JULY 2 1927

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RADIO WORLD

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America's First and Only National Radio Weekly

Vol. 11 #15 275

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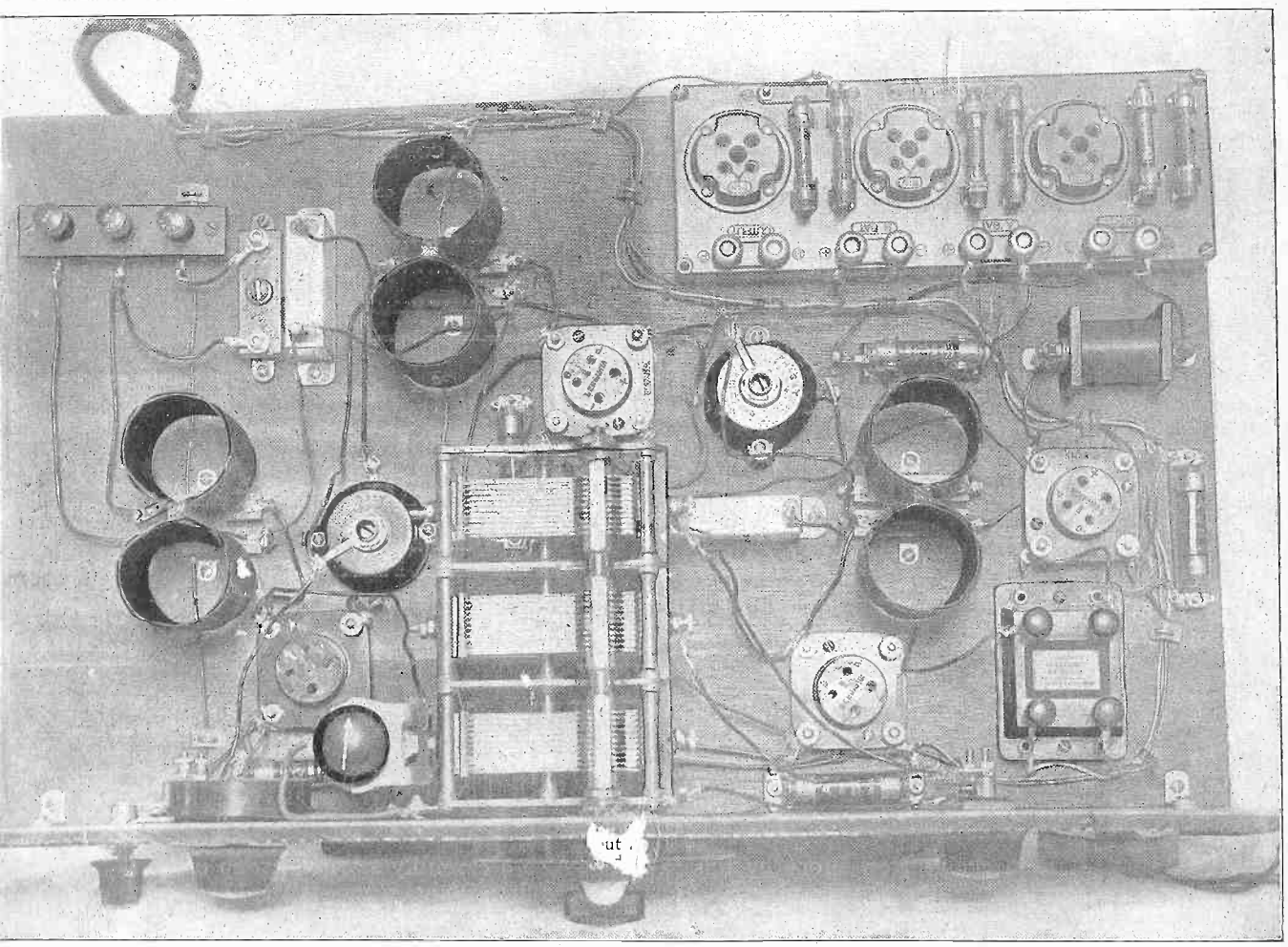

The Top View of the Planofier Seven. See Article on Page 3

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SIXTH YEAR

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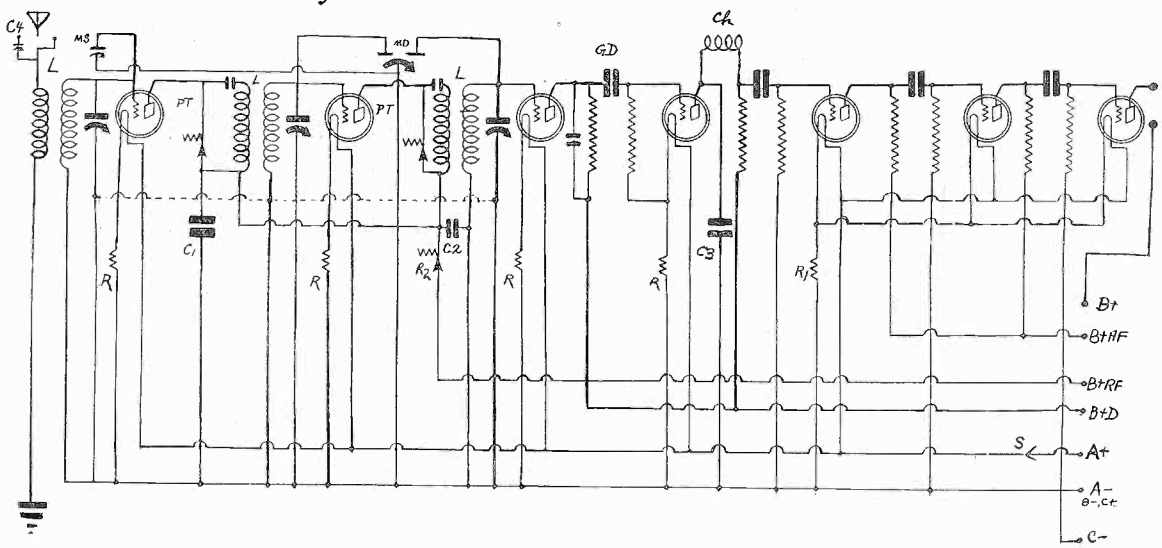
The Planofier Seven

Everything Is "Above Board" in the Set

By Robert F. Goodwin and Stuart Bruno



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Resistance and transformer coupled audio seem to have been engaged in a sort of tug-of-war, that is, as far as public opinion is concerned. First the transformer coupled amplifier would be in public favor, then the improvement of resistance coupled amplifier. This would be an incentive for the manufacturers of transformers to work overtime seeking improvements. This has brought about the development of good audio frequency transformers which amplify the signals faithfully. The old type of resistance coupled amplifier also amplified evenly.

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For this reason the transformer coupled type of amplification is not advisable when using this tube, since it would require an extremely high inductance for the primary of such a transformer. If we were to make a transformer with such a high inductance and use the new high mu tube, the amplification would be so tremendous that violent distortion would occur.

Power Tube in Last Stage

We may get away from this condition by using a very high plate potential and large grid bias, but this would not be practical. Therefore the high mu tube is used only in systems employing resistance and impedance coupling.

For the last stage we employ a power tube where the amplification constant of the tube is about 3 or 4, this tube being used to handle this extra power without distortion, rather than amplify to any great extent.

You will probably notice that the radio frequency portion of the circuits employ no method of shielding. While this is necessary when we use such coils as solenoids, where the field is rather large, it is not necessary when using a coil with a constricted field. The toroid coil is noted for this fact, but the resistance of this coil is rather large. Select a coil with a constricted field and low resistance, e.g., the binocular type. While the field is not as small as that of the toroid, the very low resistance makes the binoculars desirable. This also keeps well up the selectiyity factor, which is necessary, since

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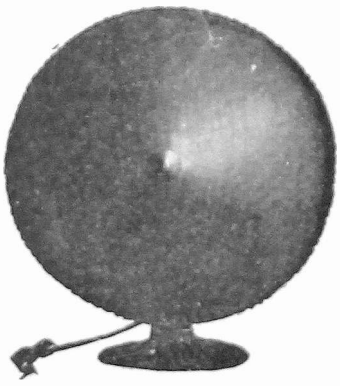

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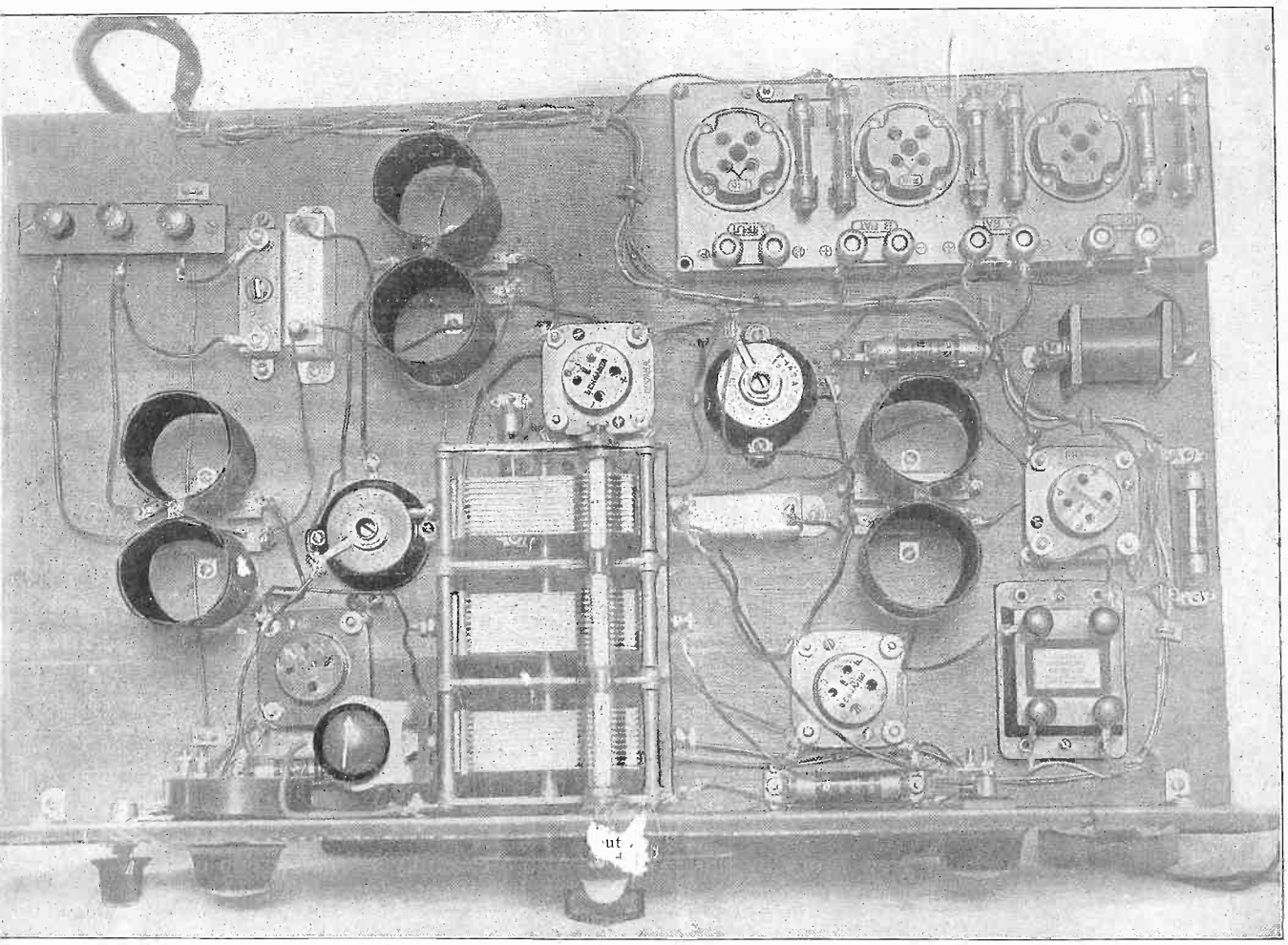

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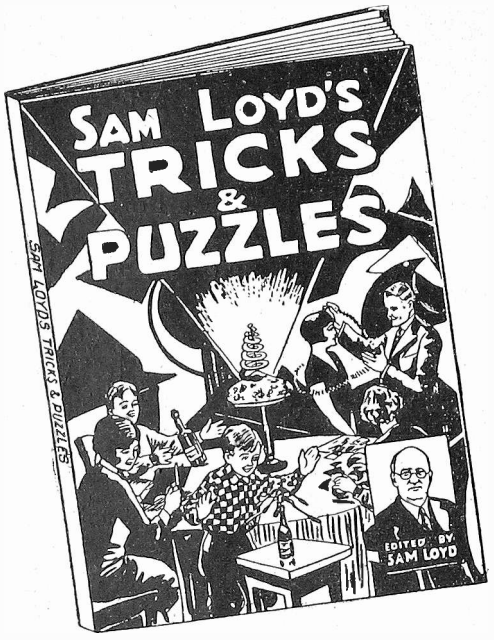
There's 1000 HOURS *of FUN!*

in

SAM LOYD'S
TRICKS and PUZZLES



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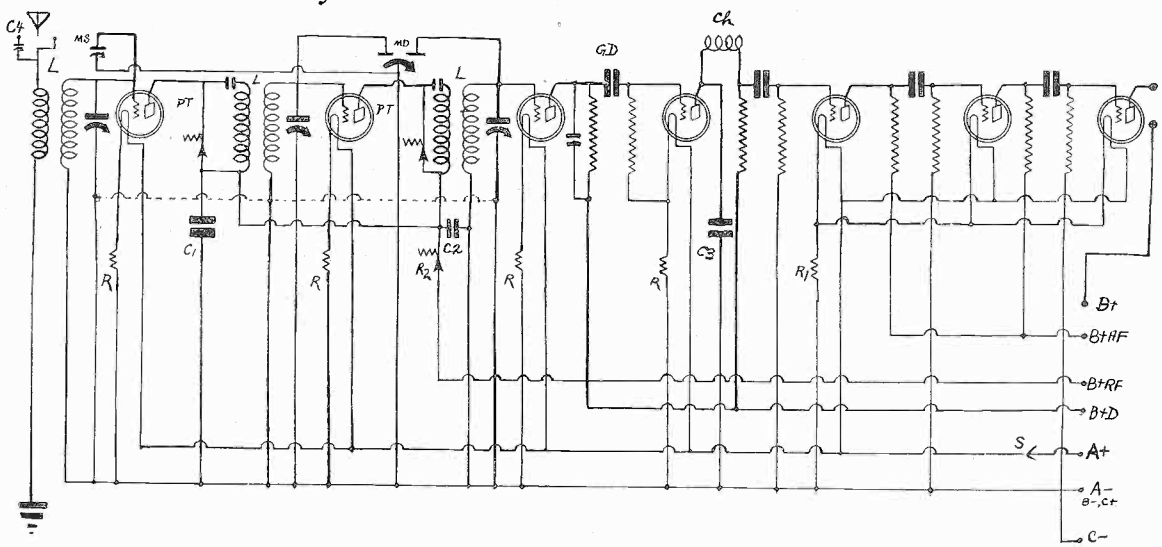

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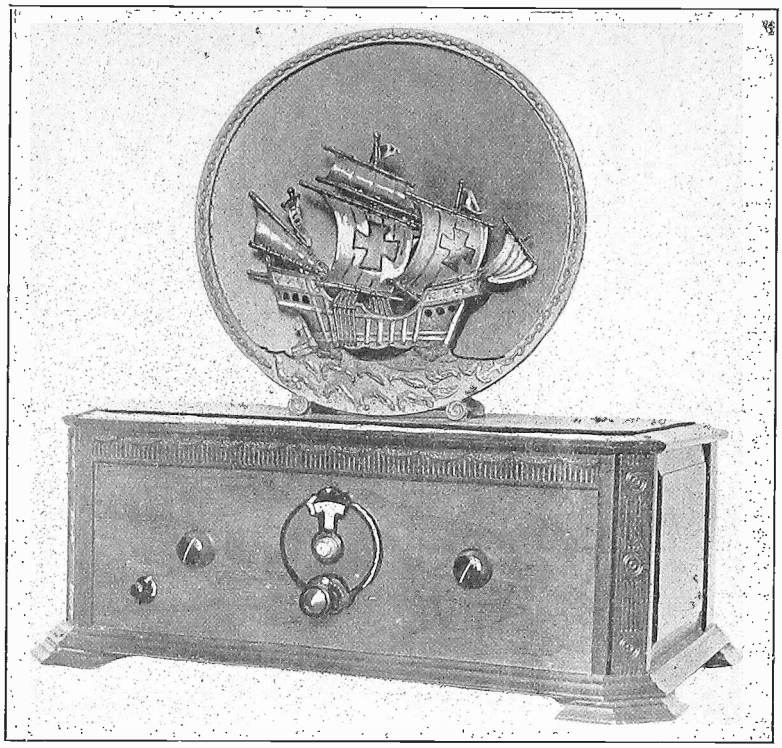


FIG. 2

The main tuning control of the Planofier Seven is the dial at center. At right is the knob of the double midget condenser, MD, while at left is the volume control knob, R2. The switch is beside it. Atop the set is a Vitalitone speaker.

no shielding is used. The three circuits are tuned with a triple gang condenser.

