESTDS)—7:30 PM to 11:30.
WBZ, Springfield, Mass., 333.1 (ESTDS)—6 PM to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 to 4; 5:30 to 10.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—12:30 to 1:30 PM; 4:30 to 5:30; 6:30 to 11.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 to 7 PM; 8 to 10; 11:45 to 1 AM.
WEAF, New York City, 492 (ESTDS)—6:45 AM to 7:45; 11 to 12; 4 PM to 5; 6 to 12.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 8 to 11.
WEAO, Ohio State University, 293.9 (EST)—8 PM to 10.
WEEI, Boston, Mass., 476 (ESTDS)—6:45 AM to 7:45; 2 PM to 3:15; 5:30 to 10.
WEMC, Berrien Springs, Mich., 286 (CST)—9 PM to 11.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30.
WFBH, New York City, 272.6 (ESTDS)—2 PM to 6.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 PM to 4; 6 to 11.
WGCP, New York City, 252 (ESTDS)—2:30 PM to 5:15; 8 to 11.
WGES, Chicago, Ill., 250 (CSTDS)—5 PM to 7; 10:30 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (ESTDS)—12 M to 12:45 PM; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (EST)—1 PM to 2; 5:30 to 10:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8:30 to 10.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—12:30 PM to 1; 2:15 to 5; 7 to 11; 12 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—7 PM to 9; 11 to 12; 12:30 to 1:30; 4:30 to 5:30; 6:30 to 9:30.
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 8:45 to 10:05; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—7 AM to 8; 1 PM to 2; 3 to 4:50; 6 to 7.
WJY, New York City, 405 (ESTDS)—7:30 PM to 11:30.
WJZ, New York City, 455 (ESTDS)—10 AM to 11; 1 PM to 2; 4 to 6; 7 to 10:30.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 7:30 to 1 AM.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15; 1:30 PM to 2:30.
WMCA, New York City, 341 (ESTDS)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—3:45 PM to 4:45; 6:20 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1; 5:45 to 7:10; 9 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 5:45 to 12.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7.
WPAK, Fargo, N. D., 283 (CST)—7:30 PM to 9.
WPG, Atlantic City, N. J., 299.8 (ESTDS)—7 PM to 8:30; 10 to 12.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—4:30 PM to 5; 6:45 to 12.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (ESTDS)—11:59 to 2 PM; 7:59 to 9:45.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 10; 12 PM to 1 AM.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30; 3 to 4; 6 to 7; 8 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:20 PM; 1:30 to 3:20; 3:30 to 11.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFDY, Brookings, S. D., 273 (MST)—8 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 10.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 9:30 to 12.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 11.
KGO, Oakland, Cal., 361.2 (PST)—11:10 AM to 1 PM; 1:30 to 3; 4 to 7.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 3:30 PM; 5:30 to 11:30.
KJR, Seattle, Wash., 484.4 (PST)—10:30 AM to 11:30 AM; 1 PM to 6:30; 8:30 to 11.
KNX, Hollywood, Cal., 337 (PST)—11:30 AM to 12:30 PM; 1 to 2; 4 to 5; 6.30 to 12.
KOB, State College of New Mexico, 348.6 (MST)—11:55 AM to 12:30 PM; 7:30 to 8:30; 9:55 to 10:10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 8:45; 11 to 12 M.
KPO, San Francisco, Cal., 429 (PST)—7:30 AM to 8; 10:30 to 12 M; 1 PM to 2; 4:30 to 11.
KSD, St. Louis, Mo., 545.1 (CST)—4 PM to 5.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:20 to 10.
KYW, Chicago, Ill., 536 (CSTDS)—6:30 AM to 7:30; 10:55 to 1 PM; 2:25 to 3:30; 6:02 to 7:20; 9 to 1:30 AM.
CNRA, Moncton, Canada, 313 (EST)—8:30 PM to 10:30.
CNRE, Edmonton, Canada, 516.9 (MST)—8:30 PM to 10:30.
CNRS, Saskatoon, Canada, 400 (MST)—2:30 PM to 3.
CNRT, Toronto, Canada, 357 (EST)—6:30 PM to 11.

SATURDAY, SEPTEMBER 19

WAAM, Newark, N. J., 263 (EST)—7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12 to 2 AM.
WAMD, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 1 AM.
WBBR, New York City, 272.6 (ESTDS)—8 PM to 9.
WBOQ, Richmond Hill, N. Y., 236 (ESTDS)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (ESTDS)—11 AM to 12:30 PM; 7 to 9.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—10:45 AM to 12 M; 3 PM to 4; 6:30 to 7:30.
WCBD, Zion, Ill., 344.6 (CST)—8 PM to 10.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12:30 PM; 2:30 to 5; 6 to 10.
WEAF, New York City, 492 (ESTDS)—6:45 AM to 7:45; 4 PM to 5; 6 to 12.
WEEI, Boston, Mass., 476 (ESTDS)—6:45 AM to 7 AM.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 7 to 8.
WEMC, Berrien Springs, Mich., 286 (CST)—11 AM to 12:30 PM; 8:15 to 11.
WFAA, Dallas, Texas, 475.9 (CST)—12:30 PM to 1; 6 to 7; 8:30 to 9:30; 11 to 12:30 AM.
WFBH, New York City, 272.6 (ESTDS)—2 PM to 7:30; 11:30 to 12:30 AM.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 PM to 3; 6 to 12.
WGCP, New York City, 252 (ESTDS)—2:30 PM to 5:15.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 2:30 PM; 3 to 5:57; 6 to 11:30.
WGR, Buffalo, N. Y., 319 (ESTDS)—8:45 to 10:15 PM; U. S. Army Band.
WGY, Schenectady, N. Y., 379.5 (EST)—7:30 PM to 10.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:30 PM; 4 to 5; 6 to 7:30.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—2:15 PM to 5; 7:30 to 10.
WHO, Des Moines, Iowa, 526 (CST)—11 AM to 12:30 PM; 4 to 5:30; 7:30 to 8:30.
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—7 AM to 8; 10:20 to 11; 1 PM to 2; 3 to 4; 6 to 11:30.
WJY, New York City, 405 (ESTDS)—2:30 PM to 5; 8 to 10:30.
WJZ, New York City, 455 (ESTDS)—9 AM to 12:30 PM; 2:30 to 4; 7 to 10.
WKRC, Cincinnati, O., 326 (EST)—10 to 12 M.
WLWC, Cincinnati, O., 422.3 (EST)—9:30 AM to 12:30 PM; 7:30 to 10.
WMAK, Lockport, N. Y., 265.5 (EST)—10:25 AM to 12:30 PM.
WMCA, New York City, 341 (ESTDS)—3 to 5 PM; 6:30 to 2.
WNYC, New York City, 526 (ESTDS)—1 to 3 PM; 7 to 11.
WOAW, Omaha, Neb., 526 (CST)—10 AM to 1; 2:15 to 4; 9 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 5:45 to 7:10; 9 to 12.
WOO, Philadelphia, Pa., 508.2 (ESTDS)—11 AM to 1 PM; 4:40 to 5; 10:55 to 11:02.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7:30; 8 to 11.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 3 AM.
WPG, Atlantic City, N. J., 299.8 (CST)—7 PM to 12.
WRC, Washington, D. C., 469 (EST)—4:30 to 5:30 PM; 6:45 to 12.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 12.
WRNY, New York City, 258.5 (ESTDS)—11:59 to 2 PM; 7:59 to 9:30; 12 M to 1 AM.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 3 to 4; 5 to 6; 10:45 to 12.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10; 11:55 to 1:30 PM; 3 to 4.
KDKA, Pittsburgh, Pa., 309 (EST)—10 AM to 12:30 PM; 1:30 to 6:30; 8:45 to 10.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 268 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10:30.
KFOA, Seattle, Wash., 455 (PST)—Silent.
KGO, Oakland, Cal., 361.2 (PST)—11 AM to 12:30 PM; 3:30 to 5:45; 7:30 to 9.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 6 to 7; 10 to 11.
KHJ, Los Angeles, Cal., 405.2 (ESTDS)—7 AM to 7:30; 10 to 1:30 PM; 2:30 to 3:30; 5:30 to 2 AM.
KJR, Seattle, Wash., 484.4 (PST)—1 PM to 2:45; 6 to 6:30; 8:30 to 10.
KNX, Hollywood, Cal., 337 (PST)—1 PM to 2; 6:30 to 2 AM.
KOA, Denver, Colo., 322.4 (MST)—11:30 AM to 1 PM; 7 to 10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9.
KPO, San Francisco, Cal., 429 (PST)—8 AM to 12 M; 2 PM to 3; 6 to 10.
KSD, St. Louis, Mo., 545.1 (CST)—7 PM to 8:30.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10:30.
KYW, Chicago, Ill., 536 (CSTDS)—11 AM to 12:30 PM; 4 to 5; 7 to 8.
CKAC, Montreal, Canada, 411 (EST)—4:30 PM to 5:30.
CNRO, Ottawa, Ontario, Canada, 435 (EST)—7:30 PM to 10.
PWX, Havana, Cuba, 400 (EST)—8:30 PM to 11:30.