When building a single control set, to make the set work satisfactorily all circuits must be in resonance. First, a condenser of high quality should be selected. Since the three condensers are made on one shaft, their capacity change must be equal. The coils selected must be equally efficient and of equal inductance value. To overcome variations due to the length of leads and difference in capacity of tubes, etc., use a three-plate condenser to compensate for the variations of the last two circuits. In the first or antenna stage, use a single balancing condenser, called a trimmer. This is necessary, due to the variations of antenna capacity effect. The compensating condenser is mounted on the front panel and is tuned only when receiving distant stations. The trimming condenser is placed inside the cabinet and permanently set.

Phasatrol Balances Set

In controlling regeneration in radio frequency amplifiers there are several methods to be used. Some employ a fixed resistance in the grid circuit, thus putting a loss in that part of the circuit. Others use one of the numerous forms of neutralizing schemes, while some use a variable resistance in the B battery circuit. This has been a very popular method for controlling regeneration. Recently there has appeared on the market a novel device that fills the neutralizing bill quite well, by changing the current phase in the plate circuit by means of a variable resistor load. The device is the Electrad Phasatrol.

Regeneration in some cases is caused by an overload of the plate circuit of the radio frequency tubes, this excess voltage being fed back to the grid, where it strengthens the incoming signal in phase with the signal voltage. By the use of the condenser shown in the phase shifting device, this back voltage is retarded so that it arrives at the grid just too late to strengthen the incoming signal, and cause oscillation. The phase is not shifted a complete 90 degrees, as this is not desirable, since a little self-regeneration greatly increases sensitivity. The variable resistance used to feed the plate of the tube is left set after it is once adjusted to a satisfactory working point.

The energy transfer system used in the detector portion of the circuit is untuned or aperiodic. Here we find that the selectivity factor of the RF stages is sufficiently high not to warrant the use of any tuning controls in the detector portion of the circuit. This allows us to keep the number of tuning controls on the panel to a minimum and still obtain fine results.

Set Not Difficult to Make

Simplicity of construction as well as simplicity of control are featured in this set.

To make construction easy parts were mounted on a baseboard in plain view, instead of having some of the parts and wiring beneath the subpanel. The wiring is done with flexible covered wire. The grid and plate leads are brought short and direct, while the filament or low tension leads are bunched.

The audio frequency amplifier may be in one complete unit, with only a few leads brought to it.

The variable condenser is mounted directly in the center of the front panel. Then mount the three-plate compensating condenser (MD), which has two stators insulated from each other and one rotor. This condenser is to be mounted on the right-hand side of the front panel. The rotor is connected to A negative, and the two stators go respectively to the stators of the second and third stage condensers. The trimming condenser (MS), is mounted directly on the frame of the tandem condenser. This can be fastened with a small bracket. The stator of this condenser is connected to the stator of the antenna stage condenser and the rotor to A negative. This is shown in Fig. 2.

The volume control (R2) is mounted on the left-hand side of the front panel. The filament switch (S) is mounted on the lower left hand side of the panel. One binocular coil is mounted on each side of the condenser and one directly behind. It will also be noticed that the Phasatrols and by-pass condensers are mounted nearest the plate of their respective sockets.

After the parts are all mounted and the set is wired. Trace all leads and make sure that the set is correctly wired. Connect aerial and ground. Insert one tube and pull the filament switch. If the tube lights insert the other tubes. Now turn C4 entirely to the right. Then turn the Phasatrols to the right. Tune in on a low wave station. You will notice that this will come in with a squeal.

To eliminate this, adjust each Phasatrol by turning to the left until oscillations just diminish. Now turn MS to a point where you get maximum power. Then adjust MD to maximum signal strength. Finally turn C4 to the left this will bring the antenna stage just below the level of the succeeding RF stages, and will allow for a broad manipulation of the compensating condenser. These operations balance the receiver roughly.

Fine Tuning

Now to tune the receiver to a fine point on a weaker signal. Should oscillations be present, turn the Phasatrols to the left but if none is noticed turn to the right until a little regeneration is noticed. This can be eliminated by manipulating the volume control. While doing this adjust (MS) to a final point. This condenser need not be adjusted again unless the receiver becomes unbalanced.

After all these adjustments are made, all that will be necessary in tuning the set is to manipulate the regular tuning dial and adjust the compensating condenser (MS), also using the volume control for a final adjustment.

The fan should not overlook the fact that the correct C bias should be used on the power tube. The voltage on the aperiodic detector unit should be about 67 when using B batteries and when using a B eliminator should be varied from 22 to 90 volts. Hence the B+ detector lead may be the same for two plate circuits. In Fig. 2 this lead is marked B+D. The other voltage values are 6 for A+, 90 for B+ RF and 135 for B+ (power). That is for a 112 power tube, with a bias of 9 volts for C—. For a —71 tube use 180 volts for B+ and 40.5 for C—.

If high mu tubes (—40 type) are used they may be placed in the fifth and sixth sockets. The diagram is wired for a special detector, —00A. If any other type is used here, connect grid return to A+ not to F—. With high mu tubes 135 volts may be applied, even to the detector, if that too is high mu.

LIST OF PARTS

C1-C2—Two Electrad .5 mfd. condensers.
C3—One Electrad .0005 mfd. fixed condensers.
C4—One X-L Variodenser, .0005 mfd.
L—Three Benjamin Lekeless coils.
GD—One Goodwin Aperiodic detector, or constants as given in caption of Fig. 1.
Ch—One radio frequency choke, 5 millihenrys or less (Goodwin).
R—Four 1-A Amperites.
R1—One 1-ampere Amperite.
R2—One 100,000-ohm Centralab variable high resistor.
MD—One midget double condenser (Marco three plates).
MS—One midget single condenser (Hammarlund .000035 mfd.).
S—One DeJur switch.
One DeJur triple condenser, each section .0005 mfd.
One DeJur resistance coupled amplifier.
Four Benjamin X sockets.
Two Electrad Phasatrols.
Three binding posts (Gnd.; Long. Ant.; Short Ant.).
One 12x20-inch baseboard.
One 7x21-inch front panel (or to match cabinet).
One National Velvet Vernier dial.
One DeJur seven-lead battery cable.
Flexatone wire.

A New Neutralization Plan

Equaphase Embodied in Freshman Electric Set

By Robert Sagala

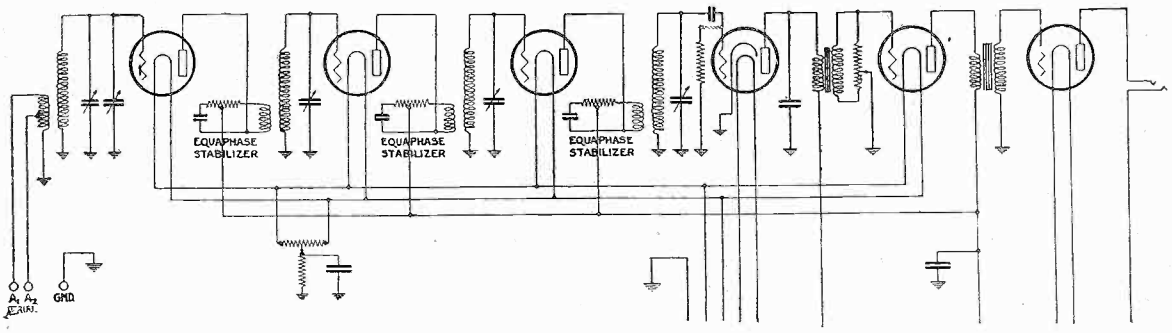


FIG. I

Circuit diagram of the new Freshman Equaphase receiver, stabilized by means of balanced reactances. AC tubes are used. Three different power transformer windings are required—one for the amplifier tubes, one for the detector, and a third for the power tube.

A SIX-TUBE electric set is one of the latest additions to the line of Chas. Freshman Co., Inc. It uses the AC tubes of the R. C. A., from whom Freshman recently obtained a license. One of the features of the electric set, called the Freshman Equaphase receiver is the method used in stabilizing the radio frequency amplifier, and for which the set was named.

As is well known, one of the causes of oscillation is feedback through the grid-plate capacity. It is also well known that if the feedback through this route is to cause augmented amplification and oscillation, the load impedance must be an inductance of rather high value. That is, the load on the tube must have a positive reaction of a high value. If the load is capacitive or purely resistive oscillation cannot take place as a result of feedback through the grid-plate capacity. The ideal condition is to have the load purely resistive over the entire range of the tuner. This can be attained by the Equaphase stabilizer.

This device consists of a series inductance coil and a resistance in parallel with a series combination of a condenser and a resistance. The total effective resistance in the condenser branch is made equal to the total effective resistance in the inductive branch, and each is made equal to the square root of the L/C ratio.

Balanced Reactions

When these relations hold, the reactance of the coil, which is the primary winding of the RF transformer following the tube, is exactly neutralized by the reactance of the condenser which is connected across it. There is then no reactance on the plate and no feedback through the grid-plate capacity. Consequently there is no oscillation.

In selecting the resistors which are used to establish this equality of reactances, account must be taken of the resistance which the secondary circuit introduces into the primary. This can be measured at a suitable frequency and the adjustment made according to the measurement. Exact neutralization of reactances cannot be effective except at one frequency. But that does not mean that complete stabilization of the set cannot be effected by the Equaphase combination. So long as the reactance is negative no oscillation can take place, as was stated above, and so long as the positive reactance is small in comparison with the resistance in series with the coil, the circuit will not oscillate. Hence it is possible to select values of impedances in the stabilizer which will stop oscillations at all settings of the tuning condenser without at the same time seriously cutting down amplification.

The use of this type of stabilizer together with tuning coils of small dimensions and fine wire makes it possible and practicable to employ four tuned stages. This arrangement also enables the use of a master control for tuning the four stages. This is a great convenience.

As a fine adjustment in the tuning when a common control is used, a vernier condener connected across the secondary of the antenna transformer is employed. This serves to sharpen the receiver and to clear up some interference.

The main volume control in the receiver is a high resistance potentiometer across the secondary of the first audio frequency transformer. The volume can also be controlled to a degree by using the proper tap on the antenna coil.

The resistance in series with the condenser should be about 380 ohms and the resistance in series with the primary of the coupling transformer should be thirty ohms less, or 350 ohms. The difference is the resistance introduced into the primary by the tuned secondary. The condenser is shunt with the primary should be variable, with a capacity about .00007 mfd. The correct capacity can be found by trial and then its adjustment can be left alone. The value of the inductance of the primary is about 20 microhenrys.

Voltmeter Is Deceptive On Storage A Battery

Distilled water should be added to that already in a storage battery if the plates are not covered by the water, but the water should be added only before charging, to give the acid a chance to mix thoroughly during the charging process. Too much water must not be added, either, since when charging, especially at a high rate, the solution starts to bubble and consequently, if near the top, will flow over. Even with the slow chargers, if a charge is continued for too great time, the same action will take place. About ¼ inch above the plates is enough coverage.

In measuring the storage A battery, the hydrometer affords an accurate method, since this tells the condition of the acid, which is important. The voltmeter is not an accurate test, for even if the battery is discharged, after standing a length of time, it will give a reading of full voltage. Upon connecting up to a set, it will be found, however, that the battery will run down in a few minutes. The battery, in this case, of course, acts like a huge reservoir of energy or a condenser, accumulating a charge. The plates act as the conductors, while the acid acts as the dielectric medium.

A battery should be charged even when not in use. Chemical action between the acid and the plates causes the same effect, e. g., clogging, when the battery is standing idle.

The average battery when fully charged will give a reading of 1.300 on the hydrometer, although on some batteries, a reading of 1.280 will be obtained. This is dependent upon the strength of acid placed into the cell by the manufacturer. When a reading of 1.210 is obtained, the battery should be recharged. Allowing it go lower will decrease the life of the battery. The charging of the battery will also become more difficult, since the pores of the plates have become clogged up to such an extent that it will take quite a heavy charge to remove the sulphate.

The connecting of the charger terminals should be done carefully. There is only one way to connect them and that is the right way. Connecting them in the opposite way will buckle and overheat the plates, as well probably destroy the entire cell.

Every now and then a coating of bluish substance will be noted on the positive and sometimes negative post of the battery. This is the sulphate. It is caused by the acid sprayed or spilled over the top combining with lead. Always clean it off.

The Six Types of Units

Used for Operation of Loudspeakers

By J. E. Anderson

Contributing Editor; Consulting Engineer; Associate, Institute of Radio Engineers

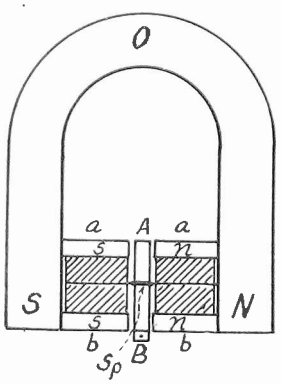


FIG 1

The balanced armature or "push-pull" type. (NOS) is a strong permanent magnet, the poles in two sections, (ss) and (nn.) A single piece of iron, the armature (AB), is suspended between the four pole projections.

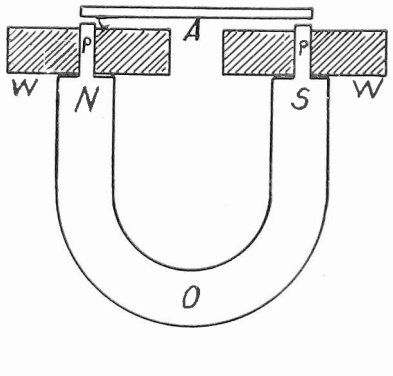


FIG. 2

This illustrates the principle of the so-called "bipolar" electromagnetic driver element. (NOS) is the field magnet and (pp) are pole pieces around which the spools of wire (WW) are wound. (A) is the armature to which the sound radiator is connected. This type of speaker introduces a second harmonic frequency.

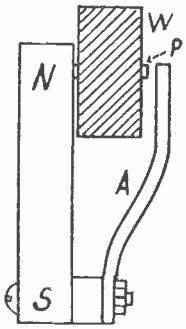


FIG. 3

This shows a simplified form of the type of unit illustrated in Fig. 2. A single spool (W) is wound around the pole piece (p), at upper right.

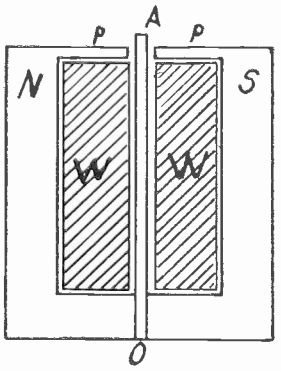


FIG. 4

The balanced or polarized relay type of driver elements. (NS) is a permanent magnet and (OA) is a soft iron armature. One end of (OA) is connected to the neutral point (o) of the permanent magnet. The current goes through WW.

INNUMERABLE loudspeaker units have been designed, some according to scientific principles, others according to a total lack of principles, both moral and scientific.

The majority of speaker units, or as they are now called, loudspeaker driver elements, work on the electromagnetic principle. A few work on the electrostatic, a few on the electrodynamic, and some on the piezo electric principle.

In the electromagnetic units the varying signal current changes the strength of an electromagnet and this magnet exerts a correspondingly varying pull on a piece of iron called the armature. In the electrostatic speakers the varying signal potential exerts a correspondingly varying pull or mechanical force on an electric conductor called the armature. In the electrodynamic the varying signal current passes through a small coil of wire placed in a strong magnetic field and the interaction of the permanent field and the varying field of the armature coil causes the coil to move.

The Response of a Crystal

The piezo electric units work on the principle that when a varying electric force is impressed across the piezo crystal in a certain direction, the crystal vibrates in accordance with the varying electric force.

As far as is known there are no drivers on the American market operating on the piezo electric or the electrostatic principles. But the electrostatic unit is coming soon. There are a few makes employing the eletrodynamic and countless units working on the electromagnetic principle.

There are two main types of driver elements working on the electromagnetic principle. One of the most efficient is the balanced armature type, often called the push-pull or floating armature type. A third type is the one operating on the polarized relay principle, which is also balanced.

The balanced type of electromagnetic unit is shown in principle in Fig. 1.

Analysis of Balanced Armature

The permanent magnetic field is obtained from a strong magnet (SON). Each of the poles of this magnet is split into two parts (ss) and (nn). The soft iron armature (A) is mounted on a stiff spring (Sp) between the four pole projections. This armature is surrounded by a small coil of fine wire (shaded portion) which is placed between the pole pieces. As a current is sent through the small coil the armature becomes magnetized in one direction or the other depending on the direction in which the current is sent through. Suppose that it is sent through so that the end near A becomes the north pole of the armature. The torque on the armature becomes such as to cause a counter-clockwise rotation, because (na) repels (A) and (sa) attracts it, also (nb) attracts (B) and (sb) repels it. Thus the armature is acted on in four different places, all tending to turn the armature in a counter-clockwise direction. When the current through the coil is reversed (B) becomes the north pole and (A) the south pole of the armature and all the forces are reversed so that the motion becomes clockwise.

Has Some Fine Advantages

One advantage of this type of construction is that there is never any tendency to demagnetize the permanent magnet by currents sent through the armature coil, and therefore the unit holds its sensitivity much longer than other units. Another advantage is that the armature is balanced both magnetically and mechanically, but the magnetic balance is unstable so that a slight change in the magnetization of the armature will produce a large effect.

One requirement of the armature is that it be made of soft iron with high permeability so that it can be readily magnetized in either direction without any hysteresis losses and with a small magnetizing force. A requirement of the spring on which the armature is mounted is that it be stiff enough to pull the armature away from the poles in case it should touch. If it is not strong enough the armature will stick to one pair of pole pieces and render the unit non-operative.

Rigidity Is Needed

Another requirement is that it be rigidly attached to the armature and to the spring supports. Lack of rigidity will render the unit inefficient and is likely to cause rattling and buzzing noises. Still another requirement of the spring and the armature is that they shall be unhampered in their movement, or friction losses will cause loss of sensitivity. Rigidity of the whole assembly is of extreme importance.

There are many structural modifications of this type of driver. They differ mainly in the size and shape of the magnet, direction in which the armature moves relative to the plane of the fixed magnet, the method of mounting the armature, and the type of pole pieces used to obtain the split poles.

The other or "bipolar" type of electromagnetic driver is shown in Fig. 2. A permanent magnet (NOS) maintains a strong permanent magnetic field. Pole pieces (pp), around which coils (WW) of fine wire are placed, project from the poles of the magnet. As a varying electric current is passed through the spools the permanent field is alternately weakened and strengthened and this produces a correspondingly varying pull to be exerted on the armature (A) placed near the pole pieces.

Extent of the Pull

The pull depends on the strength of the permanent field, on the intensity of the varying current and on the distance between the armature (A) and the pole pieces. (A) is kept away from the pole pieces by some kind of spring depending on the particular construction. In virtu-

ally all cases this spring is the armature itself, as in the ordinary horseshoe type of unit with an iron diaphragm. This type of unit introduces a second harmonic movement into the motion of the speaker, which the balanced speaker does not do. But this distortion can be made as small as desired by increasing the strength of the permanent magnet. This not only reduces the distortion to a negligible quantity but it also greatly increases the sensitivity of the unit.

A variation of this type of driver is shown in Fig. 3. A single straight magnet supplies the permanent field. A single spool of wire (W) is attached to one end of the magnet by means of a pole piece (p). The armature (A) is attached by means of a screw to the other end of the bar magnet and so adjusted that the free end of the armature is directly over the pole piece. A varying current sent through the spool varies the strength of the magnet and thus the free end of the armature is subjected to a varying pull.

This type of construction has no advantages over the preceding type except simplicity of manufacture. It costs less to make and is equally efficient.

The Balanced Relay

The balanced relay type of construction is shown in Fig. 4. The permanent magnetic structure is (pNOSp), which supplies an intense field across the gap between (p) and (p). The armature (A) is placed midway between the pole pieces and is lodged at the neutral point (0) of the magnet. The armature coil (W) is wound around the armature. When a varying current is sent through the winding the upper end (A) of the armature becomes either a south or a north pole according to the direction of the current. Suppose it becomes north. The north pole of the magnet repels it and the south pole attracts it, and therefore the movement of the armature is toward the right. When the current reverses the movement of the armature also reverses. This construction is balanced and therefore it is free from second harmonic distortion. It is a sensitive unit but it is somewhat difficult to construct. The armature should be made of soft iron or silicon steel, and it should be sufficiently rigid to pull away from either pole. As a means of decreasing the tendency of the armature to stick to the pole pieces, a thin layer of paint or varnish or non-magnetic metal can be applied to the opposite surfaces of the armature and the pole pieces.

A Coming Principle

A unit working on the electrostatic principle is shown in diagram in Fig. 5. (A) is the armature and can well be a large metallic cone, or a paper cone to which tin foil has been attached. (C) is another conductor of electricity, placed close to the armature. It should be rigidly attached to the mountings so that it cannot move. It is obvious that (A) and (C) form two plates of an electrostatic condenser. A high steady polarizing voltage is applied between these two plates by means of a battery (E). In series with this battery is a coil (L) in which a signal voltage is induced by the output of a receiver. The battery (E) causes plate (C) to exert a steady pull on plate (A). This pull is varied by the voltage induced in (L), and the result is that a varying pull is exerted on plate (A). If (A) is free to vibrate it will do so and radiate sound.

In Fig. 6 is shown a driver operating on the electrodynamic principle. An electromagnet (NNS) magnetized by a field winding (FF) is employed instead of a permanent magnet. This produces an intense magnetic field across the ring shaped opening between the central round pole (S) and the annular pole (N). In this opening is placed a small coil of fine wire, shown by dots to represent the cross section of the various turns.

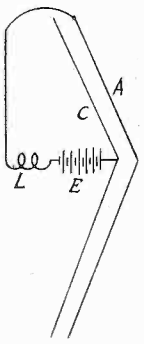


FIG. 5

This illustrates the electro static type of speaker, prophesied to become popular. Essentially it consists of two parallel conducting plates (C) and (A), one of which is rigid and one which is able to vibrate. A polarizing voltage (E) of from 200 to 500 volts is impressed across the two plates. The signal voltage is induced in series with this voltage by means of the coil (L), which can be the secondary of an audio transformer. Plate (C) exerts a force on plate (A) and when the force is variable the (A) plate will vibrate. The effectiveness of this speaker depends on (E).

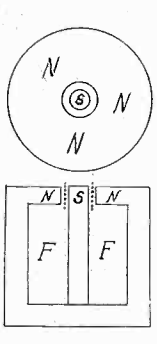


FIG. 6

This illustrates the electrodynamic type of loud speaker driver element. A cup-shaped electromagnet (NNS) is used to supply the field. A direct current is sent through a coil (FF) wound around the central core the end of which is marked (S). The signal current is sent through a small movable coil suspended between the poles. This small coil is represented by small dots. Lower view is the cross section of the unit and top view is the view of the unit looking down. The armature coil is suspended in the annular opening between (NNN) and (S).

Uses a Light Coil

This coil is made very light and it is mounted so that there is a minimum of separation between it and the pole faces. When a current is sent through this small coil it tends to move just as the winding in an electric motor tends to move when a current is sent through it. The direction of the motion depends on the direction of the field across the pole faces and the direction of the current through the small coil. When a varying or alternating current is sent through the smal coil the coil moves back and forth in accordance with the current impressed. If the coil is attached to the diaphragm of a speaker or a cone, sound will be radiated.

One advantage of the type of construction is that the armature coil can move through a wide amplitude without striking anything, and without any change in the sensitivity of the unit. It is therefore particularly adapted to reproducing low notes.

Task Is Too Difficult

But it has also disadvantages. It requires a battery for the polarizing current, an objectionable feature to many. But this really is not so objectionable when a battery or other direct current source is required in the set anyway. Another thing that is regarded as a disadvantage is that an output transformer is necessary to match the impedance of the speaker to that of the tube which feeds it.

A real disadvantage is that it is difficult to match the speaker to any tube. If the impedance of the coil be made high, the armature will be heavy and then it will not respond to the high notes. If the impedance be made low and a transformer is relied on to match impedances, the secondary current, or the current through the armature coil, will be heavy, requiring a heavy wire. Again the armature will be heavy.

The best material for permanent magnets is cobalt steel, but this steel is expensive and very difficult to handle. A very good material is tungsten steel, specially treated. It is not exceedingly difficult to work, is moderately expensive, and has a high coercive force, which means that it is not easily demagnitized after it has been put in the magnetic state. A good material is chrome steel. It is much cheaper than tungsten steel and easier to work. If the chrome steel magnet be made about 10% larger than the tungsten steel magnet the two will be about equally efficient, but the tungsten magnet will hold its magnetization much better than the chrome steel magnet. In some forms of construction it is very important to have a steel which will resist demagnetization while in others it is not so important. Ordinary tool steel is useless as permanent magnet material. It will not hold its magnetization.

Comparison of Demagnetization

The balanced forms of driver elements shown in Figs. 1 and 4 are not easily demagnetized by currents flowing in the armature windings. The unbalanced forms shown in Figs. 2 and 3 can easily become demagnetized by heavy direct currents flowing in the armature windings, and for these forms it is important to have a steel which will resist demagnetization.

The best material for electromagnets and armatures is silicon steel. It has the highest permeability and lowest hysteresis losses of commonly available magnetic material. But this only comes in sheets, and sometimes armatures cannot be made out of it. The next best material is pure Swedish iron or the equivalent American product, Armco iron. These products come in sheets, rods and various other forms. It has slightly lower permeability and higher hysteresis losses than silicon steel, but for many uses this is immaterial.

When a permanent magnet used in a loud speaker has lost its magnetism through abuse, it can easily be restored. A very strong electromagnet is needed for the purpose. The current is turned on the electromagnet and the poles of the magnet to be reactivated is placed across the poles of the electromagnet. After a few minutes the magnet has been restored, provided that the electromagnet is much stronger than the permanent magnet is to be. Of course direct current is necessary in the electromagnet.

WMSG and WGL Sue to Stop Radio Board

Two stations in the New York district filed injunction suits challenging the power of the Federal Radio Commission. They were WGL, owned and operated by the International Broadcasting Company, which attacks the constitutionality of the Radio Act, and WMSG, the Madison Square Garden station, which states that the limitations imposed by the commission amount to confiscation of property, without due process of law and without compensation.

In response to WMSG's statement, the government officials state that the commission's regulation of radio does not actually deprive the broadcaster of any property, but that it is simply a power to regulate a commerce between the States, derived from Congress and the Constitution. They state that it is proper for the Commission, in the lawful exercise of regulatory power, to prescribe a separation between stations, as a means of avoiding radio congestion and interference.

The Woman Chooses the Set

And That Accounts for Artistic Appearance

By Katrina Fleming

RADIO is a modern development and it is technical. Comparatively few people understand its workings. For these reasons a radio receiver is not considered decorative in the home no matter how attractive it may be. It is not to be compared in decorative value with a huge green bottle, or with a rusty shield dug up from an old battlefield, or with an old canvas with a few daubs of misplaced paint, or with an ancient worm-eaten chest without any paint. An old grandfather's clock is welcomed in any home for its decorative value, and it matters not that it keeps the wrong time. A radio set of similar proportions would not be tolerated in a barn. A cuckoo clock is considered highly appropriate on the wall but a loud-speaker any place where it is seen is an offense to the eye. It matters not that it is more in place than a cuckoo in a clock.

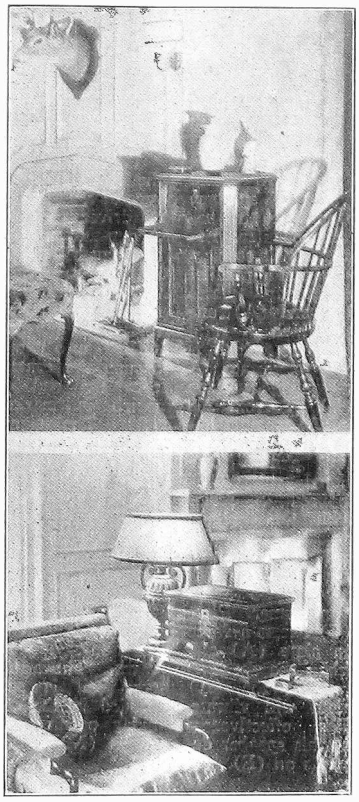
Radio is new and therefore it has not yet been endowed with any decorative nor artistic value. The day will come when the radio monstrosities of 1922 will be highly valued for their exquisite craftsmanship and huge amounts will be paid for their possession as antiques. In the year 2,422 or 2,423 the superknobodyne of 1922 will have the place of honor in the most exclusive home, and the privileged visitors to that home will exhale many an "ah!" in admiration of this rare and artistic contraption.

Must Be Dressed Up

But we are now too close to the inception of radio to tolerate a radio set in the home as a radio set. It must be concealed and made to appear something else. It may be piece of furniture, a clock, a treasure chest or something else to which we have become accustomed by long association. If the radio quality of reproduction can be retained when thus concealing the radio set all is well, but if quality cannot be retained let it be subdued by the camouflage.

Of course, a radio set is a desirable addition to any home, in fact it is now almost indispensable. But few perons will admit a radio receiver to the home unconcealed, lest it appear that they are condoning something new. So radio has entered the furniture field, the antique field and the building field.

Some very attractive combinations of radio and furniture have been brought out. The console type has been one of the most popular.



THE present-day trend is toward attractive appearance. At top is a console model, at bottom a table model of the treasure chest variety.

Some High, Some Low

Almost a life-long association with the phonograph console has accustomed many to this as a piece of decorative furniture and hence they admit the radio set in that form. Some prefer the highboy and others the low-boy type of console. The photograph herewith shows a corner of a room in which a console type of radio receiver forms the central motif. It is a decidedly attractive corner, albeit a mixture of the old and the new. Even the most rabid radio enthusiast who would prefer a receiver in the form of copper wire entanglements will have to admit that the corner is inviting a pleasant radio evening by the fireside.

The treasure chest advocate will find the arrangement shown in the second photograph more to his liking. Here the central object is a radio set built into the form of a chest with all the trimmings. Auxiliary objects in the picture suggestive of treasure are the jewel box, the little strongbox, and not the least the comfortable chair

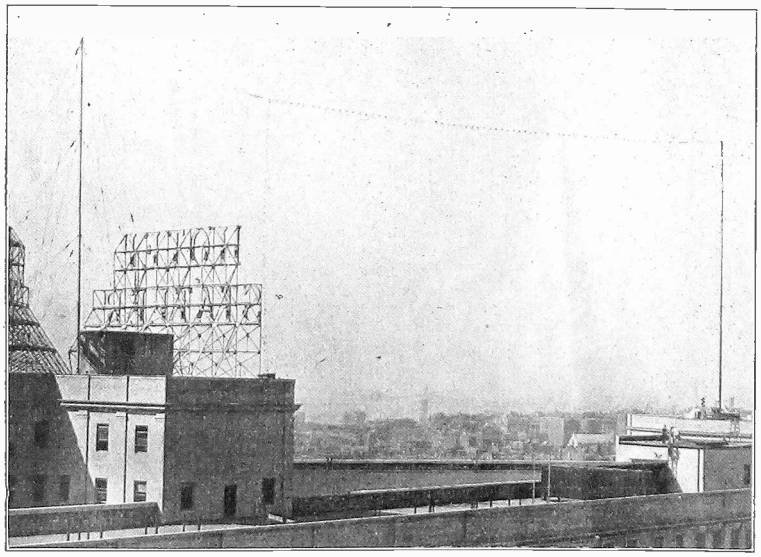
Woman Does the Choosing

When the console type of receiver is used the loudspeaker and the power supply units can be placed inside the console directly under the set. This method removes one of the common objections to radio in the home. But this idea cannot be well followed in the treasure chest type of concealment, unless the table on which the chest stands forms an inseparable part of the receiving system.

The choice of type of radio set is nearly always up to the woman of the house. The factors which count in her mind are attractiveness of the set, its harmony with the rest of the furnishings of the home, and dust collecting nooks about the set. If there are any nooks and corners about the set in which dust settle and defy removal the set so handicapped is ruled out.