SUNDAY, SEPTEMBER 20

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

MONDAY, SEPTEMBER 21

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12 M; 7 PM to 11.

WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12 M to 1:05 PM; 8 to 2 AM.
WAMB, Minneapolis, Minn., 243.8 (CST)—10 PM to 12.
WBBM, Chicago, Ill., 226 (CST)—6 PM to 7.
WBBR, New York City, 272.6 (ESTDS)—8 PM to 9.
WBZ, Springfield, Mass., 333.1 (ESTDS)—6 PM 11:30.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 12.
WCBD, Zion, Ill., 344.6 (CST)—8 PM to 10.
WCCO, St. Paul and Minneapolis, Minn., 416 (CST)—9:30 AM to 12 M; 1:30 PM to 6:15.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 PM to 7; 8 to 10; 11:45 to 1 AM.
WEAF, New York City, 492 (ESTDS)—6:45 AM to 7:45; 4 PM to 5; 6 to 11:30.
WEAR, Cleveland, O., 300 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 7 to 8.
WEEI, Boston, Mass., 476 (ESTDS)—6:45 AM to 8; 3 PM to 4; 5:30 to 10.
WEMC, Berrien Springs, Mich., 286 (CST)—8:15 PM to 11.
WFAA, Dallas, Texas, 475.9 (EST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30.
WFBH, New York City, 272.6 (ESTDS)—2 PM to 6:30.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 to 3:10; 6 to 7:30.
WGES, Chicago, Ill., 250 (CSTDS)—5 PM to 8.
WGCP, New York City, 252 (ESTDS)—2:30 PM to 5:18; 8 to 10:45.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 3:30 to 5:57.
WGR, Buffalo, N. Y., 319 (ESTDS)—12 M to 12:30 PM; 2:30 to 4:30; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (EST)—1 PM to 2; 5:30 to 8:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—2:15 PM to 5; 6:30 to 12.
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 7:30 to 9; 11:15 to 12.
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—7 AM to 8; 1 PM to 2; 3 to 8.
WJZ, New York City, 455 (ESTDS)—10 AM to 11; 1 PM to 2; 4 to 5:30; 6 to 6:30; 7 to 11.
WKRC, Cincinnati, O., 326 (EST)—8 PM to 10.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 1; 2 to 3; 4:30 to 6; 7:30 to 11:30.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15 PM; 1:30 to 2:30; 3 to 5; 6 to 10.
WMAK, Lockport, N. Y., 265.5 (EST)—8 PM to 12.
WMCA, New York City, 341 (ESTDS)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—3:15 PM to 4:15; 6:20 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1:30; 5:45 to 10:30.
WOC, Davenport, Iowa. 484 (CST)—12:57 PM to 2; 3 to 3:30; 5:45 to 6.
WOO, Philadelphia, Pa., 508.2 (ESTDS)—11 AM to 1 PM; 4:40 to 6; 7:30 to 11.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 to 4; 6:15 to 11:30.
WPAK Fargo, N. D., 283 (CST)—7:30 PM to 9.
WPG, Atlantic City, N. J., 299.8 (ESTDS)—7 PM to 11.
WQJ, Chicago, Ill., 488 (CST)—11 AM to 12 M; 3 PM to 4.
WRC, Washington, D. C., 469 (EST)—1 PM to 2; 4 to 6.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (ESTDS)—11:59 AM to 2 PM; 7:30 to 11.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 10:30; 12 to 1 AM.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 6 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:15 PM; 2:30 to 3:20; 5:30 to 10.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:45 PM to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (PST)—9 AM to 10:30; 11:30 AM to 1 PM; 1:30 to 6; 6:45 to 7; 8 to 1 AM.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30; 5 to 8.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 1:30 PM; 5:30 to 10.
KJR, Seattle, Wash., 384.4 (PST)—1 PM to 2:45; 6 to 6:30; 7 to 11.
KNX, Hollywood, Cal., 337 (PST)—12 M to 1 PM; 4 to 5; 6:30 to 12.
KOB, State College of New Mexico, 348.6 (MST)—11:55 AM to 12:30 PM; 7:30 to 8:30; 9:55 to 10:10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 10.
KPO, San Francisco, Cal., 429 (PST)—10:30 AM to 12 M; 1 PM to 2; 2:30 to 3:30; 4:30 to 10.
KSD, St. Louis, Mo., 545.1 (CST)—7:30 PM to 10.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10.
KYW, Chicago, Ill., 536 (CSTDS)—6:30 AM to 7:30; 10:55 to 1 PM; 2:15 to 3:30; 6:02 to 7.

TUESDAY, SEPTEMBER 22

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12 PM to 1:05 AM.
WAMB, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 12.
WBOQ, Richmond Hill, N. Y., 236 (ESTDS)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (ESTDS)—6 PM to 11.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 PM to 4; 5:30 to 10.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 PM to 7; 11:45 to 1 AM.
WEAF, New York City, 492 (ESTDS)—6:45 AM to 7:45; 11 to 12 M; 4 PM to 5; 6 to 12.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 7 to 10; 10 to 11.
WEEI, Boston, Mass., 476 (ESTDS)—6:45 AM to 8; 1 PM to 2; 6:30 to 10.
WFAA, Dallas, Texas, 457.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30; 11 to 12.
WFBH, New York City, 272.6 (ESTDS)—2 PM to 6:30; 11:30 to 12:30 AM.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 PM to 3; 6 to 11:30.
WGCP, New York City, 252 (ESTDS)—2:30 PM to 5:15.
WGES, Chicago, Ill., 250 (CSTDS)—5 PM to 8; 10:30 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Bupffalo, N. Y., 319 (ESTDS)—11 AM to 12:45 PM; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (EST)—11 PM to 2:30; 5:30 to 7:30; 9:15 to 11:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—12:30 PM to 1; 2:15 to 3:15; 4 to 5:30; 7:30 to 10:45; 11:30 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 7:30 to 9; 11:30 to 12.
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—7 AM to 8; 1 PM to 2; 3 to 4:30; 6 to 11.
WJY, New York City, 405 (ESTDS)—7:30 PM to 1:30.
WJZ, New York City, 455 (ESTDS)—10 AM to 11; 1 PM to 2; 4 to 6; 7 to 11.
WKRC, Cincinnati, O., 326 (EST)—6 PM to 12.
WLIT, Philadelphia, Pa., 395 (EST)—11 AM to 12:30 PM; 2 to 3; 4:30 to 7.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 1 PM; 1:30 to 2:30; 3 to 5; 6 to 11.
WMCA, New York City, 341 (ESTDS)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—3:45 PM to 5; 6:50 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1:30; 5:45 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 5:45 to 10.
WOO, Philadelphia, Pa., 508.2 (ESTDS)—11 AM to 1 PM; 4:40 to 5; 10:55 to 11:02.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7:30.
WPG, Atlantic City, N. J., 299.8 (ESTDS)—7 PM to 11.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—4:30 PM to 5:30; 6:45 to 11.
WREO, Lansing, Michigan, 285.5 (EST)—8:15 PM to 11.
WRNY, New York City, 258.5 (ESTDS)—11:59 AM to 2 PM; 4:30 to 5; 8 to 11.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 8 to 10; 11:30 to 1 AM.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 6 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—9:45 PM to 12 M; 1:30 PM to 3:20; 5:30 to 10:45.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFMQ, Fayettville, Ark., 299.8 (CST)—9 PM to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 11.
KGO, Oakland, Cal., 361.2 (PST)—11:30 AM to 1 PM; 1:30 to 3; 4 to 6:45; 8 to 1 AM.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 3:20 PM; 5:30 to 11.
KJR, Seattle, Wash., 384.4 (PST)—9 AM to 6:30 PM; 8:30 to 1 AM.
KNX, Hollywood, Cal., 337 (PST)—9 AM to 10; 1 PM to 2; 4 to 5; 6:30 to 12.

WEDNESDAY, SEPTEMBER 23

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12 M to 1:05 PM; 8 to 12.
WAMB, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago. Ill., 226 (CST)—8 PM to 10.
WBZ, Springfield, Mass., 333.1 (ESTDS)—6 PM to 11.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 to 4; 5:30 to 11.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 PM to 7; 8 to 9:15; 11:45 to 1 AM.
WEAF, New York City, 492 (ESTDS)—6:45 AM to 7:45; 11 to 12 M; 4 PM to 5; 6 to 12.
WEAO, Ohio State University, 293.9 (EST)—8 PM to 10.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 6:45 to 7:45.
WEEI, Boston, Mass., 476 (ESTDS)—6:45 AM to 8; 3 PM to 4; 5:30 to 10.
WEMC, Berrien Spring, Mich., 266 (CST)—8:15 PM to 11.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1.
WFBH, New York City, 270.6 (ESTDS)—2 PM to 7:30; 12 M to 1 AM.
WGCP, New York City, 252 (ESTDS)—2:30 PM to 5:18; 8 to 10.
WGES, Chicago, Ill., 250 (CSTDS)—5 PM to 7; 10:30 to 1 AM.
WGBS, New York City, 316 (ESTDS)—10 AM to 11 PM; 1:30 to 4; 6 to 7.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (ESTDS)—12 M to 12:45 PM; 2:30 to 4:30; 6:30 to 11.
WGY, Schenectady, N. Y., 379.5 (CST)—5:30 PM to 7:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10; 11:30 to 12:30 AM.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 368 (ESTDS)—2:15 PM to 5:30; 7:30 to 11; 11:30 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 6:30 to 12 M.
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 568 (ESTDS)—7 AM to 8; 10:20 to 11; 1 PM to 2; 3 to 4; 6 to 8.
WJZ, New York City, 455 (ESTDS)—10 AM to 11; 1 PM to 2; 4 to 6; 6 to 11:30.
WKRC, Cincinnati, Ohio, 326 (EST)—8 PM to 10.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 7:30 to 9.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15 PM; 1:30 to 2:30; 3 to 5; 6 to 11.
WMCA, New York City, 341 (EST)—10:45 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—6:30 PM to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 4 to 7:05; 9 to 11.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 12 M.
WPAK, Fargo, N. D., 283 (CST)—7:30 PM to 9.
WOJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to ; 7 to 8; 10 to 2 AM
WRC Washington, D. C., 469 EST)—1 PM to 2; 4 to 6:30.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (ESTDS)—11:59 AM to 2 PM; 7:59 to 9:55.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 9.
WWJ, Detroit, Mich., 352.7 (EST)—6 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 6 to 7; 8 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:15 PM; 2:30 to 3:20; 5:30 to 11.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30 AM.
KFMQ, Fayettville, Ark., 299.8 (CST)—7:30 PM to 9.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (PST)—11:30 AM to 1 PM; 1:30 to 2:30; 3 to 6:45.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 10.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 715; 12 M to 1:30 PM; 5:30 to 12.
KJR, Seattle, Wash., 484.4 (PST)—9 AM to 1 AM.
KNX, Hollywood, Cal., 337 (PST)—1 PM to 2; 7 to 12.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9; 11 to 12 M.
KPO, San Francisco, Cal., 429 (PST)—7 AM to 7:45; 10 to 12 M; 1 PM to 2; 3:30 to 11.
KSD, St. Louis, Mo., 541.1 (CST)—6 PM to 7.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10:30.
KYW, Chicago, Ill., 536 (CSTDS)—6:30 AM to 7:30; 10:30 to 1 PM; 2:15 to 4; 6:02 to 11:30.
CNRA, Moncton, New Brunswick, Canada, 313 (EST)—9:30 PM to 11.
CNRR, Regina, Saskatchewan, Canada—8 PM to 11.
CNRO, Ottawa, Ontario, Canada, 435 (EST)—7 PM to 11.

THURSDAY, SEPTEMBER 24

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (EST)—12 PM to 1:05.
WAMB, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12 M.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 10.
WBOQ, Richmond Hill, N. Y., 236 (ESTDS)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (ESTDS)—6 PM to 11:45.
WCAE, Pittsburgh, Pa., 461.3 (CSTDS)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 11.
WCBD, Zion, Ill., 344.6 (CST)—8 PM to 10.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 PM to 4; 5:50 to 10.
WEAF, New York City, 492 (ESTDS)—6:45 AM to 7:45; 11 to 12 M; 4 PM to 5; 6 to 12

(*Concluded on page* 31)

A THOUGHT FOR THE WEEK

Many a young radioist without a degree can tell some of the learned professors of physics more about the eccentricities of the ether than the solemn Yoricks ever dreamed of.

RADIO WORLD

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

TELEPHONES: LACKAWANNA 6976 and 2063
PUBLISHED EVERY WEDNESDAY
(Dated Saturday of same week)
FROM PUBLICATION OFFICE
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M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
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EDITOR, Roland Burke Hennessy
MANAGING EDITOR, Herman Bernard

SUBSCRIPTION RATES

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

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

ADVERTISING RATES

General Advertising

1 Page, 7⅛"x11"	462 lines	$300.00
½ Page, 7⅛"x5½"	231 lines	150.00
¼ Page, 4⅛" D. C.	115 lines	75.00
1 Column, 2¼"x11"	154 lines	100.00
1 Inch		10.00
Per Agate line		.75

Times Discount

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

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

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

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

SEPTEMBER 19, 1925

New Books

Broadcasting: Its New Day, a book on the past, present and future of radio, by Samuel H. Rothafel (Roxy), former director of the Capitol Theatre, N. Y. City, and Raymond Francis Yates, published by Century Co., N. Y. City.

The first few chapters of this book deal with the present methods of broadcasting. There are many suggestions and criticisms given which are very useful in the artistic improvement of presentations of broadcast programs.

The question as to who is to pay for broadcasting is discussed fully, accompanied by the views of Secretary Hoover and David Sarnoff, vice-president of the Radio Corporation of Amerca. How radio effects education, sports, international politics and commerce is outlined in a thorough fashion. Suggestions for interference eliminations are also given.

The second half of the book treats the technical and artistic future of broadcasting and commercial radio very carefully, touching all the important angles, such as radio-vision, tele-mechanics and transmssion of radio power.

A Set for Every Shut-In

THERE are today in this country more than 200,000 shut-ins; that is, one fifth of a million invalids who never, or rarely, go outside the four walls of their rooms. These figures are based on statistics recently compiled by medical authorities.