Technical excellence of the set seldom enters as a factor in her selection. Whether she likes the tone quality of the receiver or not largely depends on how well the set measures up to her other points of judgment. It is up to the man of the house to see that the tone quality is there as well. While the woman makes the final decision, she must give heed to the man's wishes on the point of quality, because if she does not, he may refuse to listen to the set and spend his evenings at the club, where "the boys" have a set which has been selected for technical excellence, and which is still very good looking.

WBZA USES CAGE TYPE AERIAL



THE AERIAL MASTS and the cage antenna of Westinghouse station WBZA, atop the Hotel Statler in Boston. The masts are 160 feet high, while the antenna has a span of 160 feet. The studios, offices, control and transmitting rooms are on the second floor of the house, extreme left, 16 stories above the street.

SOUTH AFRICA PLANS UNITY

In an attempt to unify control of broadcasting in the Union of South Africa, Cape Town and Johannesburg may be linked up by radio, according to reports received by the Department of Commerce from Assistant Trade Commissioner William L. Kilsein, Johannesburg, South Africa.

The Hard Road to Quality

The Goal Is Reached, But Only 20% Know It

By Knute Petersen

GREAT improvement has been effected in broadcasting and reception during the past few years. In the early days even the best transmitting stations used phonographs and player pianos promiscuously before the microphone. Now these stations are using the highest type of available artistic talent directly before the microphone. All "mechanical performers" are prohibited.

At first little thought was given to the modulation. Often it happened that the wave was badly overmodulated. Now the average percentage of modulation is so low that no overmodulation occurs on even the loudest passages. Furthermore, the modulation is so low that the second harmonic which is introduced into the signal when the percentage of modulation is too high is negligible.

Not much thought was given previously to quality of modulation over the entire audible scale. Now the modulation is the same for all essential frequencies within a very close margin.

At the receiving end the improvement in quality has been slower than at the transmitting end, because many entered the receiver manufacturing field who had no adequate knowledge of the fundamental principles of radio in general and quality in particular.

Accumulation of Knowledge

But knowledge of these things was accumulated and broadcast in technical circles and great improvement in the received programs was the result.

There was no one thing that came first in this general improvement of equipment. The realization that more power was required to operate loudspeakers satisfactorily brought larger tubes. The demand for the low notes in the signal brought large transformers with high inductance primaries and it also brought resistance coupled receivers with high mu tubes The demand for the low as well as the high notes brought cone speakers of large dimensions.

The demand for convenience of operation brought about simplified control in the receivers. At first it was thought necessary to have a variable for every component part of the circuit. As a result there were receivers which had a rheostat for every tube, one or more variable high resistances for oscillation control, one separately controlled condenser to every tuned circuit together with a vernier condenser for each, potentiometers for varying the grid bias, taps on the primaries to change the coupling, taps on the secondaries for varying the tuning range, rotatable primaries for changing the coupling, and other variables without number.

"Variomania" Disappears

As a result of this mania for variables, which has been called "variomania," receivers horrible in appearance and well-nigh impossible to operate appeared. At present variables are used only for tuning and for volume control, and these are reduced to the smallest possible number. One or two controls for tuning and one for volume control are now popular. Many sets use a single control for tuning and another for volume control. The result is that the receiver is simple to operate and it is possible to build it so that it looks like a piece of art.

The demand for convenience also brought socket power devices. At first these were designed to eliminate the B battery only. Then they were built to include the C battery also. Finally attempts were made to build them so as to elminate the filament battery also. Fair results have been obtained and the prospects for complete success along this line are very bright. In fact, many receivers of excellent performance characteristics are now in operation in which no batteries whatsoever are used.

Competition Fruitful

The keen competition between the phonograph and the radio was one of the greatest forces for improving the quality of both. But a few years ago the quality of phonographically reproduced music was atrocious. It was an ordeal to listen to one of the instruments. Radio came along. It was an improvement over the phonograph, bad though it was at first. The phonograph manufacturers got busy and turned out instruments capable of reproducing recognizable music. That was a challenge to the radio element. They accepted it and now the duel is being fought. The best phonograph reproduction is now on a par with the best radio reproduction, and either is almost as good as the original.

In the competition between the phonograph and the radio the phonograph had the early advantage of greater talent. Nearly all the great artists of voice and instrument were bound by contract to the phonograph makers. Radio had to take what was left. At first there was not much to take, but now practically all the great artists are available to the radio.

Radio has one advantage over the phonograph, and that is that its programs come to the listener right off the griddle. Phonograph music is bought in the store deliberately at so much per package. Radio music comes wafting through space so that he who listens may hear by simply tuning in on it. A peach plucked off the tree is much more delicious than a peach fished out of a tin can. The two peaches might have grown on the same tree, or even the same branch; but the canned peach grew a season or two ago, the one plucked off the tree did not stop growing more luscious until the moment it was picked. The plucked peach ripened in the sun, the canned peach ripened in the shade of a warehouse, or perchance under the action of a chemical. So it is with the music from the phonograph and the radio. The phonograph record has been perfected in a studio and deprived of some of the human element. The radio rendition is the result of growth and it is alive and vibrant.

The artistic phase of radio has always outrun the technical development. In the early days when "mechanical performers" were used the technical equipment at both the transmitting and receiving ends was so poor that nothing but the novelty of the thing sustained interest in broadcasting.

First-Class Artists Now

Later, when mediocre human talent was employed, the technical equipment improved a little but still the reproduced programs were mediocre.

Now when artists of first magnitude perform before the microphone, the average reproduction is of first order.

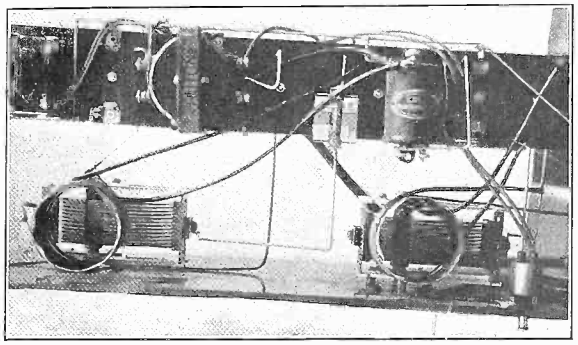
Of course one frequently hears a radio receiver which gives the illusion of reality, but such receivers are none to plentiful. The defect now lies mainly with the receiving equipment. Soon the listener will not be satisfied with distorted radio. The general buyer is learning fast.

Poor reception is not now so much a matter of technical development of receivers as with the exploitation of radio. It is well known how to build receivers capable of fidelity of reproduction, but there are many sets built which can not reproduce any program properly. And these sets are in daily use. They serve well to impart news and useful information to their owners, but they are not able to create the illusion of reality.

These receivers also serve to keep the rhythm of a musical composition and belch forth a great volume of sound. Hence they serve well those who would fill the room with noisy cadence. But when it comes to reproducing classical music as rendered by the great artists or organized groups of artists, these sets can do no better than create a displeasing caricature.

It is safe to say that more than 80% of the sets in use today fall in this class.

MIGHTY POOR COIL PLACEMENT



UNCONTROLLABLE OSCILLATION will result if the coils are placed parallel and fairly close to each other as shown. Place them at right angles, or at the popular Neutrodyne angle, and keep them away from the variable condensers.

Much Heat Dissipation, New Resistor Demand

By H. E. Osmun

Central Radio Laboratories

The rapid gain in popularity of the new A-B-C socket power circuits such as those using the Raytheon 350 milliampere or Q. R. S. 400 milliampere tubes, has created a need for resistors of much greater current capacity than any thus far used in radio receiving circuits. This has been brought home forcibly to many an experimenter who has hooked up the ordinary small resistor in the new circuits only to see it go up in smoke after a few minutes' service.

These new circuits dissipate much more energy in the resistances than has been the case in circuits used heretofore. This is obvious when we consider that we are now dealing with a pressure of 300 volts and a current of .3 to .4 ampere, while in the past, high voltages have been used for B battery circuits only, where the current seldom exceeds .06 ampere.

To have a sound understanding of the new resistances needed, it is advisable to refer to some of the fundamental laws of resistance in electrical circuits. The following laws are simple and accurate. They should have a prominent place in every radio experimenter's note book.

The Four Points

1. The **ohm** is the unit for measuring electric resistance. A resistance of one ohm in a conductor will cause a pressure drop of one volt at a current of one ampere.

2. **Ohm's Law** is a simple equation to determine resistance, current, or voltage drop in an electric circuit. If I is the current in amperes, E is the voltage drop through the resistance, and R is the resistance, the following relations are all expressed by Ohm's law:

$$I = E/R$$
$$R = E/I$$
$$E = R \times I$$

3. The **watt** is the unit of electric power. It represents the energy expended when one ampere flows through a resistance of one ohm or through a drop of one volt. The amount of energy expended in any resistance, therefore, is the current in amperes multiplied by the drop in volts. It is also determined by multiplying the square of the current in amperes by the resistance in ohms.

4. Electric energy is dissipated in a resistance as heat, and the amount of heat is in direct proportion to the watts of electric energy dissipated, regardless of the shape or kind of material used in the resistor. Rheostats or fixed resistors that are to dissipate a large amount of energy, therefore, must have ample size to radiate the heat generated, and must be manufactured throughout of material that will withstand high temperatures.

Difference in Energy

Rule number four has been relatively unimportant in receiving circuits of the past, because the amount of energy dissipated by any single resistor was small. For example, a filament rheostat, controlling two type —01A tubes from a six-volt storage A battery, will dissipate between one and two watts. This energy is so small that most any rheostat, regardless of size, will handle it without undue heating.

A little later in radio history there came a demand for fewer panel controls and it was partly answered by controlling the filament of all the tubes in the set with the same rheostat. For a six-tube set, using one ½-ampere power tube, this required a possible dissipation of from four to seven watts in the rheostat and many of the small rheostats formerly used could not carry the current without burning out. New and larger rheostats of low resistance designed for this service were frequently called heavy duty. These rheostats may confuse many purchasers today, because while satisfactory for the purpose for which they were designed, the maximum energy they will dissipate without breaking down will not exceed 10 watts, and is often less.

The ordinary wire-wound radio rheostat does not break down because the wire burns out, for it is normally wound with the same kind of wire used in electric heaters that operate continuously at a red heat. The wire is wound on and insulated by fibre, for that material can be easily wound flat and then bent into the required shape. Since this fibre is covered up by the wire, however, it has little radiating surface and becomes the hottest part of the rheostat. The limiting factor, therefore, is the temperature at which the fibre breaks down. Fibre disintegrates slowly at the boiling point of water, 212°F, and rapidly at higher temperatures.

Many Must Dissipate 18 to 35 W

Most resistors needed for the new circuits must dissipate from 18 to 35 watts normally, and should be capable of dissipating up to 50 watts for a short period of time to guard against burning out through an accidental short of the the equipment. While it is possible to manufacture a conventional radio type of rheostat to dissipate this amount of energy at a temperature within the safe limit of fibre, it is scarcely practical because such a rheostat must be so very large in size it is difficult to find space enough for it in ordinary radio equipment. The only alternative is to wind the resistance on material that will withstand high temperatures without damage.

The new Centralab power rheostats and potentiometers are an example of the heat-proof construction necessary for permanence. The Nichrome resistance wire is wound on a metal strip insulated by asbestos. This metal strip is then formed into the rheostat frame. It is welded to the contact shoe support in such a way that the entire assembly is practically heat proof, while the wire is open to free air circulation on all sides. The finished rheostat is only two inches in diameter, but will dissipate 50 watts of electrical energy at a temperature of 480°F. Prolonged operation at this temperature can cause no possible damage to the rheostat, because the three materials used, Nichrome wire, steel and asbestos, are all proof against high temperatures.

While this article has referred particularly to wire-wound resistors, the same ratio of temperature to energy dissipated applies to the carbon type resistors that are popular because a high resistance of carbon can be manufactured at a lower cost than one of wire. Carbon or graphite variable resistors are excellent for radio purposes where the resistance must be of the order of 10,000 ohms or more and where only a small amount of energy is to be dissipated. They are at a decided disadvantage where used to dissipate more than five watts, however, because they must either be extremely large in size so as to operate at a low temperature, or their resistance will fluctuate so badly as to render them useless as a control. This is due to the high temperature coefficient of carbon.

Wire Versus Carbon

Metallic wire has a very low temperature coefficient as compared to carbon, causing its resistance to remain practically constant over a range of several hundred degrees. Carbon, on the other hand, will decrease in resistance rapidly with a rise in temperature. This change is so great that the commercial carbon variable resistance will decrease in resistance at least 20% with a rise of 200 degrees in temperature.

It is evident that practical resistors for the new power circuits must be wire wound, have a large area for heat dissipation, and be constructed of heat proof material throughout. Faulty resistors are not only a source of aggravation, but may actually break down the high priced condensers or rectifying tube by failing in service.

The Public Demand

The demand of the radio public is for convenient and dependable operation of the radio set from the light socket without sacrifice of radio quality or performance. The listening public is getting more and more critical of performance and will not tolerate distortion or hum. Quality not only must be retained but must be improved. Furthermore, the public does not want to be limited to lower or so-called dry cell tubes.

So far, economy of operation has not been a major factor in radio. The prospect has bought the best set he could afford or, in many cases, the set his friends talked about, whether or not he could afford it, and he has not counted the costs. This is passing. With more and more good sets to choose from, economy will be the deciding factor in many cases.

It is to the advantage of the customer to purchase standard socket power equipment that may be used to operate any good radio set. He is then free to choose his set on its merits alone, rather than to choose some special set because it is designed for light-socket operation. He is also free to change to another set if he desires without sacrificing his investment in the power equipment.

Present radio receivers with standard tubes, socket-powered with the present indirect system of A power and good rectifier-and-filter B power, set a very high standard of performance, convenience and economy. With this high standard established as a criterion, together with the great commercial advantages, it is not likely that the AC tubes or other new devices will quickly supplant the present tried-and-true system. The AC tube, no matter how good it may be in its ultimate development and application, can only closely approach or, at best, equal present standards of performance. It is not within the bounds of probability that it will attain such perfection without going through a long period of quantity production and application.

ONCE-A-NIGHT IS RULE

Los Angeles.

No matter how popular a musical selection may be, it is never rendered more than once during the course of an evening's broadcast at KFI. This is a strict rule, followed in the interest of better and more varied entertainment.

Get a Tone-Quality Set, Is Caldwell's Advice

By Orestes H. Caldwell

Federal Radio Commissioner

Our broadcasting stations, especially the leading ones, are transmitting music of irreproachable tonal excellence. The ordinary cheap or old-fashioned radio set does not begin to do justice to the music in the air. When such music is filtered through a cheap, poorly designed receiver, its phonograph-like sound offends. Yet, right nearby, a good receiver may be taking the very same ether impulses and converting them into gorgeous tone harmonies.

As a matter of fact, the average home to-night is receiving not the 1927 radio that is in the air to-night, but rather 1923 radio, or 1925 radio—depending on the date of the set being used. The public fails to realize this, and we radio people haven't yet impressed sufficiently upon them how much they are missing.

Progress Surprising

Surprising progress has been made in achieving tone quality in receivers during the past year or two, and the family which can afford to invest several hundred dollars in a modern radio receiver, and has not done so, is simply depriving itself of values that would cost many times more, measured in terms of concert tickets, phonograph records, or any other form of entertainment.

And after selling a customer a set, the radio industry should see that that customer is provided with all the accessories which will make radio a convenience and pleasure in the home.

Take the simple idea of letting the family enjoy radio in every room of the house, by operating a number of loud speakers from the central set.

Jacks Easily Installed

Telephone jacks can be installed in various rooms throughout the whole house for a few dollars, and each member of the household, including the children and the maid, can retire at leisure to their own rooms while the program goes on. A clock switch to turn the program off (or on) completes the convenience. After four years' satisfaction with such an arrangement, I have often wondered why more radio listeners looking for full radio enjoyment, do not equip themselves likewise.

Radio is already a great unifying and educational influence in American life. If the nation is to get the full advantage of radio's benefits, public interest demands that there should be a receiving set in practically every American home.

The Trade's Task

Electrical and radio manufacturers, jobbers and dealers can do much to stimulate the American public in its natural interest in radio, and right now, by well-calculated promotional effort, can tremendously accelerate the present annual buying by the public toward this end of radio in every home.

The Federal Radio Commission is already well along with its assigned task of bringing reception to the present 6,000,000 radio homes.

But on the radio industry and trade—on manufacturers, jobbers and dealers—rests the responsibility for the three-fold greater job of the next ten years, the job of selling radio to 16,000,000 homes yet unequipped—the job of putting radio in every American home.

Programs From Europe Sent by Copenhagen

An all-European musical concert, to which a dozen widely separated cities contributed, recently was broadcast by Copenhagen radio stations, according to advices from Vice Consul Ellis A. Johnson, Copenhagen, Denmark, just made public by the Department of Commerce.

The full text of the announcement is as follows:

"During a period of three hours, by means of relaying, the Danish radio public was able to hear London, Paris, Toulouse, Berne, Prague, Langenberg, Moscow, Daventry, Bruxelles, Oslo, Frankfort and Lyons. The concert was satisfactory in all respects and proved exceedingly popular with the Danish radio public."

Even Old Sets CanBeImproved

How long will one endure a bad set to save the price of a new receiver? Old automobiles wear out and when they no longer make the grade the owner buys a new one. But an old radio set does not wear out, but relatively grows a better caricaturist as time goes on. The worst part of it is, to the bystander at least, that the owner of this set has become accustomed to the caricature and does not know that the set lacks in fidelity.

The only way to convert this dweller in the radio stone age is to make him listen to an excellent modern receiver. He will soon give up his old set for a new one and recline in solid musical comfort, just as an owner of an old automobile will get a new machine after he has tasted the comfort of new springs and cushions, and real power.

Why Hesitate?

Many people realize that their receivers are old and out of date but they hesitate getting new equipment on the ground that the advance in radio is so rapid that new sets also will be out of date. That is a foolish reason for sticking to an old set. It is false assumption. Nothing revolutionary is in sight. You might as well not buy new clothes, when all your wardrobe is past the service state.

But if a set is out of date and needs refreshing as far as quality is concerned it is not necessary even to get a completely new outfit. Some of the parts in it are probably as good as similar parts are now. It will be no improvement in quality to change them.

Some Suggestions

Perhaps the old set can be renovated by the simple replacement of audio transformers, by the increase in the plate voltage, by the adjustment or introduction of grid bias batteries, by the use of a power tube in the last stage, by the introduction of a suitable volume control, and by the substitution of a better kind of loudspeaker. There are innumerable little changes that can be made at small cost in a set which will greatly improve the quality. Just what the required changes will be in any set will depend on the original construction of that set.

Stations Off Waves, Despite Warning

Washington.

Since the order of the Federal Radio Commission requiring stations to keep within one-half a kilocycle of their assigned frequency, reports have been received of a number of stations failing to live up to the requirement. One station, according to a report, was 28 kilocycles off the channel assigned it.

In each case the Radio Commission has warned the offender that a second offense will result in a cancellation of license.

PUSH-PULL RESISTANCE COUPLED AUDIO

This circuit, developed by J. E. Anderson, was published in the June 11 issue. Complete theoretical and practical information on this hookup. The circuit was operated direct from a DC house line without filter of any kind and produced no hum or motorboating. Send 15 cents for copy. Radio World, 145 W. 45th St., New York City.

Loop Outside Window Works In Steel Building

Is your set well-behaved in some locations and a bad actor in others? Two cases of misbehavior may be cited. First, he set may be very noisy and squeally in one place and normal in other locations. Second, the set may be sensitive and selective in most locations but be quite insensitive in others.

In the first case the noise is probably due to secondary interference This can be defined as receiving two stations of different frequency at the same time. This is an inherent possibility in a Super-Heterodyne. The reason it is seldom noticed is that the interfering station may be so far away that no squeal is heard. The only way to ameliorate this trouble is to tune out the interference in the radio frequency level.

The second kind of misbehavior is not a fault of the set but is due to the failure of the operator to realize what he is expecting from a set. One of the first requisites for reception is that there be something to receive. The most sensitive set ever constructed will not bring in a signal which never reaches the set. The receiver must have something to work on.

One place where not much can be expected is inside a steel railway coach. The set is completely surrounded by a ground electric and magnetic shield, except for a few tiny aperatures called windows. Practically nothing but the strongest signal gets inside the car. Something might be received if the loop is put out of the window, but not much. An insulated wire strung alongside the roof of the car on the outside and connected with the set metallically should bring in something.

In the interior of steel buildings the situation is just about the same. It is even worse when this building stands in the midst of numerous similar buildings, such as big apartment houses.

Music Card-Indexed For Speed and Safety

"Music on order" is a slogan which might easily be adopted by the Musical and Literary Research Department of the National Broadcasting Company. This department of the concern which owns and operates WEAF of New York, manages WJZ, New York, and WRC, Washington, and furnishes radio programs to three separate networks of broadcasting stations, has expanded its activities to the point where it is prepared to furnish, on extremely short notice, complete orchestrations and vocal arrangements of compositions suitable for any sort of a broadcast feature.

This service is only one phase of the department's work, however. Originally established to avoid legal difficulties in connection with literary and musical material used in broadcasting, the department has come to include a very complete music library, groups of musicians skilled in composition and in vocal and instrumental arrangements, research workers continually in search of new material, copyright experts and clerks, fifteen people in all. Incidentally, original scripts for broadcast programs and original music to accompany them are now being regularly prepared under the supervision of the department.

An Accurate Check-up

The question of copyrights in the music and literary fields is a highly involved one. Wide distribution of various rights connected with musical and literary compositions and in many cases the overlapping of such rights make the whole problem of fees for the use of this material on the air extremely technical. In many cases, reservations have been made by composers, authors and their representatives regarding the frequency with which their material may be used in broadcasting. Other compositions are limited to the arrangements which may be made from the originals. Sometimes, while original compositions are not copyright, certain arrangements and translations of them may be thus protected. The entire matter is a complicated one.

A very accurate check must be kept by people well versed in the intricacies of copyrights on all material which is used in preparing broadcast programs and in addition complete data on exactly what works are used, with dates. This routine requires the constant attention of a corps of workers, since the data must be filed and cross-indexed to provide ready reference.

Perhaps a more interesting phase of the department's activities concerns itself with research work and the manner in which the music library is maintained. Skilled music readers are always at work seeking out new and forgotten compositions, ranging from grand operas to the simplest songs. Many different sources are used, including indices of all kinds, various reference works, files of old newspapers and magazines and countless others.

Versatile Reference

The music library itself is cross-indexed in a number of ways, so that compositions appropriate to any theme can be located within a very short time. One index is maintained by composers, one by titles, one by first lines and several by subjects with which the music treats. The present accurate and helpful condition of these indices has entailed a great deal of continuous effort, but it has proved its worth many times.

When a broadcast program is being prepared dealing with any particular subject, country or period, musical compositions which have been written about that theme are almost instantly available.

Constant work is also necessary to make sure that the proper arrangements are at hand. For this reason, the department must forecast the requirements of the program department. In most cases, when a selection is added to the music library, both vocal and instrumental arrangements suitable for broadcasting are made, so that no time may be lost when a call comes in for the music.

Constant work is also necessary to make sure that one is correctly keeping track of literary works which may form the basis of broadcast presentations. The question of interlocking rights in the dramatic field is such that few standard plays have been used in broadcasting. On the other hand, there are few stage plays which are ideally suited to microphone production. These two conditions have resulted in original work and the adaptation of standard works as the material for most radio dramatic presentations.

Work Accomplished

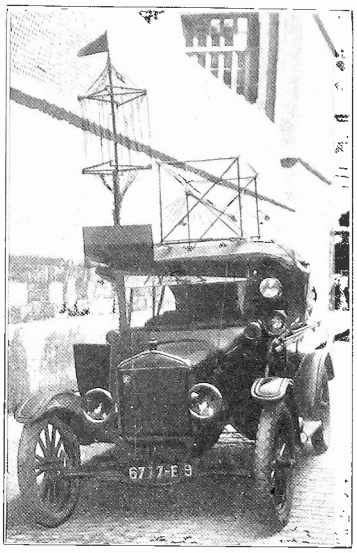
Most of this work for the National Broadcasting Company has been done in or under the supervision of the Musical and Literary Research Department. Standard fairy tales have been adapted for radio use, involving the preparation of original scripts and the composition of original music. This series was highly successful.

Other series of broadcasts which have been outstanding are two which are now being furnished on regular schedule to the National Broadcasting Company's Network stations, the "Great Moments in History" and the Biblical dramas. Much of the music which has been used to provide atmosphere for these program features has been composed especially for the broadcasts by members of the Musical and Literary Research Department.

Both of these series have attracted widespread attention, due without doubt to the fact that they have been prepared and broadcast by people thoroughly experienced in the various lines of effort involved and well versed in broadcasting as well.

The Musical and Literary Research Department is under the management of Nicholas deVore, a musician of wide experience and an expert on the subject of copyrights as well. As his assistants, Mr. deVore has a group of men thoroughly conversant with their particular lines of work, who can speak with authority on their individual subjects and who are recognized in their special fields.

ROOM FOR A PARROT



(Delano)

The cage aerial is coming into its own in France, and one progressive merchant has established a shop to furnish such aerials ready-made, to set up on any automobile. On Sunday he sets up a pair of sample antennas on his Ford, connects his receiving set to them, and gives free concerts in the Bois de Boulogne or the Grand Boulevards.

Mode of Life Changed By Stations, Says Gibbs

Radio is giong to change the mind of man, declares Sir Philip Gibbs, the British writer, who believes that radio is going to give man a mastery over life beyond all previous dreams.

"Here again the scientists have presented new opportunities to humanity which will surely alter their scheme of life, their habits of mind, their social customs and pleasures, almost as much as the alteration of material conditions which are now awaiting them," he writes in Hearst's International Cosmopolitan.

Threshold of a New Age

"Again we stand only on the threshold of a new age, and yet already we are conscious of newly revealed wonders which in the old days would have been thought miraculous and are indeed taking us into a region beyond mere matter, in the sanctuaries of eternal force."

"Radio has already opened up new vistas of knowledge, according to Sir Philip, and has given to people wider sympathies in life and put them into touch with other countries and minds.

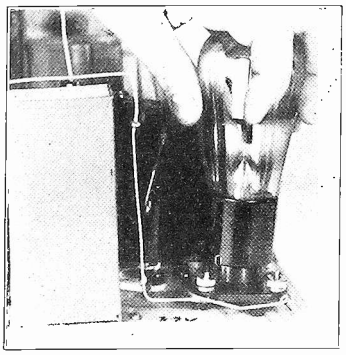
"Perhaps those are high words to use about an invention which is called wireless or radio," he adds, "so common now after a few years of use, that most of us have a wireless aerial over our chimney-pots.

Hopes for Less Vulgarity

"One must not underrate the effect even now on the human mind caused by this broadcasting habit which has taken hold of life. One may only hope that it will be less vulgarized by some of its transmitters.

"We are still at the beginning of this new knowledge. Marconi's beam system of wireless telephony is already past its experimental stage; it is now possible to focus the ordinary wireless rays upon a particular locality with directness.

A WORD OF CAUTION



(Hayden)

ALWAYS be sure that the rectifier tube is in the socket of the A or B eliminator before turning on the house line. If the line is turned on before the tube is inserted, the high voltage in the secondary windings of the transformer many blow out the condensers shunted across this circuit, since the accustomed load—the rectifier tube—is missing.

Many Are Stimulated By Classical Music

Paul Althouse, concert favorite and for ten years leading tenor with the Metropolitan Opera Company, broadcast in the Atwater Kent concert recently, over a network of twelve stations from WEAF. Afterward he said: "The public likes to be 'jazzed' with classical music. People seek an emotional sensation in every kind of music they hear, except perhaps the sublime classics, which appeal primarily to the mind. One finds a distinct reaction to specific emotional moods of a song. One set of individuals will denote by their manner a pleasure in words and music of a tranquil nature. Another set, having different emotional characteristics, find a keener enjoyment in the swiftly moving phrases, the more enlivening text of a spirited song.

"This is evident from the light of enjoyment in the eyes, the eager straightening of the figure, the clasping or unclasping of hands, or the relaxing of tensely held bodies. I have come to the conclusion that many people find their greatest stimulus in the music of the classical composers. The emotional response to this music is no less pronounced than that exerted by a jazzing effect."

Mr. Althouse is a native of Reading, Pa., where he received his academic and early musical training.

WJZ BROADCASTS BALL SCORES

A new service for the baseball fan has been inaugurated from WJZ. Every weekday afternoon at 5:30 and 6:50 o'clock, the latest baseball scores are given, as reported by the Associated Press. On Sunday afternoons there is only one reading of the baseball scores.

HOT STUFF

If at any time you may want some radio advice,
Don't go to any ol' guy who thinks he's best.
For if you do, you're merely gambling, as with dice.
Come to us, we'll fix you as we do the rest,
And rest assured we aim to trim 'em nice.—Advt. Anon.

Broadcasting Gives Way When SOS Is On Air

By J. T. W. Martin

Unexpected drama occasionally flashes into the lives of radio listeners living near both coasts of the United States when signals of distress from a ship at sea causes suspension of broadcasting.

Picture a listener who has tuned his receiver to 492 meters for one of the National Broadcasting Company's weekly radio features. The program is progressing smoothly when there is a sudden interruption. A strange voice remarks, This is station WEAF, New York. We are signing off because of an SOS." Silence follows. The station is standing by to insure that rescue arrangements may be carried on without interruption from broadcasting.

A hurried trip down the dials probably divulges that about half of the local stations signed off at the same time or shortly after WEAF One by one, the remaining broadcasters suspend their programs. Within four or five minutes the air is clear. Pleasure, in the form of broadcast entertainment, has given way before the pressure of business—and a grim business it is.

Imagination at Work

Broadcast listeners can receive a good many thrills from following the course of an SOS signal, even if they are unable to read code. It is simple to picture a disabled steamer wallowing through forty-foot waves while a heroic radio operator clings to a support in his reeling shack on deck and sends out details of the ship's condition and position to vessels and land stations which have replied to his signals of distress

At the station's transmitter, another angle of the drama is apparent. Every broadcasting station situated on or near the coast is required by law to maintain what is known as a "600-meter watch." Perhaps the term "600-meter listen" would be more nearly descriptive, since this "watch" consists of constant listening on the regular ship communication channel while the station is on the air. Keeping the "watch" is a tiresome job into which excitement enters only on those rare occasions when signals of distress are heard.

However, the watch is strictly maintained at most of the stations. In the case of WEAF, WJZ and WRC, stations managed by the National Broadcasting Company, operators who are assigned this duty are compelled to keep a log of calls heard, with the times at which the signals are received.

WEAF's transmitter is at present located at 463 West Street, New York City. The station's antenna is on the roof of this building, and the 600-meter watch is maintained in the room which houses the transmitting apparatus. The watch is begun fifteen minutes before the station goes on the air, to make sure that the ether is clear at that time, and it is kept until the transmitter is shut down.

Verifies Signal

When the "watchman" hears a signal of distress, he first verifies it by communicating by telephone with the District Communications Superintendent of the Navy Department, located in the Whitehall Building. This office is in turn in constant touch with the Navy Yard in Brooklyn, where the Navy Deparment radio station for the district, NAH, is located

On many occasions, before the watchman at WEAF's transmitter has had time to verify the call with the District Communications office, NAH, the "Watch Dog of the Ether," will have opened up with, "QST DE NAH QRT SOS"—meaning, in dot and dash parlance, "General call from NAH, clear the air because of an SOS," an order to all broadcasting stations in the district to shut down activities.

When this call is heard, or before that time in the case of an SOS which has been intercepted by the watchman and verified by the District Communications office, the operator at WEAF's transmitter immediately turns a switch which throws the station's program off the air. Then, speaking into a microphone in front of him, he announces that the station is signing off because of an SOS. The transmitter is shut down, but the tubes are kept burning, because within a short time the air may be clear again.

Not One Station Has Exclusive Wavelength

The new frequencies for the broadcasting stations have been announced and were listed in the June 11 issue. No station has a frequency or wavelength all to itself. Even WJZ and WEAF, while not sharing time with any station, find other stations on their very waves for simultaneous broadcasts.

For instance, WEAF, New York City, 610 kilocycles frequency, 491.5 meters wavelength, finds WAPI, Auburn, Ala., and WSKC, Bay City, Mich., on the same wave. WJZ, New York City, finds KFRC, San Francisco, on the 660 kc (454.3 m) channel with it.