What a wonderful thing it would be if every one of these shut-ins should have a radio set for whiling away those tedious hours, and also have them feel that they are still a part of our social system, and enable them to keep in touch with the activities of the outside world. How splendid it would be if the whole country were to know that every invalid or unfortunate was hearing outside voices and sharing in the general joy of life.

All this can be accomplished if RADIO WORLD readers will give a thought or two to those who cannot help themselves. Many of our readers have sets that they have discarded for newer or better ones. To what finer use could these sets go to, than to have them go into the weak but welcome hands of the shut-ins?

Let us all help. You can do your share by sending us the name and address of some shut-in who would like to have a radio set, or you can do even better by sending us you name and address, letting us know you have a set that you will contribute to this cause, and that you will shop it direct when we send you the name of someone who would be glad to have it.

We are all busy. We all have our livings to make. We all must think first of those who are closest and nearest to us—but in doing this we should not forget those other ones, and surely God in his compassion will smile when he knows that the strong ones are taking care of those who have been invalids for years, and the other smaller ones to whom are now denied the most precious things so prized by children.

Let us all help. Let's do it today. Let us hear from you at once.

Letters to the Editor

Wants No Tax Imposed

EDITOR RADIO WORLD:

Blace A. Morris may favor a tax on receiving sets, as he stated in his letter to you, but I do not, and neither does any other person unless he happens to be in the phonograph or theatrical business. The tax might be all right for people who have lots of money, but how about the fellow with limited funds, who can barely afford to build a set, let alone having to pay for the privilege of using it afterwards?

Music dealers are now taking on radio sets as a sideline, so if the demand for phonographs, records, sheet music, etc., is diminishing, they can capitalize on the increasing popularity of radio.

Mr. Morris says that if people want entertainment in the form of radio they should be willing to pay for it. Well, they do pay for it. They pay for the sets. When a person wants a phonograph for entertainment he buys one and does not pay a tax for the privilege of using it.

The large radio corporations and other concerns that own broadcasting stations can afford to pay the talent that they engage. Particularly is this the case with concerns selling radio sets, because the better they make their programs, the more sets they will sell.

Mr. Morris mentions the fact that in Germany sets are taxed $25 per year. Well, what does radio count for in Germany? The tax is simply to restrict the number of sets in use, and there are very few sets in Germany compared to the number in this country. In Berlin outdoor aerials are forbidden because the chimney-sweeps don't like them. This shows how important radio is in Germany.

EDWARD W. PRATT
746 Cumberland St.
Lebanon, Pa.

* * *

Announcer Annoys Him

EDITOR RADIO WORLD:

I have been a reader of RADIO WORLD for the past year and like your magazine very much. I just read your editorial on thick skulls. Some announcers talk too much, yet do not give their call letters as often as they might. I have been trying ever since last winter to find the station that announced the time three hours earlier than Central Standard Time and then allowed an orchestra to play three piecês without even attempting to give their call letters. Talk about thick skulls!

C. E. WALKER
Aledo, Ill.

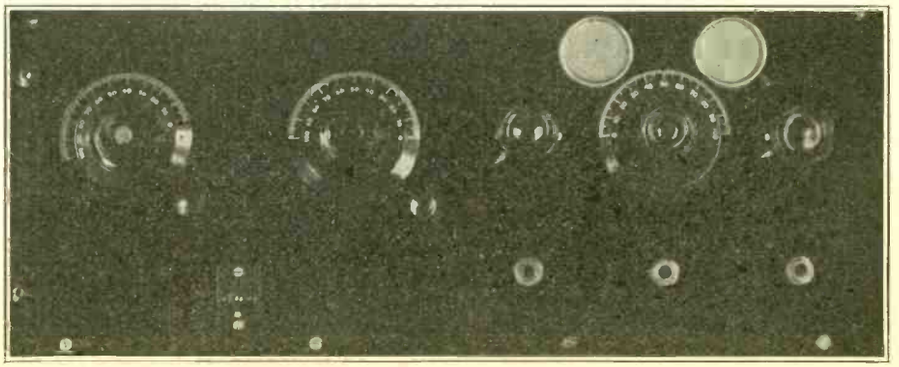
Sets Owned by Farmers Now Total 550,000

WASHINGTON.

A survey just completed by the Department of Agriculture reveales that the number of farmers owning radio sets has increased from 365,000 to 550,000 during the past year.

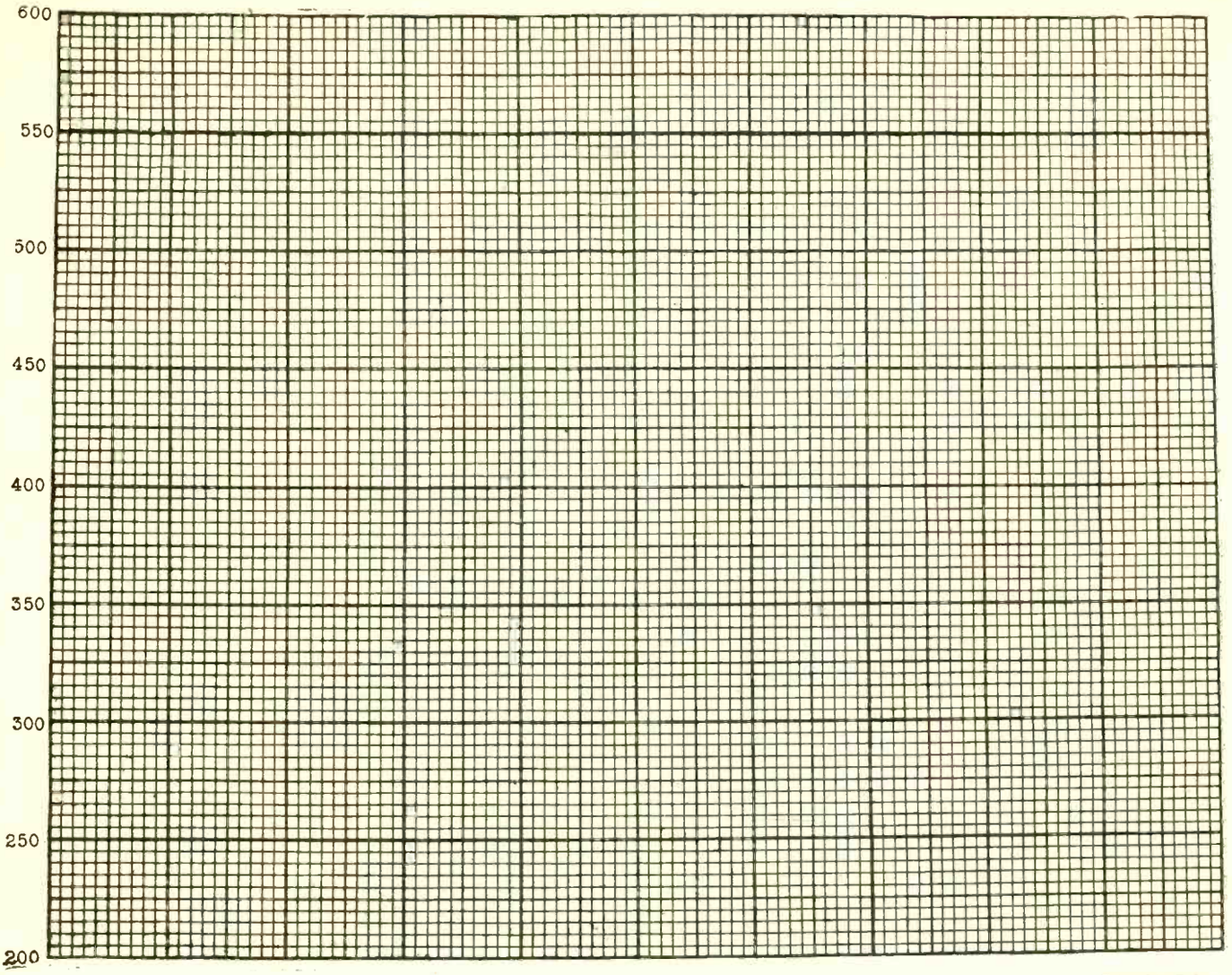
The big increase is attributed to the need for farmers for crop and weather information in addition to the educational and entertainment benefits.

The Agricultural survey during 1923 showed that 145,000 farmers owned radio sets. This is an increase for the two years of 405,000 sets.



A YEAR AGO a fan would make a set with a panel that looked like this, but today beauty reigns.

Chart Your Stations on This



Columbia Print.

YOU can have a ready log sheet for all stations if you will tune in a few, mark the wavelength point where it intersects the dial setting, and then draw the curve. Number the horizontal line in sections 1/10 the total dial divisions. For a 100-division dial, mark 10 at each black line, for a 180-division dial mark 18.

COMPLETE LIST OF BROADCASTING STATIONS

Appeared in RADIO WORLD dated Sept. 12. Revised to date.

Other features in our Sept. 12 issue were: The 1926 Model Diamond, by Herman Bernard; An Oscillating Wavemeter, by J. E. Anderson; A 20-to-110 Meter Receiver, by Sidney E. Finklestein. 15c per copy. RADIO WORLD, 1493 Broadway, New York City.

LITERAL COMPLIANCE —By Irving Hoffman

THE RADIO TRADE

The New Sleeper Sets Are Things of Beauty

The radio receiving sets that the Sleeper Radio Corporation is putting out this Fall are among the most beautifully constructed sets ever seen. They are electrically as well as mechanically excellent. There is no home too well decorated with good furniture for excellent combination with one of these receivers. In one of the types there is room enough for an A battery, a charger and a switching arrangement. This is known as the Sleeper Serenader.

The Sleeper Radio Corporation will have two booths at the Radio World's Fair, booths Nos. 53 and 57. This fair will be held at the 258th Field Artillery Armory. Among those who will be present at the booths are: Gordon C. Sleeper, president; H. C. Doyle, treasurer; F. A. Klingenschmitt, vice-president; J. J. West, sales manager; H. E. Mauersberg, R. Cameron, W. A. Wehrman, R. Cameron, H. Van Cleaf, J. P. Devine.

The New Barfield V

The new Barfield V, a straight line frequency five-tube set, put out by the Barfield Radio Company, 13 Tillary Street, Brooklyn, N. Y., is now being shown. This is a fine set, reasonably priced, and has performed wonderfully on test. Good DX has been brought in all summer in a poor location. It is a two-dial control set, easy of operation and can be accurately logged. The straight line frequency condensers give an even spacing of stations all over the dial; KDKA coming in at 42 and WOK, Chicago, at 15. The range is 200 to 600 meters. Fifteen hundred miles range on loud speaker has been a consistent performance. New super-resistance amplification, which is a feature, gives full volume on 90 volts without any distortion. The set has only 28 soldered connections and is supplied with battery cable with terminals marked plainly with metal markers. It is encased in a solid walnut cabinet, inlaid with bird's eye maple making a handsome piece of furniture. The dials are the new Marco vernier window dials, the newest obtainable.

Tested and approved by RADIO WORLD Laboratories

Brazil Market Slow

WASHINGTON.

Brazil has only 26 broadcasting stations, a survey of that region by the Electrical Division of the Department of Commerce reveals. While definite information as to the total number of receivers in Brazil is lacking, it is probable that it will always be comparatively small due to the low purchasing capacity of the great mass of people. Opinion has been expressed that eventually there will be a radio receiving set in every village of the interior to give the inhabitants news of their state capital and of the outside world.

Coming Events

SEPT. 12 to 19—Fourth Annual National Radio Exposition, Grand Central Palace, N. Y. C. Write American Radio Exp. Co., 522 Fifth Ave., N. Y. C.

SEPT. 14 to 19—Second Radio World's Fair, 258th Field Artillery Armory, Kingsbridge Road and Jerome Ave., N. Y. C. Write Radio World's Fair, Times Bldg., N. Y. C.

SEPT. 14 to 19—Pittsburgh Radio Show, Motor Square Garden. Write J. A. Simpson, 420 Bessemer Bldg., Pittsburgh, Pa.

SEPT. 14 to 19—Radio Show, Winnipeg, Can., Canadian Expos. Co.

SEPT. 21 to 26—First Annual Radio Expos., Broadcast Listeners' Association, Cadle Tabernacle, Indianapolis, Ind. Write Claude S. Wallin, Hotel Severin.

SEPT. 21 to 29—International Radio Exposition, Steel Pier, Atlantic City, N. J.

SEPT. 28 to Oct. 3—National Radio Exposition, American Exp. Palace, Chicago. Write N. R. E., 440 S. Dearnborn St., Chicago, Ill.

SEPT. 28 to OCT. 3—Midwest Radio Week.

OCT. 3 to 10—Radio Exposition, Arena, 46th and Market Streets, Philadelphia, Pa., G. B. Bodenhof, manager, auspices Philadelphia Public Ledger.

OCT. 5 to 10—Second Annual Northwest Radio Exposition, Auditorium, St. Paul, Minn. Write 515 Tribune Annex.

OCT. 5 to 11—Second Annual Radio Show, Convention Hall, Washington, D. C. Write Radio Merchants' Association, 233 Woodward Bldg.

OCT. 10 to 16—National Radio Show, City Auditorium, Denver, Colo.

OCT. 12 to 15—Radio exposition, Post-Dispatch (KPRC), Houston, Tex.

OCT. 12 to 17—Boston Radio Show, Mechanics' Hall. Write to B. R. S., 209 Massachusetts Ave., Boston, Mass.

OCT. 12 to 17—St. Louis Radio Show, Coliseum. Write Thos. P. Convey, manager, 737 Frisco Bldg., St. Louis, Mo.

OCT. 12 to 17—Radio Show, Montreal, Can., Canadian Expos. Co.

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

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

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

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

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

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

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

Literature Wanted

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

Trade Service Editor,
RADIO WORLD,
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 .....

L. A. Tucker, R. I. Box 52, Azle, Tex.
E. B. Keim, Andalusia, Pa. (Dealer).
Thomas Finnegan, 456 South 18th St., Terre Haute, Ind. (Dealer).
Harold Keck, 1315 Court St., Allentown, Pa.
H. A. Addison, 313 Lyndhurst St., Baltimore, Md.
William C. Peace, 126 Seaton Place, Washington, D. C.
Vialis F. Walz, Glen Haven, Wis. (Dealer).
Lester S. Byrd, 304 E. 15th St., Fort Worth, Tex.
Norman L. Hardinger, Tinley Park, Ill. (Dealer).
A. DeLanney, Tampico Tamps, Mex.
Addison Steward, 179 F St., N. E., Linton, Ind.
Eldon Stewart, 129 S. Seminary, Princeton, Ind.
Wm. Haugsted, Nevada, Ia.
John H. Simon, 1747 N. Croskey St., Philadelphia, Pa.
Frank Auld, 1920 N. Cansac St., Philadelphia, Pa.
Kenneth Virtue, Kirlin, Ind.
Robert Clifford, R. D. No. 4, Coatesville, Pa.
Frank T. Walden, Cottage 6, Minnesota Soldiers Home, Minneapolis, Minn.

Business Opportunities Radio and Electrical

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

DISTRIBUTER WANTED, represent manufacturer producing revolutionary patented radio article, nationally known improvement; exclusive territory. Box AA, Radio World.

RETAIL RADIO, ELECTRIC SUPPLY, wants partner, experience, invest $5,000 to $10,000; stand thorough investigation; long lease; wish to expand. Box BB, RADIO WORLD.

RADIO AND SPORTS GOOD STORE in busy shopping section, near Penn station, subway, "L" and tubes, car and bus lines; rent $5,000 year; will sell for cost of merchandise and fixtures plus $2,000 for good will; owner engaged in other business. Box CC, RADIO WORLD.