The power and distance differences will make such situations unimportant, but the mere fact that two of the world's greatest stations did not get an exclusive channel shows how scarce the channels are in respect to the number of stations that must be accommodated.

WJZ, which had been authorized under the Hoover administration of radio, to use 50,000 watts, is reduced to 30,000. WBAP, Fort Worth, Tex., formerly 10,000, is now 1,500. Other power changes are: WBBM, Chicago, 10,000 to 1,000; WBZ, Springfield, Mass., 5,000 to 15,000 (increase); WEAF, 20,000 to 5,000; WEBH, 10,000 to 2,000; WGN, Chicago, 1,500 to 15,000 (increase); WGY, Schenectady, N. Y., 20,000 to 30,000 (increase); WWAE, Chicago, 10,000 to 500; KEX, Portland, Ore., 20,000 to 2,500; KOA, Denver, 20,000 to 5,000.

Straight Line Capacity Favored for Unit Tuning

By C. T. Burke

Engineering Department, General Radio Company

Variable air condensers are made with three general types of plate shapes, although there are many modifications of each type.

The first rotary variable condensers were made with "straight line capacity" plates. These plates were semi-circular in shape and are called straight line capacity because the curve of capacity plotted against dial divisions (angle of rotation) is a straight line.

The relation between capacity, wavelength, and frequency is such that this plate shape tends to result in crowding of stations at the lower end of the capacity range. That is, there are more transmitting channels for each dial division at the lower end of the scale than the upper. This objectionable feature has led to a widespread use of other plate shapes.

The straight line capacity plates have, however, one distinct advantage when used in single-control set-ups. Where it is desired to tune several circuits with one control, some form of capacity adjustment is nearly always necessary to compensate for different zero capacitances in the several circuits.

Feature of Unbalance

If semi-circular (straight line capacity) units are used, this adjustment can be made by slightly advancing one or more of the units. If this be done with condensers having other plate shapes, the capacities will become unbalanced as the control dial is advanced. This is due to the fact that if the plate shape is not "straight line capacity," the capacity variation per dial division increases as the condenser is turned toward maximum capacity, and the unit which was advanced gains capacity more rapidly than the others.

This feature has caused at least one important manufacturer of uni-control receivers to return to the semi-circular plate shape.

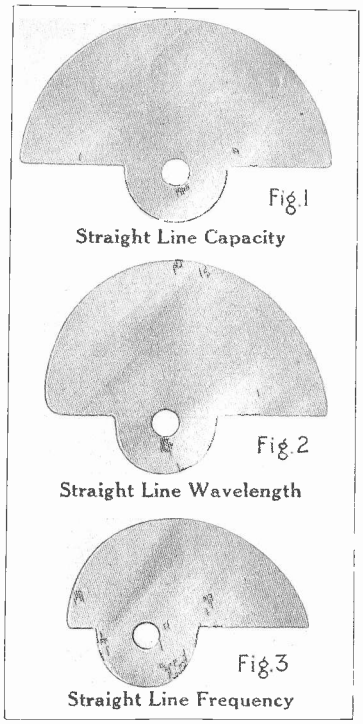
Results in Slow Motion

It may be noted that the effect of "straight line wavelength" and "straight line frequency" condensers is strictly a slow motion action, having a variable reduction, gradually lessening as the condenser is advanced. The same result can be and, in fact, has been accomplished by a slow motion dial so constructed as to vary automatically its reduction ratio to give the effect of a "straight line frequency" plate when used with a "straight line capacity" condenser.

The disadvantage of the semi-circular plate shape was first realized in connection with the construction of wavemeters. This was long before there were enough broadcast stations for the problem of station separation to be serious.

As the relation between capacity and wavelength is not a direct proportion, a dial calibrated in wavelengths will not have equal divisions over its scale if a semi-circular plate shape is used. This not only makes the instrument more difficult to read, particularly as to the estimation of readings which fall between divisions, but involves difficulty in calibration, as the space between two points ten meters apart for instance, could not be divided into ten equal one-meter divisions.

A plate shape which would give equal divisions for equal wavelengths, i.e., "straight line wavelengths," was highly desirable, and a condenser with such a plate shape was first used commercially in the General Radio 124 wavemeter, introduced in 1916.



THE SHAPE of the plates determines the rate of capacity change. In SLC condensers the shape is semi-circular. In SLW the plates are trimmed slightly at one side. This retards the higher frequency tuning. The SLF condenser effectuates this retardation most emphatically.

When the multiplication of broadcast stations began, the straight line wavelength plate was introduced for condensers used in receivers, and became very popular, due to the better separation of stations resulting from its use.

Broadcast stations continued to multiply, however, until all channels in the wavelength range allotted to broadcasting were filled. The transmission channels were assigned on the basis of uniform frequency rather than uniform wavelength separation, and, as they all became occupied, the difficulty of crowding a great many more than half the stations into the lower half of the dial again rose. The obvious step was, of course, the straight line frequency plate shaped to give equal frequency divisions over the dial. This plate shape not only improves the distribution of stations over the dials, but is the only type of condenser which can be used in a single control Super-Heterodyne, where there is a constant difference of frequency between the two circuits being tuned.

Obstacles to Straight Frequency

Certain objections, however, have prevented this type of condenser from achieving the wide popularity which was promised for it. In order to obtain a straight line frequency variation an extremely low minimum capacity is required. The stray or zero capacity of most receivers is so large as to defeat this requirement and to prevent the realization of a true straight line frequency variation.

Another objection was the large physical dimensions of most of the straight line frequency condensers, due to the fact that this plate shape is very inefficient in its use of space. Then, too, there is the fact that in the conventional type of condenser, there is a rotation of but 180 degrees in which all stations must be included. Spreading out stations on the lower portion of the dial necessarily results in crowding them closer together on the upper.

It so happened that the policy of the government in assigning channels was to give the high-powered stations channels in the upper portion of the waveband, and the crowding together of these stations, generally having the better programs, proved disadvantageous.

DX by Short Waves New Lure for Fans

An increasing number of stations is making use of the short waves in broadcasting. They use the regular broadcast wave for reaching the public in the immediate vicinity of the station and the short wave for reaching those located over 1,000 miles away. Usually the same program is projected on both waves and the two transmitters operate at the same time.

The latest to join the short wave broadcasters is WRNY of New York, which has just been licensed by the Federal Radio Commission to operate a 500-watt short wave transmitter in conjunction with its regular transmitter.

The steady increase in the number of short-wave broadcasters will soon result in intense popular interest in this form of communication, which may be comparable to the enthusiasm manifested during the early years of broadcasting. Successful long distance reception is the lure which will convert many radio fans to the short waves.

Grid Current Shows Extent of the Bias

Ordinarily no grid current should flow in an amplifier circuit. Hence if one finds grid current flowing, indicated by a reading on the milliammeter, the bias is too small, or there is no bias, or the bias is erroneously positive. Amplifier tubes never take anything except a negative grid bias.

On the other hand, in a detector circuit, particularly where the grid return is made to A plus, grid current will flow. The method of detection with grid leak and condenser actually depends on the flow of grid current. Hence detector tubes might give a reading, except that the current flow may be so small as to make little impression on the grid meter.

WBZ CHIMES IN

WBZ is telling the radio audience the correct time daily as measured by the Hamilton watch. This service is furnished by True Brothers, jewelers. All studio timepieces are corrected hourly to conform with the master clock.

WHEN TO TAKE OFF CAPS

When a trickle charger is used it is not necessary to remove the vent caps of the storage battery. But if the charging rate is 2 amperes or more the caps should be removed during the charging process.

When using the trickle, be sure though, that the small ventilation holes in the vent caps are always kept clear. This may be done with a toothpick.

AC Filament Wiring Needs Close Attention

B. F. Miessner, inventor of an AC tube, described its application to receivers in a lecture before the Radio Club of America. Mr. Miessner followed his talk with a demonstration of a commercial receiver made according to his design and it was the concensus that this demonstration was excellent.

The general performance of the receiver demonstrated that there were advantages in the use of this new type of tube. It was brought out in the discussion that followed that very little difficulty would be experienced in building receivers designed for use with this tube or in converting existing receivers for use with it. Mr. Miessner pointed out that already three independent tube manufacturers were in production on these tubes and he expressed his appreciation for the wholehearted co-operation which these manufacturers have given him in the tube's development.

In discussing the application of the tube, Ralph A. Clark, Vice-President of the Armstrong Company, said that his organization had rebuilt at least a half dozen receivers of standard design, employing various types of circuits, and had experienced little difficulty in their work.

Answers Questions

Questions were asked of Mr. Miessner regarding the characteristics of the audio amplifier circuit used in the receiver which he demonstrated. These questions related to the audio frequency range of the amplifier with particular reference to amplification at the lower frequencies. It is possible to eliminate a great deal of the hum from an alternating current receiver where the loudspeaker and the audio frequency amplifier apparatus are of such a nature as to cut off at the lower range.

Eliminating the hum by this process is a poor system, it was pointed out by Arthur H. Lynch, recognized as a leader in the resistance coupled design field. Several receivers applying these tubes had been used with resistance coupling and that the amount of hum from the loudspeaker was practically nil.

Mr. Miessner said that the filament circuits of the tubes, carrying the heavy current they do, would require a certain amount of precaution in order to prevent a direct pickup by induction from the filament wiring to the windings of the audio frequency transformers.

Lynch's No-Hum Plan

It was further pointed out by the distinguished Mr. Lynch that this difficulty could be eliminated by the use of resistance coupling, since there was no possibility of a pick-up of this nature, because with resistance coupling no magnetic apparatus is employed.

A further development regarding hum was brought out in connection with the power apparatus and a number of those who had built these receivers indicated that the power equipment could be installed directly in the receiver chassis if resistance coupling was used.

Announcement was made of the fact that the Mayolian Corporation has ready for the market a special driver unit which includes all the A and B eliminating apparatus for the application of these tubes to either new or existing receivers.

Mr. Meissner pointed out that the Garod Type E. M. receiver, which was used in his demonstration, had its filaments wired in a special manner.

The Filament Wiring

A pair of heavy leads is run from the driver unit to terminals inside the receiver and individual pairs of wires run from these terminals to the filament terminals of each tube socket. This is done to prevent inductive pick-up as well as to reduce the resistance in the filament circuit.

In existing types of receivers, which may be remodeled so as to employ these new tubes, it was suggested by R. R. Mayo that instead of following the Garod system that the heavy wires from the driver unit be attached to a central portion of the filament circuit, so that the filament current could pass through the filament circuit in each direction, thus permitting the use of the ordinary wiring without in any way altering the receiver. The resistance drop, when this method is employed, has been found to be sufficiently low to cause no trouble.

Mr. Miessner's talk was accompanied by a series of technical steriopticon slides.

Plane's Aerial Is Small Kite

Washington.

Successful experiments with a smaller and more efficient radio kite than that now in use have been conducted by the Bureau of Aeronautics of the Department of the Navy, and Navy engineers believe that this kite, which is used for hoisting radio antennas from a plane which has been forced down, will supplant the present one, the Department announced.

The tests have been conducted by Samuel F. Perkins, of Dorchester, Mass., at the Naval Air Station at Anacostia, D. C., in co-operation with naval officers. A new test kite, which measures four feet, is being constructed by Mr. Perkins, the statement said, and "it is hoped will make trials even more successful."

Department's Statement

The full text of the statement follows:

"The Bureau of Aeronautics, Navy Department, has been working on the development of smaller and more efficient radio kites than those now in use. The kite is used for hoisting radio antennas from a plane which has made an emergency landing and the antenna wire takes the place of the kite string.

"Samuel F. Perkins, of Dorchester, Mass., has successfully concluded radio and signal kite tests at the Naval Air Station at Anacostia, D. C. Lieut. A. I. Price and Ensign S. V. Edwards, U. S. N., flew the Perkins Man Carrying type of kites with ease, showing they could be flown from a plane forced down at sea.

Making a Special One

"Mr. Perkins is now constructing a four-foot special kite of powerful design that it is hoped will make trials even more successful, as the five-foot Perkins Radio Kite had more than enough lift to carry the 500 feet of aerial wire.

"If the four-foot kite is successful, as all figures prove that it will be, it will be by far the smallest kite to be used in any work of this nature. All officers and others witnessing the tests on the kites commented on the fact that the kites flew like birds and seemed determined to get up and stay up, and on the speed with which they could be handled."

The results are also being eagerly watched by fans who would like to use the kite with their portable set.

WRNY Transmits Also On its Tenth Harmonic

WRNY, New York, has been licensed by the Federal Radio Commission to operate a new 500-watt short-wave transmitter in conjunction with its regular broadcast transmitter. The short-wave set will operate on 30.91 meters (9,700 kilocycles). The new transmitter will be operated jointly with WRNY's regular transmitter, which works on 309.1 meters. The short wave set will be on the air at all times when WRNY's regular transmitter is broadcasting.

It will be noted that the short wavelength is a harmonic of the higher wavelength, necessary as the two transmitters are housed in the same building. The low wavelength was selected by WRNY's engineers because the station wanted to reach distant points rather than the nearby ones reached perfectly with 309.1 meters. It is estimated that an average radius of between 2,000 and 3,000 miles will be reached regularly with the new transmitter, with greater distance occasionally.

John L. Reinartz has been retained as consulting engineer, as he is considered one of the foremost experts on short-wave work in this country. The transmitter itself has been assembled by WRNY's engineers under the supervision of James V. Maresca, chief engineer of the station. The short-wave set will go into operation during the latter part of this month, and listeners-in are asked to send in reports as to their reception of WRNY's programs. The call letters of the short-wave set are 2XAL. These call letters are used only when the short-wave transmitter is used for code work. With a power of only 50 watts and using code, 2XAL, has been frequently in touch with the West coast, as well as with steamers 2,000 miles out of New York.

Expert Reports on Condition of Roads

Pittsburgh.

The road reports and tourist trips broadcast daily from KDKA are prepared and delivered by a veteran tourist. He is James A. Hemstreet, manager of the touring department of the Automobile Club of Pittsburgh, A. A. A.

Mr. Hemstreet was a highway pioneer in the early days of the automobile. He has crossed the continent eight times over as many different routes, and has served as manager of the Washington and New York touring bureaus of the American Automobile Association. He published the Automobile Green Book for many years.

The reports, which are sponsored by the Gulf Refining Company, are given at 6:20 Eastern Standard Time on Monday, Wednesday, Thursday, Friday and Saturday, and at 4:50 on Tuesday.

The plan of the reports is: Monday, New England and the east; Tuesday, transcontinental routes; Wednesday, Ohio, Michigan and northwest resort country; Thursday, east and south; Friday, Pennsylvania road conditions and special week-end trips; Saturday, main touring routes.

SIXTH YEAR

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The First and Only National Radio Weekly

Member, Radio Publishers Association

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Mysterious Sea Noises Mar Radio Navigation

Washington.

Mysterious noises of the sea are seriously interfering with the under water radio acoustic work of the Coast and Geodetic Survey on the Atlantic Coast, the Chief of the Survey's Division of Hydrography and Topography, Commander W. E. Parker, announced. The survey has been developing within the last four years methods of accurately locating position of ships when beyond the range of visibility of shore objects, and while the work on the Pacific has progressed satisfactorily it has been handicapped on the Atlantic by sounds so far baffling the Government scientists, Commander Parker said.

"We are listening perhaps to the clicks of the oyster instead of the sound of the bomb signal in our radio acoustic work," said Commander Parker. "For the last four years we have been developing methods to accurately locate our ships when beyond the range of visibility of shore objects.

Where Radio Steps In

"In hydrographic surveys, the location of ships by longitude and latitude by the stars or by the sun observations is not sufficiently accurate. Ordinarily a ship is located by measuring with a sextant, with two angles between three objects on shore, these objects having been accurately determined in their position by geodetic surveying. When a ship is beyond the range of visibility of shore objects, which is a matter of approximately 12 miles or so on the Atlantic Coast, there has been no means of accurately determining its location until our radio acoustic method was adopted.

"The radio acoustic method was adopted by the Coast Geodetic Survey, with the cooperation of the Bureau of Standards and the Coast Artillery Corps of the Army.

Bomb is Exploded

"First we plant hydraphones along the coast in depths of about eight or nine fathoms or approximately 50 feet. These hydraphones are connected with the shore stations by cable. The shore stations have radio sounding equipment. When the master of the Coast Survey ship desires to get his exact position, he explodes a bomb under the water. The bomb contains approximately a pound of TNT. The instant of explosion is recorded automatically on the Survey ship by means of a hydraphone installed on the ship, which is connected electrically with an automatic time recording device. The sound travels to the shore hydraphones, which pick it up. It causes a fluctuation in the current that travels along the cable. That actuates the radic sounding mechanism, causing a radio signal to be sent out in succession from each of the stations. The radio signal is picked up by the ship's receiving equipment and recorded on the automatic time device.