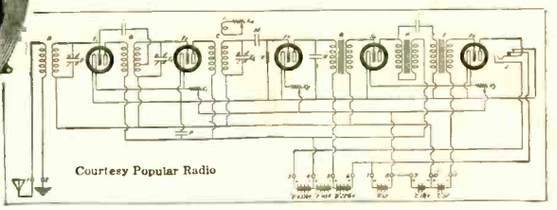
ELECTRICAL ENGINEER has perfected entirely new radio loud-speaker; has no horn, operates like sounding board; extremely simple cheap to manufacture; expert musicians say quality is perfect; appearance is especially pleasing; party with capital will find in this exceptional opportunity for quick returns; references and complete information gladly furnished. Box DD, RADIO WORLD.

Tuned Radio Frequency Kit
$12.00
Complete with Brackets

The complete Low Loss Inductance System, comprising two tuned circuit transformers and an antennae coupler with a uniquely constructed variable primary for governing the selectivity of the antennae circuit.

NOW—All the world can have it!

The sensational favor which Chicago and New York showered upon the AERO COIL has prompted its designers to make it available to every fan in the Nation. Vigorous plans are, therefore, under way to place the Aero Coil where every city and village can see it and witness its markedly superior performance.



Declared by Chicago and New York the most SELECTIVE, *most* POWERFUL *Inductance Ever Designed!*

Enjoy the *"knife-edge" selectivity* with which Aero Coils cut through the tangled mass of Chicago and New York broadcasting *at will!* Enjoy the *uncanny sensitivity* with which sets built of Aero Coils pick up the far off, small, low-wattage stations that you never thought existed! Be thrilled by the *amazing volume* with which Aero Coils amplify for the loud speaker, reception which you have always had to listen to on the head phones! Build a 5-Tube Tuned Radio Frequency Set with Aero Coils . . . . . the true low loss inductance system.

PATENTS PROTECT ITS SUPER-EFFICIENCY

Its *lower* circuit resistance, its *lower* high frequency resistance, its *lower* distributed capacity, and the fact that its dielectric is 95% air are the reasons why the Aero Coil tunes so sharply into resonance—and why it actually uses the energy which other types of inductances waste. Hence, Aero Coil is the inductance of today—and tomorrow, and you can be assured that it is—for the construction which makes it the *ideal* inductance is patented, and no inductance can be made so good as Aero Coil unless in violation of these patents!

95% Air dielectric —No dope on windings — All turns air-spaced — Solenoid (cylindrical) windings —Variable primary

Engineers recognize cylindrical winding to be superior to any other. The Aero Coil is the only Air dielectric cylindrical inductance with a variable primary. Aero Coil patents prevent imitation.

Build *Your* Set Now!

The construction which makes possible the far superior results obtained from Aero Coils also makes them cost a bit more—but, performance considered, their price is low. $12.00 for a set of three, complete with nickel plated mounting brackets which fit any condenser. Go to your dealer's today and obtain a set of three. A circular containing complete hookups for building the most selective, most sensitive, most powerful five-tube receivers ever designed is enclosed in each package.

If your dealer has not yet obtained his stock of Aero Coils, order direct, enclosing price with your order.

Free Booklet showing new circuits and giving full constructional information of help to any fan or set builder—mailed on request. Write for the Aero Booklet.

AERO PRODUCTS, Inc.

217 North Desplaines Street, Chicago, Illinois

Successors to
HENNINGER RADIO MFG. CO.

AERO COIL

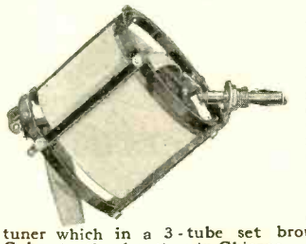
All Aero Coils embrace a patent-protected method of construction which makes possible a far more efficient inductance performance than is possible with any other type of coil.

Use AERO COILS

Wherever An Inductance Is Required

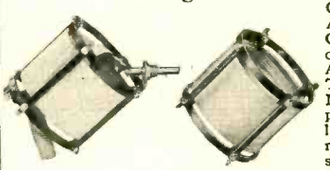
[THE ONLY AIR DIELECTRIC COILS HAVING VARIABLE PRIMARIES IN ANTENNAE CIRCUITS]

The Aero Coil 3-Circuit Tuner



Another adaptation of the patented protected Aero-Coil construction and for that reason the most efficient three-circuit tuner ever offered. More than covers the broadcast wave band when shunted with a good .0005 condenser. This is the tuner which in a 3-tube set brought in Havana, Cuba, in the day-time in Chicago. Price..... **$8.00**

The Aero Coil Radio Frequency Regenerative Kit



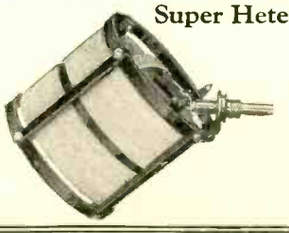
Consists of one AERO COIL 3-Circuit Tuner and one AERO COIL Antennae Coupling Transformer. Makes the most powerful, most selective 4-tube, non-radiating set possible to build. Price **$11.00**

The Aero Coil Wave Trap Unit

Also for Crystal Sets

By reason of the characteristics made possible by the Aero Coil construction, this unit makes a very efficient wave trap or crystal set. Price **$4.00**

The Aero Coil Oscillator for Super Heterodynes



The characteristics achieved through the use of the Aero Coil principle make of this instrument the ready means to tremendously increase the efficiency of the oscillator circuit in any Super Heterodyne receiver. Pr. **$5.50**

Prepared by KIRTLAND-ENGEL ADVERTISING COMPANY - CHICAGO

Directions for Wiring The DX Reflex Receiver

(*Concluded from page 6*)

These are R1 and R2. The filament of the audio-frequency amplifier tube is not critical and is controlled by a ballast resistance. As a matter of fact the filaments of the other two tubes are not always critical either, but a certain point will be found, where the reception is best. After this point is found, which is not difficult at all, the rheostat is left alone.

In order to obtain the full value of the receiver, the best of parts must be used. The coils employed were the Aero Coils and have a very low resistance factor. The variable condensers C1 and C2, the capacity of them each being .0005 mfd. may be of the straight-line wavelength or preferably straight-line frequency type. (Amsco). The straight-line frequency dial may be used on any of the circular plate type condensers, if such condensers are at hand. The effect will be practically the same as with the SLF condenser using ordinary dial.

The first audio-frequency transformer should be of the high ratio type (about 6-to-1). The second one should be of the low ratio type (about 3-to-1). Any of the standard make transformers may be used. The crystal detector used was the Carborundum. This was found to be stable as well as efficient. This is a fixed crystal.

The 6-volt type tubes are best for this circuit, although the 4-volt type are very fine, reducing the volume hardly any.

The wiring of the set is the most important of all things and should be done with extreme care. Bring the beginning of L1 diagram to the aerial. The end goes to the ground. The beginning of L2, marked 3 on the diagram, Fig. 1, goes to the G post of the audio-frequency transformer, AFT1. The end of the coil, No. 4 on the diagram, goes to the grid post of tumbe No. 1. The stator plates of C1 go to the end of the coil and the rotary plates of the condenser go to the beginning of this coil. The beginning of L3, marked 1 on the diagram, goes to the plate of tube No. 1. The end of this coil, marked 2 on the diagram, goes to the P post on the second audio-frequency transformer. The B post of this transformer goes to the only B plus post on the terminal strip (90 volts). The beginning of L4, marked 3 on the diagram, goes to the arm of the rheostat, R2, and also to the rotary plates of the variable condenser C2. The end of this coil (4 on the diagram) goes to the grid post of tube No. 2, and to the stator plates of the condenser C2. The beginning of the tickler coil, L5 (1 on the diagram). The end of L6 (2 on the diagram) goes to the B plus post on the terminal strip. This is the same B plus lead mentioned before.

The beginning of L7 (3 on the diagram) goes to the base of the crystal detector. The catwhisker of the detector goes to the P post on the first AFT. The B post of this AFT goes to terminal (4 on the diagram and G on the coil). Bring the F post of the first AFT to the arm of R1, R2, the F post of the second AFT and to the A minus post on the terminal strip. Across the secondary of the first AFT shunt a .001 mfd. (C4) condenser. This will be across the posts F and G. Bring the resistance wire of R1 to the F minus post on the socket of tube No. 1. The F plus on the socket of this tube goes to one terminal of the switch S. This same terminal connects to the F plus post on the second socket and to the F plus post on the third socket. The other terminal of the switch goes to the A plus post and the B minus post on the terminal strip. R3 is connected in series with the negative lead of the last tube. In other words, one terminal of the resistance wire goes to the F minus post on the socket and the other to the A minus post of the terminal strip. The G post on the second AFT goes to the grid post of the third tube. The plate of this tube goes to the top terminal of the single circuit jack, while the bottom terminal goes to the B plus post.

The Untuned Transformer

It will be noted that one of the coupling transformers is of the type usually tuned, yet has no tuning condenser across it. A condenser in this position helps but little, hence the coil L6L7 is used just as it is, for it passes all the frequencies delivered to it. A condenser here would be more of a balancer than anything else. If oscillation is too great connect the beginning of L4 to A+ instead of to A—.

The aero coils look a trifle different than shown, because the primary is within the secondary; but the primary is pictured externally to elucidate the connections.

How to Obtain Best Results

Care should be taken when turning the tickler coil. If this turned parallel to the secondary, a great deal of howling will take place. This is due to the mutual induction between the coils being at a minimum, and the transfer of energy from the plate to the grid is greatest. Use a short antenna (100 feet overall at most). This includes the lead-in.

LIST OF PARTS

Two aero coupling transformers (L1L2 and L6 and L7shrdluetaoinupnupnupnun and L6L7).

One aera 3-circuit tuner (L3L4L5).

Two .0005 mfd. variable condensers (C1 and C2).

One high ratio AFT (AFT1).

One low ratio AFT (AFT2).

One fixed crystal detector (CD).

Two 10-ohm rheostats (R1, R2).

One ballast .25-amp. resistor (R3).

One single circuit jack (J1).

Three 4" dials.

One .001 mfd. fixed condenser (C4).

One switch, S.

One 7x18" panel.

Accessories: Three tubes, A and B batteries, phones, loud speaker, No. 10 rubber covered wire for connecting up purposes, one 7x18" cabinet, aerial, ground and lead-in wire, and a ground clamp.

Anderson's New Theory

(*Continued from page* 8)

which is illuminated by a monochromatic source of light, for instance the yellow light from a sodium flame. The slit is vertical and parallel with the mirror. In the mirror will appear an image *s* of the slit which is a virtual source of light of the same wavelength as the original. If a telescope T is mounted at the opposite end of the mirror and focused on the slit *s*, there will appear a series of yellow and black bands in the field of view. These bands are called interference fringes and are caused by the interference between the two sources of light, the original and the image. Interference takes place because the light from the image must travel a greater distance to a given point in the field of the telescope than the light from the source. The latter travels in a straight line while the former travels first to the mirror and then to the given point. Hence the two rays of light may reach the point in phase or in opposite phase. Where the field is dark the two beams are in opposite phase, where it is light they are phase.

This principle may be applied directly to radio. Let the Heaviside layer represent Lloyd's mirror, the broadcasting station the source of monochromatic radiation, and the receiving antenna the telescope. The direct wave from the transmitting station will arrive to the antenna by a shorter path than the reflected wave. Hence the latter will be retarded more or less according to the path difference. If the retardation at a given point is equal to 180 degrees, there will be a dark band there, or destructive interference; if the retardation at the point is 360 degrees. there will be a bright band, or constructive interference. There will be another dark band at a point where the phase retardation of the reflected wave is 540 degrees and another bright band where the retardation is 720 degrees. Another 180 degrees gives a dark band and still another 180 degrees gives a bright band, and so on. Hence the entire field around a transmitting station will be striated. If a receiving antenna happens to be located in a bright band, reception will be good there; if it happens to be located in a dark band, reception will be poor.

Now suppose that the reflecting layer be tilted slightly. The striae or interference fringes will then be shifted, and will sweep across the receiving antenna at a rate depending on the rate of the tilting. This will cause fading or periodic variations in the strength of the received signals. If the tilting is very slow the number of bands passing over the antenna in a given time will be small and the fading will be slow; but if the tilting occurs faster, the bands will sweep across the antenna much more rapidly and the fading will be faster. It would not require a very rapid tilting of the reflecting layer to produce audio frequency or even superaudible frequency fading.

It does not matter in what way the relative retardation between the two branches of the wave is effected. It is known that light travels more slowly in air than it does in a vacuum, and that it travels still more slowly in denser transparent media such as water, glass, mica, oil, etc. Hence if a denser medium were interposed in one of the branches of the wave, that branch would be retarded and this would result in a shifting of the interference fringes. This is often done in Lloyd's mirror to shift the bands. Now if the density of the interposed medium varied continuously, the fringes would move and fading would result. Variation in the density of the air might account for enough variation to explain fading.

RESULTS

FAN'S APPLE-BOX DIAMOND HIS SWEETEST RADIO FRUIT

DIAMOND EDITOR:

The Diamond of the Air scores again.

The broadcast band on the Pacific coast reaches from 215 to 509 meters (inclusive). This is covered easily with ten degrees on each end of the dial that are excess.

Well, now just make a guess. What did I do with loop and earphones? With my set in the middle of my bed in a house with double tin roof, two lower floors with tin ceiling (a monster condenser) I pull in KGW, 700 miles away; KFI, 300 miles, all or any time during heavy broadcasting of five stations, KPO, KGO, KFRC, KJBS, KLX, KTAB, KRE, KFQH and KUO. All stations are audible on speaker and locals are very loud.

I have moved into a new house now and use an outside aerial. I am pulling in KOA, Denver, 2,000 miles away, on the speaker. After I read your article for the novice in the July 25 issue, I corrected the polarities and proceeded to listen in.

This set has been tried on ultra-short waves (40 meters), and does nicely, inserting the aerial and ground to the primary of the detector. I proceeded to listen in and the signals were strong and steady. I expect to Heterodyne The Diamond soon and will be glad to hear from anyone who has already done so.

I would suggest to the man who could not speak a good word for The Diamond to get good tubes and pay especial attention to the first (RF) tube and the last audio tube, and to see that the primaries and secondaries are not skinned. If I had used the best parts and advice I could put hot coals on anyone who knocks The Diamond. I say, throw all your present parts in the ash can and build over again.

If one wets the tip of his finger and gets a click on any part of the set he is on the right road to success. Where men with experience, brains and fine up-to-the-minute laboratories put out an idea, it will work.

I appreciate The Diamond and though she is made from an apple box without a speck of solder, using nuts and bolts for connections, I am having fun patting myself on the back, and my friends give me a pat too.

H. L. SUGGS,
218 Fourth Street,
San Francisco, Cal.

RECENT BACK NUMBERS of Radio World, 15c each. RADIO WORLD, 1493 Broadway, New York City.

Getting the Most Out of the 5-Tube Geared Set

The following are some tips on the 5-tube geared set published last week:

The detector and the audio-frequency rheostats are mounted inside the set on the baseboard. These need no attention, except to turn off the tubes. In order to do away with this troublesome feature of turning the tubes on and off, a switch may be inserted in the A plus lead. The detector rheostat need be set only once during the first test of the set and after that left alone. The audio-frequency rheostat need just be turned on and left alone. The potentiometer P is also placed inside the set. Put the arm exactly in the center of the resistance wire and let alone.