"From this timing device we can determine within one one-hundredths of a second the time required for the sound recorded to reach each one of the recording stations.

Measures the Distance

"The intervals, multiplied by the known velocity of sound in sea-water, gives us the distance from the ship to each of these hydraphone stations. It is then a simple matter to strike arcs from each of these hydraphone stations of radiae equal to the determined distance from each. The intersection of these, of course, is the position of the ship.

"On the Pacific Coast, the Coast Survey has been using this method successfully for about two years and we have been able to locate the position of a Coast Survey ship more than 20 miles from shore. But on the Atlantic Coast it has not worked so well, because of the noises in the sea which prevent the reception of the bomb sound. What produces these is, of course, conjectural. We have been investigating this for the past six months.

"We had considerable trouble last year on the Pacific Coast on account of noises similar to those now interfering on the Atlantic Coast.

Failed Again

"These hydrahones operated on the Pacific Coast were lifted to the surface and examined several times and found to be in perfect condition. When replaced in the sea, they operated satisfactorily for a short time and then they began failing to record the bombs because of these noises. One of the hydraphones was moved out about 1,000 fathoms, where it operated satisfactorily, but the new position was not a good one from a surveying point of view. The captain of the Survey ship operating it was at his wit's end until he heard a fisherman remark that the former position, where the trouble was encountered,was the best crabbing ground in that section of the coast. The hydraphone was then hoisted and painted and we never had any more trouble.

"The ships that are equipped with the radio acoustic ranging device are the steamer Lydonia, now operating off the North Carolina coast, south of Cape Lookout, and, on the Pacific Coast, the steamer Pioneer, now working south of the Columbia River off Tillamook Bay, and the steamer Guide, which is operating north of the Columbia River."

Others will be so equipped.

Freshman Licensed By Radio Corporation

The Chas. Freshman Company, Inc., has signed up with the Radio Corporation of America and parent companies for the right to use all the radio patents that the R. C. A. and associates own and control pertaining to the particular radio circuits manufactured by Freshman.

The Freshman organization is said to do the largest yearly radio business of any of the concerns licensed to use the patents of the R. C. A. and its associated companies.

"As a result of the completion of these arrangements," declared Charles Freshman, president, "we showed in Chicago an electric set entirely without batteries, operating directly from the house current."

DISKAY, TENOR, NATURALIZED

Los Angeles.

Joseph Diskay, tenor, who is an exclusive artist over KNX, recently received his citizenship papers and as a result, dropped the title of "famous Hungarian tenor," under which he went for years.

FOIL FOR CONDENSERS

The tin foil used in the construction of high-grade paper condensers usually consists of 85% pure tin and 15% lead.

Radio Effect of Aurora Being Studied in Canada

The effect that the aurora borealis has upon radio communication is being studied by the National Research Council of Canada. As Canada is closer to the north magnetic pole than any other country and therefore more favorably situated for the study, the International Research Council made representations to the Canadian body as to the advisability of making such study. A committee of physics and engineering of the Council met in Ottawa and recommended that the research work be undertaken. That the aurora has a remarkable effect on wire communication is well known. During severe magnetic storms the wire systems of both this country and Canada are often put out of order, rendering communication impossible for hours at a time.

That the aurora has similar effect on radio communication is apparent. A further object of observing the aurora is that it furnishes the only means available of gaining information of the conditions of the atmosphere at distances 50 to 250 miles up.

Scientific Baron Seeks Only Exchange of Ideas

By Herman Bernard

Having arrived in the United States from Germany, Manfred, Baron von Ardenne, only twenty years old, but a radio scientist extraordinary, was met at a New York pier by a reporter for a newspaper syndicate. The reporter could not believe his eyes. He had been told that the Baron would arrive, and had looked up a European "Who's Who" to discover that Baron von Ardenne was a Marshal in the German army during the campaign of 1870 and 1871. The reporter had French blood in his veins, and glossed over the identity of the nation against which Baron von Ardenne had done his campaigning.

But instead of seeing an old man with gray whiskers the reporter met a very handsome youth.

"Are you Baron von Ardenne?" asked the amazed reporter.

"I am," replied the visitor, most modestly.

"You're not a marshal, are you?" asked the reporter.

The inquirer was told that the visitor's grandfather had possessed that rank.

A Tube Inventor

The young Baron, accompanied by Edward R. Dietze, of Hamburg, his associate in radio research, went to the Hotel Commodore, under the tutelage of Eric Palmer. David Loewe, of the Loewe radio firm of Germany, who was here on a visit more than a year ago, had cabled Mr. Palmer a request to look after the titled traveler. The Baron and David Loewe's brother, Siegmund, were co-inventors of the Loewe triplex tube, which contains a detector and two resistance coupled audio stages, all complete and wired right inside one evacuated glass envelope. There is also a resistance coupled radio frequency version of the tube. The Loewe concern manufactures these valves.

A few days after the Baron and Herr Dietze had become reconciled to the Movietone, the Vitaphone and the Phonofilm, which they heard in Broadway theatres, these two amiable visitors invited some radio editors to be their luncheon guests at the Commodore. At this social session the editors did some gasping along more pronounced lines than the reporter who had figured out the Baron to be a monagenarian. For the luncheon discussion developed the fact that the Baron's visit here has no connection whatever with money, no business squint of any kind, but is solely scientific and smothered in brotherly love. He wants to make arrangements whereby publication can be obtained in the American radio press, including "Proceedings" of the Institute of Radio Engineers, of his writings, and perhaps in exchange for which American research papers may similarly be reprinted in Germany, simply for the mutual advance of the science.

Says R. C. A. Bought Patent

The eleemosynary nature of the mission virtually took the guests' appetite away, and they all had only chicken salad, strawberry shortcake and coffee. Mr. Palmer signed the check, but not with his name.

The table talk developed the interesting assertion that the Radio Corporation of America had purchased the United States patent rights to the Loewe three-in-one tube, but Mr. Dietze explained that there would be no object in making this tube for consumption here, as it was too difficult to make, and American tube works might not be equal to the task. Besides, if made abroad, a 40 per cent. import duty would have to be paid here. He added, however, that the tube is widely known and used in every other country in the world.

David Loewe had come over here principally to sell the patent to the R. C. A. or one of its allied concerns, but had departed without revealing whether his visit had been successful.

The Baron, however, need not concern himself with business matters here, for he has an income that in Germany rates quite high, and it all comes from his laboratory, where he had a staff of engineers working under him. The ideas successfully applied are converted into patents and the patents are converted into money. As German marks now are worth something, he gets along very well.

Some of His Work

Pamphlets, documents, photographs and miscellaneous papers were exhibited by Mr. Dietze as showing what the Baron had done. His forte is audio frequency amplification, although he has done something along radio frequency lines, also.

He has an Ultradyne, consisting of the usual modulator, the oscillator without DC voltage on the plate, a tuned input (filter) into the intermediate channel, three resistance-coupled intermediate frequency stages, detector fed by another filter, and three resistance-coupled audio steps. It is an excellent nine-tube set, the Baron said, and pointed out that the intermediate channel did not self-oscillate, due principally to the special type of detector hookup. This consisted of a statically open grid return, with the low potential of the grid coil connected to a .002 mfd. fixed condenser, the other side of which went to the negative filament. Rectification is obtained by plate overload.

Another work of the Baron, whom Mr. Palmer liked to call the John Hays Hammond, Jr., of Germany, is a vacuum tube meter, which measures microamperes with a milliammeter. Its object is economy, since microammeters are expensive.

Sensitivity Greatly Increased

The vacuum tube, used as such a microammeter, is 10,000 times more sensitive than the milliammeter alone. The device is worked on the basis of plate current change under different test conditions. The grid current in microamperes is determined by reading the plate milliammeter and consulting the characteristic curve of the tube microammeter. The system is familiar in this country, but the Baron puts a new angle to its utilization.

It was hard to get any English out of the Baron, for although he can understand it quite well, he talks it only fairly, whereas Herr Dietze speaks like a lad just out of Harvard. It developed that Herr Dietze was born in Scotland, although it must be added, out of respect to Harvard, he has no trace of Scotch accent. He did the interpreting. He is only eighteen.

The Baron was somewhat miffed when he saw last week's issue of RADIO WORLD, announcing his arrival under the heading "Europe's Science Adonis to 'Rescue' Sopranos."

Not "Praise Indeed"

Mr. Palmer had written the article—but not the headline—and in the text had referred to the Baron as one of the handsomest scientists in Europe. The Baron explained that in Germany all science is taken very seriously, and while he did not object to the Adonis appellation per se, he was sure that in Germany such a moniker scarcely would be considered approbation of Sir Hubert Stanley proportions.

The article dealt in part with the resistance coupled tube which produced such quality that even sopranos sounded like sopranos when reproduced on the radio.

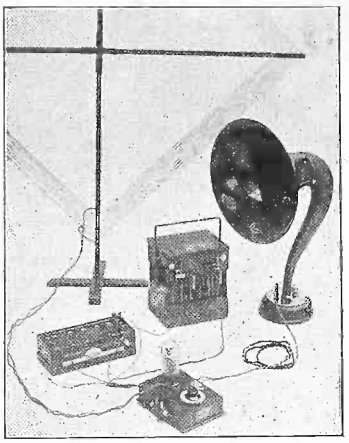
Discussing reproduction in Germany, he admitted that loudspeakers there were not of the best quality, and that our transmission is slightly better than theirs. Remote control work is atrociously done over there, due to the land wires suppressing desirable frequencies and introducing extraneous noises. But Germany is fast improving in radio, is about to take on high quality speakers, particularly the cone type, and simultaneously give popular esteem to tone quality sets. At present distortion in sets is quite considerable, he said, hence, as in America, poor speakers work better on bad sets than good ones, since the finest speakers are faithful reproducers of the distortion, too. He deplored lack of power tubes in Germany and said they would be used soon, as well as battery eliminators, including AC tubes.

An Early Start

The Baron started in radio when he was fourteen, by sending and receiving code dealing with school lessons, his fellow "hams" being classmates. By the time he was sixteen he had written a textbook on radio that was used in the schools. A little later he had ten receivers in his laboratory, and the German Post Office Department seized them, for reasons he doesn't quite understand yet, although he doesn't expect his American visit to help clear up this mystery. Some months later he found one of the sets exhibited at a German radio show in Berlin, his home town, as a product of the Police Department. The police breasts were seen to swell with vicarious pride, but the Baron was tactfully silent.

The Baron is of a retiring nature—not necessarily that he goes to bed early—is tall and slim, and all wrapped up in his work, to which he devotes unstinting time. He is so busy that he has had no time to devote to women, although it was noted that during leisure moments aboard the liner on the ten days coming over, he managed to devote nearly 100 per cent. of his wakeful hours to the opposite sex.

GERMANY'S FAVORITES



THIS represents popular equipment in Germany today, according to Baron von Ardenne, on a visit here. The set is a detector and two-stage resistance coupled amplifier, built inside the triplex tube, except for coils, which are plugged in. The B battery (90 volts) is at left, the A battery at right. A loop may be used instead of plug-in coils. The speaker is a horn of the type popular in the United States two years ago.

Radio University

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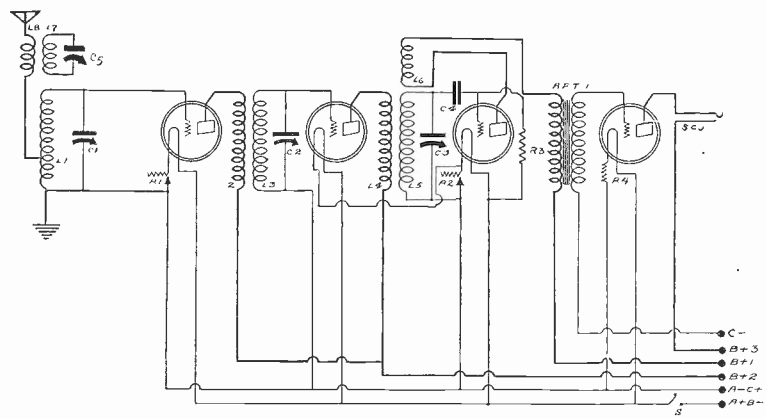

FIG. 546
The circuit requested by Harry L. Conder.

PLEASE GIVE me the circuit diagram of a four-tube receiver, employing a regenerative detector, with a three circuit tuner, two tuned stages of radio frequency amplification, and a stage of transformer coupled audio frequency amplification. I have three .0005 mfd. variable condensers which are hooked up to floor or set, a loud ringing sound is all these condensers are common, similar to the regular gang type. I have another separate .0005 mfd. variable condenser. I think it will be necessary to use a trap in the set, since I live about five blocks from a powerful broadcasting station. Everybody around here has a great deal of trouble in tuning out this station, and only when traps are installed are they successful. Included with the above parts are, a ten ohm rheostat, a fifteen ohm rheostat, a 1A Amperite, a .0001 mfd. fixed condenser, a 6 megohm grid leak, six binding posts and a single circuit jack. The data on the coils, and any special wiring hints would be appreciated.—HARRY L. CONDER, Bound Brook, N. J.

The receiver diagrammed in Fig. 546 should give you very good results in your location. C1, C2 and C3 are the drum-controlled condensers. C5 is the individual .0005 mfd. condenser, inserted in the trap circuit. It is shunted across a forty-five turn coil L7, which is wound on a three inch diameter tubing, using No. 22 double covered wire. In series with the antenna at this point, and wound on the same tubing as L7, is the primary winding L8, which consists of ten turns. Separate both windings, about one-quarter inch. L1, the antenna coil, consists of fifty turns, tapped at the tenth turn from the beginning. It is wound on a three inch diameter tubing. L2 and L4 each consist of ten turns, while L3 and L5 each consist of forty-five turns. L2 and L3, and L4 and L5 are each wound on a three inch diameter tubing with No. 22 double cotton covered wire. Allow one-quarter inch space between the windings. L6, the tickler, consists of thirty-five turns of No. 26 single silk covered wire, wound on a one and three-quarters inch diameter tubing. This is placed inside of the tubing carrying L4 and L5, but near the L5 winding. R1 is the fifteen ohm rheostat. R2 is the ten ohm rheostat. R3 is the 6 megohm grid leak. C4 is the .00025 mfd. fixed condenser. R4 is the 1A Amperite. AFT1 is a three to one ratio audio frequency transformer. SCJ is the single circuit. S is a filament switch, used to cut off the A supply. B plus 1 equals forty-five volts. B plus 2 equals sixty-seven and one-half volts. B plus 3 equals ninety volts. Use a four and one-half volt C battery for the audio tube. As to the wiring of L1, which is a bit tricky. The beginning of the winding is brought to the ground post. The tap is brought to the beginning of the primary winding L8. The end of L1 is brought to the G post and to the stationary plate post of C1. Use —01A tubes throughout for best results.

* * *

I HAVE a four-tube model Diamond of the Air, which I constructed some months ago, using standard parts. I am not able to get stations which operate above 400 meters. I also find that the detector tube does not oscillate very well I use a standard length antenna. Please tell me what to do.—EDWARD MARTINS, Pawtucket, R. I.

Add ten turns to the secondaries of both the antenna and the three-circuit coil, to get the higher waves. For more oscillatory action, add five turns to the tickler coil, winding them over the present wire, if necessary. Try placing a .00025 mfd. fixed condenser from detector plate to A minus.

* * *

RECENTLY I was presented with a 1925 model six-tube receiver, consisting of three stages of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio frequency amplification. The set works fine, except that when the panel, which is metal, is accidentally hit, or when some heavy object falls upon the floor or set, a loud ringing sound is heard. This, of course, is very annoying and distorts the signals considerably. Is there anything that could be done to avoid this?—GORDON F. MATHERS, Farmingdale, L. I., N. Y.

Use flexible wire for leads to two RF and detector grids. Try switching the AF and RF tubes around. Then try switching the detector tube around with each one of the AF and RF tubes. A microphonic tube in the detector socket usually causes most of the trouble.

* * *

WOULD I get better results if I took the transformer employed in a straight stage of audio frequency amplification, in a three-tube regenerative set and used it for reflexing? Two tubes would then be doing the work of three.—JOHN W. GRATTON, Peekskill, N. Y.