Now for the variable condensers. These are also set once and then left alone. Here is how to tune the receiver and set the condensers.

Light the filaments, put the phone or loud speaker plug in jack and turn the coupling dial to about 50. Turn the tap switch to the 4th tap. Turn the first RF tube rheostat all the way up and the second RF tube three-quarters of the way. The set should oscillate at this point. Turn all the rotary plates of the variable condensers to the point where the oscillation ceases. You will note that the plates of these condensers are all at the same angle. Tighten the set-screws of the condensers. The only other time that the condensers will need adjustment is when the weather gets damp and you will note that the tuning is erratic. The set screws are loosened and the same procedure as was done before is enacted. The set should be very simple to tune and should work as soon as completed. The second RF tube rheostat controls the oscillatory action. This rheostat is only tuned up full when listening to DX stations.

Use a short antenna (80 feet) for best results. Don't forget to try different tubes in different sockets. (5 volt filament terminal voltage).

Dry-cell (1½ or 4½ v.) tubes may also be used if so desired. In that case the UX120 (3 volts filament voltage) works great in the amplifier circuit.

HOW TO BUILD THE POWERTONE, 1 dial, 5 tubes, described in RADIO WORLD, issues of Aug. 29 and Sept. 5. Powertone Trouble-shooting, Sept. 12. Send 15c for all three. Special diagrams and "blueprint in black" included among the many illustrations. RADIO WORLD, 1493 Broadway, New York.

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FREQUENCY DIAL THEORY

Capt. O'Rourke's Masterful Discussion of Radio's New Craze

(*Concluded from page* 13)

the actual frequency of a dial setting aproximated. As 200 to 600 meters = 1,500 to 500 kcy., or 1,000 kcy. range, each dial division (if there are 100) would equal 10 kcy., the very same separation as is established between channels.

The 4-Ring Circus

The SLC condenser, ordinary dial, is the top curve, told in terms of frequency. The next is the SLW curve, no more a straight line, because we are dealing now with frequency, and a straight line here would have to represent equal dial distribution on a frequency basis. The experimental frequency type dial, third curve from top, is shown up as compared with a true SLF curve. No condenser accomplishes this SLF line, partly because there is a bend at the high frequency end or lowest capacity settings.

Great Possibilities

The frequencies are shown at left, vertical, the corresponding wavelengths for the stated wavelength units being at right. As the frequency ratio was not followed further than this in wavelength conversion, the SLW curve on a frequency basis is not accurate. But as a theoretical, or rather approximate example, it is very helpful. It serves the excellent purpose of permitting at least a rough comparison of all four curves on one chart. Hence, by reading the chart for the stated wavelengths or frequencies (heavy lines) the dial settings for all four classes or types may be read and a comparison made of the separation achieved. As commercial dials will do better than the experimental one it is safe to say that they will be a boon to the possessors of SLC condensers and 89% of the condensers in use are of that kind.

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS.

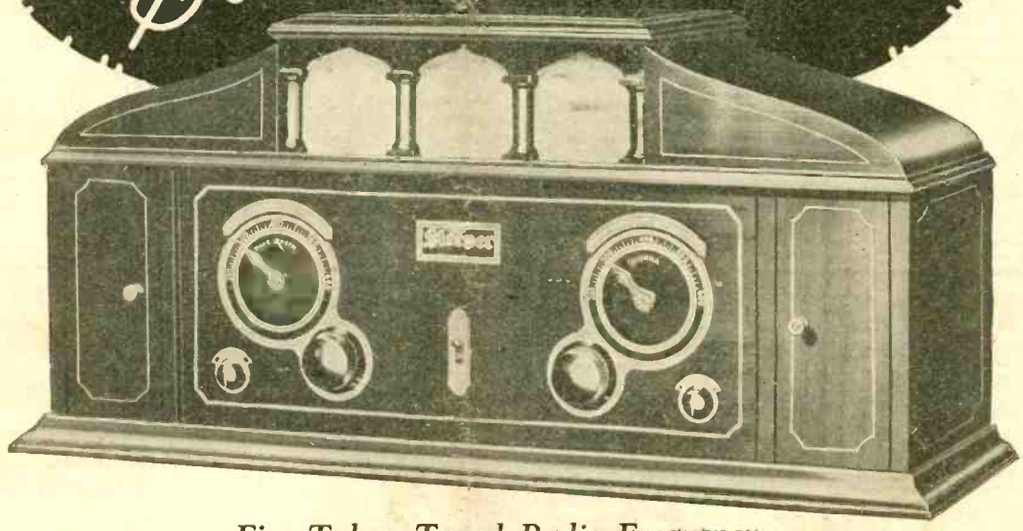
10 CENTS A WORD. 10 WORDS MINIMUM

THE KEY TO THE AIR

(Concluded from page 19)

WEAR, Cleveland, O., 390 (EST)—10:30 AM to 12:10 PM; 3:30 to 4:15; 7 to 11.
WEEI, Boston, Mass., 467 (ESTDS)—6:45 AM to 7:45; 1 PM to 2; 2:30 to 10.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30; 11 to 1 AM.
WFBH, New York City, 272.6 (ESTDS)—2 PM to 7:30.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 PM to 4; 6 to 7:30.
WGCP, New York City, 252 (ESTDS)—2:30 PM to 5:15.
WGES, Chicago, Ill., 250 (CSTDS)—5 PM to 8; 10:30 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 11:30; 6 PM to 7:15; 8:30 to 11.
WGR, Buffalo, N. Y., 319 (ESTDS)—12 M to 12:45 PM; 2 to 4; 7:30 to 11.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10.
WHAS, Louisville, Ky., 399.6 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—2:15 PM to 5; 7:30 to 11; 11:30 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—7:30 PM to 9; 11 to 12.
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WJY, New York City, 405 (ESTDS)—7:30 PM to 11:30.
WJZ, New York City, 455 (ESTDS)—10 AM to 11; 1 PM to 2; 4 to 6; 7 to 12 M.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 8:30 to 9.
WLW, Cincinnati, O., 422.3 (EST)—10:40 AM to 12:15 PM; 1:30 to 5; 6 to 8; 10 to 11.
WMAK, Lockport, N. Y., 265.5 (EST)—11 PM to 1 AM.
WMCA, New York City, 341 (ESTDS—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—3:15 PM to 4:15; 6:50 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1:30; 5:45 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 AM to 2 PM; 3 to 3:30; 4 to 7:10; 8 to 9.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7.
WPG, Atlantic City, N. J., 299.8 (ESTDS)—7 PM to 11.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—1 PM to 2; 4 to 6:30.
WREO, Lansing, Michigan, 285.5 (EST)—8:15 PM to 9:45; 10 to 11.
WRNY, New York City, 258.5 (ESTDS)—11:59 AM to 2 PM; 7:39 to 10.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 8 to 9.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30; 3 to 4; 6 to 7; 8 to 9.
KDKA, Pittsburgh, Pa., 309 (EST)—9:45 AM to 12:15 PM; 2:30 to 3:30; 5:30 to 10:15.
KFAE, State College of Washington, 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 to 1:15 PM; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 7.
KGO, Oakland, Cal., 361.2 (PST)—11:30 AM to 1 PM; 1:30 to 3; 4 to 6:45; 7:15 to 10.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 3:20; 5:30 to 11:30.
KJR, Seattle, Wash., 484.4 (PST)—9 AM to 1 AM.
KNX, Hollywood, Cal., 337 (PST)—11 AM to 12:05 PM; 4 to 5; 6 to 12.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9.
KPO, San Francisco, Cal., 429 (PST)—7 AM to 8; 10:30 to 12 M; 1 PM to 2; 3:30 to 11.
KSD, St. Louis, Mo., 595.1 (CST)—7:30 PM to 9.
CNRA, Calgary, Alberta, Canada, 435.8 (MST)—9 PM to 11.

Here is the new Sleeper Serenader #100!



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