No. But it would be a practical idea for a portable, for instance.

MANY MONTHS ago there appeared in RADIO WORLD a circuit of a four-tube regenerative receiver, consisting of a stage of tuned radio frequency amplification, a regenerative detector with variable condenser feedback (Hartley), and two stages of transformer coupled audio frequency amplification. I have the circuit and the layout, both of which I copied out of this issue, which I have mislaid. Now, according to the layout, the coils are mounted horizontally in the same line, but about sixteen inches apart, or at the opposite ends of the panel. Will I get better results if I place one coil at right angles to the other?

(2)—The transformers are also mounted in the same line, and close to each other. How about mounting them at right angles.

(3)—I wish to use a 171 power tube in the last audio stage. The filaments as they are now wired are controlled by a ½ ampere ballast resistor. I suppose I will have to insert separate ballasts in each circuit, e. g., ¼ in the first and half in the last. Is this correct?

(4)—Do I have to use a higher C bias than for the —01A?—MORRIS SHUTZENGER, Boylestown, Ind.

(1)—No. Since they are such a great distance away from each other, the field between them is extremely small.

(2)—Their present mounting is all right. Ground the cores.

(3)—Yes. You can use these separate ballasts, or a three-quarter ballast for both of them.

(4)—Yes. The 171 requires a much greater C voltage than the —01A used in the preceding stage, e. g., forty and one-half, with one hundred-eighty on the plate.

* * *

CAN ANY type radio frequency and three-circuit tuner coil, with secondaries matched to variable condensers, be used in the receiver shown on page 11 of the March 19 issue of RADIO WORLD?

(2)—What do the words "optional B plus" refer to?—EDGAR WILLIAMS, Emory, Tex.

(1)—Yes.

(2)—You can either use a common B voltage for both the RF and detector or separate ones for these tubes. The optional B plus means that a separate B voltage is being applied to the plate of the RF tube, as well as the detector tube. Of course, the connection between the tickler and the end of the plate winding is broken.

* * *

LAST MONTH a friend presented me with a one-tube regenerative set. The set squeals too much. The standard three-circuit tuner is used. A rheostat is used for filament lighting control of a —01A tube. I tried reducing the B voltage, upon the suggestion of a friend of mine, but this did not help. If I turn the rheostat down so that it does stop whistling, the signals disappear. The larger tubing of the three-circuit tuner measures three inches in diameter and four inches in height. In the smaller winding there are twelve turns, while in the larger winding there are forty-seven turns. These are both close to each other. The smaller tubing, which is inside of the larger tubing near the larger winding, is one and one-half inches in diameter and one and one-half inches long. On it are wound thirty-nine turns. The wire on the larger tubing is No. 24 double cotton covered, while that on the smaller tubing is No. 26 single silk covered. What would you suggest doing? —R. THOMAS WYLE, Plainville, N. Y.

Take six turns off the winding on the smaller tubing. This is what is, of course, known as the tickler winding. Also, separate the smaller and larger windings on the larger tubing, about one quarter inch.

* * *

I WISH to build the three-tube regenerative set, shown on page 4 of the Dec.

18 issue of RADIO WORLD, but with some changes.

(1)—A rheostat is used in the filament circuit of the first audio tube and a ballast in the second audio stage. Could a single ballast of the one-half ampere style replace both?

(2)—I am going to place the set in an upright phonograph. This will necessitate the use of a small baseboard for mounting. Is it all right to place the variable condensers three inches apart?

(3)—The coil, sockets, grid leak and condenser will all be mounted above the subase. The audio transformer will be mounted underneath, upside down. Is this O. K.?—CLARENCE J. HYATT, Los Angeles, Calif.

(1, 2 and 3)—Yes. Be sure that you keep the plate and grid wires away from the panel. Place the sockets with the filament posts facing the panel, and the G and P posts in the rear.

* * *

SIX OR SEVEN months ago, I constructed a six-tube receiver, consisting of three tuned radio stages, a crystal detector, a stage of transformer coupled and two stages of resistance coupled audio frequency amplification. The receiver works wonderful. I have quite a bit of trouble with the crystal, however, which burns out. I have tried many types but to no avail. I would, therefore, like to substitute a tube as a detector. The first two stages of RF are tuned by a gang condenser. The next stage is tuned by a single condenser. The crystal circuit is, of course, also tuned by a single condenser. The filaments of the first two RF tubes are controlled by a rheostat. The next tube filament is controlled by a rheostat. Please give a diagram, illustrating how to insert the tube as a detector, using a fifteen ohm rheostat to control the filament.—WARREN MERCHOF, Acton, Mont.

Fig. 547 shows how to insert the tube as a detector. The crystal detector is, of course, taken out of the circuit. That is, the stationary plate post connection from the coil in the detector circuit, instead of running to the crystal, runs right through until one terminal of the 00025 mfd. fixed condenser C and the 3 megohm grid leak R is reached. The other terminal of this combination is brought to the G post on the new detector tube socket. The rotary plate post of the condenser in this circuit, instead of being brought to the B post of the transformer, is brought to the plus A post on the socket. The resistance wire contact of the new rheostat is connected to the minus F post of the socket. The other terminal or arm is brought to the minus A post. The plate post of the new tube socket is brought to the P post of the transformer. The B post of this transformer is brought to the B plus detector post, or forty-five volt post. The A battery leads may be connected to the A leads in the other portion of the set, instead of making them separate. The B plus Amp. voltage is the same as applied to the plates of the other RF tubes. The heavy dash lines indicate where the new installation has been made. The lighter dotted lines show new connections to be made.

* * *

REGARDING THE three-tube reflex, which appeared in the Radio University columns of the Jan. 29 issue of RADIO WORLD.

(1)—Could another stage of transformer coupled audio frequency amplification be added?

(2)—Should I place the RF coils at right angles to each other? About how far apart?

(3)—Can all the parts for this set be placed in a seven by eighteen inch cabinet?

(4)—Is it all right to use the baseboard method of mounting?

(5)—Would you suggest using regeneration in the detector or radio frequency stage?

(6)—Is any special type of antenna necessary?

(7)—Would it be O. K. to use a 112 tube in the last stage?—ROY GARDNER, Valley Junction, Ia.

(1, 2, 3 and 4)—Yes. Place the coils about four inches apart.

(5)—No.

(6)—No, the standard 100 foot, inverted L can be used.

(7)—Yes.

* * *

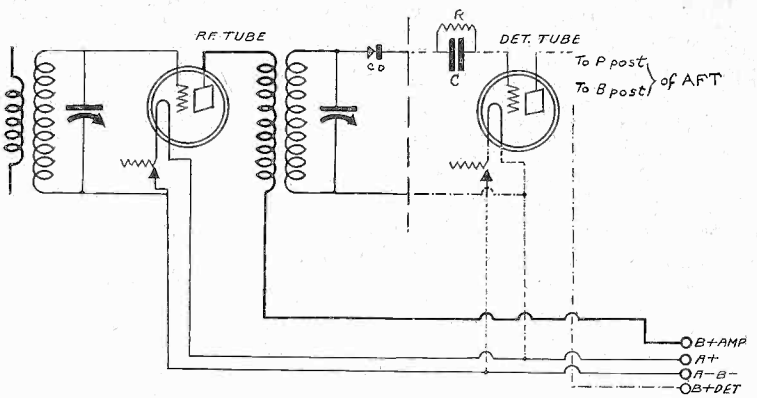

FIG. 547

The circuit diagram illustrating how to hook in a tube as a detector, instead of a crystal, as requested by Warren Merchof.

COULD AN indoor antenna, e. g., six turns of No. 18 insulated wound around the moulding ten feet in each direction, be used with much success on a five-tube radio frequency set?—PETER OSLOW, Chester, Pa.

Yes. Of course, the signals will not be as loud as with an outdoor antenna, but it will be equal if not louder to that obtained with a loop.

* * *

RECENTLY I saw a circuit of a three-tube reflexed regenerative receiver, in which the tubes in the first and second tuned radio frequency stages also acted as AF amplifiers. Do you think that a set of this type would be too difficult for a novice to construct and operate?—WILLIAM OAKS, Phoenicia, N. Y.

Yes. Suggest you build the set as a straight three-tube regenerative set, with a tuned stage of radio frequency amplification, a regenerative detector and a stage of transformer coupled audio frequency amplification.

* * *

WHAT IS the name of the electrolyte used in Edison element storage batteries and what is its gravity?

(2)—What substance should be used to prevent evaporation?

(3)—How far from the top of the test tube should the solution be?

(4)—Can this type of battery be overcharged or charged in the reverse direction without any harm to the cells?—ISIDOR MANDOWSKY, San Francisco, Calif.

(1)—Potassium hydroxide, known to the layman as caustic potash. It is usually mixed to a gravity of about 1.250.

(2)—Any type of pure mineral oil, such as Nujol, etc.

(3)—No more than three-quarters of an inch, or to a greater height than is necessary to cover the round element. When the solution is above this level, the battery discharges very quickly. A white crystal salt forms aiding evaporation. This of course should be wiped off, the top of the cell being kept clean at all times.

(4)—Yes.

* * *

I AM building a portable, using —99 type tubes, and would like to have some data. Six tubes are used in two untuned RF stages, a regenerative detector (three-circuit tuner) and three low ratio transformer audio stages. A rheostat is used to control the RF filaments. Ballasts are used in the other circuits.

(1)—Should the tubes be placed vertical or horizontal?

(2)—Would I get just as good results with two stages of transformer coupling using a bit higher ratio AFT?—THOMAS A. CHARLES, Nyack, N. Y.

(1)—Always place them vertical, otherwise the elements will sag and hit each other.

(2)—Yes.

Stations' Work Brilliant In "Covering" Lindbergh

By J. T. W. Martin

Radio had reported outstanding news events before, but the receptions to Col. Charles A. Lindbergh presented such a many-sided problem that they could not be described from any one point. Accordingly, it was decided to pick up descriptions from five widely separated observation posts in Washington and from seven in New York, so that every phase of the receptions might be heard by radio listeners.

The observation sites in Washington and the announcers who manned them were: the Navy Yard docks—Graham McNamee, WEAF; the top of the Washington Monument—Phillips Carlin, manager of WEAF; the dome of the Capitol—Milton J. Cross, WJZ; the U. S. Treasury Building — John B. Daniel, WRC; the foot of the Washington Monument—Graham McNamee, WEAF. In New York City, the points were: Pier A, North River, at the Battery—Graham McNamee, WEAF; the offices of Merlin Hall Aylesworth, president of the National Broadcasting Company, at 195 Broadway—Phillips Carlin, Manager of WEAF; the reviewing stand at City Hall—Thomas Cowan, WNYC; the top of the Municipal Building—Arnold Morgan, WEAF; the Metropolitan Life Insurance Tower at 1 Madison Avenue—Ralph Wentworth, WEAF; the Welte-Mignon studios at Fifth Avenue and Fifty-fifth Street—Graham McNamee, WEAF; the Mall in Central Park—Milton J. Cross, WJZ.

The Washington broadcast was heard through the largest special chain ever linked together, fifty stations in all, a combination of the Natioinal Broadcasting Company's Red Blue and Pacific Coast Networks. The greatest radio audience ever assembled, estimated at 30,000,000people, was able to listen to the event, but these facts seem almost insignificant beside the manner in which the ceremonies were reported. Through the medium of the system utilized, listeners were able to hear descriptions of all the various functions, the din of whistles, sirens, shouts and applause which greeted the flyer.

Reported from Twelve Points

Sitting at ease in their own homes, scattered from Maine to California, they were kept at the main center of interest during the entire Washington reception. While immense crowds in the capital were straining for a glimpse of the hero, radio listeners heard him speak on two different occasions, listening to his reply to President Coolidge after the Chief Ex-

THE NEW AC TUBES

Everybody should have on hand for ready reference full data on the new AC tubes. The filaments of these tubes are heated by alternating current from a step-down transformer and anybody having AC can put these tubes into a set by making some wiring changes. Those who have AC and who are about to build a set also should possess this full information. Send 15c for the June 4 issue that contains the data on the AC tubes and also on two new rectifier tubes for B eliminators. Radio World.

ecutive had pinned on his breast the Distinguished Flying Cross and later hearing Col. Lindbergh's remarks at the National Press Club reception.

Portions of descriptions from the five vantage points in Washington and the seven in New York were combined in a manner which welded the reports into smoothly running units. Traffic jams and other unforseen events caused the carefully laid official plans to go astray, but the radio report never faltered. With an ease which has caused thousands of listeners to express amazement, the broadcast reports shifted constantly as the actual events which were taking place changed the center of interest. In no case was the changeover from one point to another anything but instantaneous, and in no case did the reports clash.

This successful result was obtained through the use of three special circuits leading from each of the observation posts to a main control board located in the control room of WRC. An operator and an announcer were stationed at each of these points, and by the use of headphones all of the announcers were able to hear the reports from all other points. Cues to stand by and to take the air were relayed by the operators from one post to another and passed on to the various announcers.

Valuable in News Work

In working out this system, Capt. H. W. Angus, vice-president of the National Broadcasting Company, who had complete charge of the special broadcasts from Washington and New York, was assisted by Eugene F. Grossman, operating engineer of the Broadcasting Company, who numbers among his other technical achievements the transmission of acts of grand opera, as performed by the Chicago Civic Opera Company, direct from the stage of the Chicago Auditorium through a nation-wide network of stations last January.

The success with which the "radio reporting" of the Lindbergh functions was carried through seems conclusive proof of the real place of broadcasting in the distribution of news concerning outstanding events. And the manner in which the nation-wide transmission was received appears positive evidence that radio will never compete with the established channels of news distribution.

The radio reports of the Lindbergh Washington and New York receptions were carried practically instantaneously to every radio receiver in use throughout the United States. A many-angled sound picture of the ceremonies was provided for the listeners at the very instant that the events were taking place. Still, it seems positive that this report stimulated the sale of newspapers which carried news reports of the same functions.

Records Established

These two media of spreading information, the daily newspapers and broadcasting, possess such dierent characteristics that neither infringes upon the other. Radio is evanescent. It is gone when it is finished. But newsprint, presenting a more thorough and more carefully prepared report, is capable of being preserved for almost any desired length of time.

Broadcast news reports of outstanding events and newspaper reports of the same happenings do not clash. But it appears that both have their places in a properly balanced scheme of news dissemination.

A few of the new records established by the National Broadcasting Company in the Nationwide Lindbergh reception follow:

Miles of Wire Line Used—14,000.
Number of Engineers Involved—350.
Pick-up Points—Washington, 5; New York, 7.
Number of Stations—50.
Estimated Audience—30,000,000.
Number of "Radio Reporters"—Washington, 4; New York, 6.
Longest Continuous Program Devoted to one subject—11½ hours.

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With the new wavelengths, frequencies and power. All the 694 stations in the United States given alphabetically by call letter with the location cited and also the identity of station or stations which share time on the air. Send 15c for the June 11 issue that contains this complete list. Radio World, 145 W. 45th St., New York City.

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THE RADIO TRADE

Hazeltine Corp. Wins Grebe Patent Suit

In a decision by Federal Judge Grover M. Moscowitz, in Brooklyn, the A. H. Grebe Company, Richmond Hill, was restrained from manufacturing accessories, covered by Neutrodyne patents held by the Hazeltine Corporation and Independent Radio Manufacturers, Inc., 15 Exchange Place, Jersey City, N. J. An accounting of the profits of the Grebe Company, received during the period of alleged infringement of the patents, was also ordered.

The defendant contended that in the original patent of Louis A. Hazeltine, filed shortly after he left the employ of the United States Navy, where he had been employed as a laboratory engineer, there had been a clause permitting the general use of his patent.

LINDBERGH PLANE SPEAKER. Pictures and explanatory article appeared in Radio World dated June 25, 1927. Sent on receipt of 15 cents or start your subscription with that number. Radio World, 145 W. 45th St., N. Y. C.

New Molded Condensers

The Polymet Manufacturing Corporation has developed a new line of fixed mica condensers.

These are attractively molded in genuine Bakelite. Each condenser is guaranteed to an accuracy of plus or minus 5%.

Convenient, well-tinned soldering tabs are a notable feature of this construction.

B ELIMINATOR BOOKLET

The story of the B eliminator or B power unit is told in virtually single syllable words in the little booklet just issued by the Raytheon Manufacturing Company, Kendall Square Building, Cambridge, Mass. "A Few Things You Will want To Know About Reliable B Power For Your Radio" is the title. A copy is obtainable from the manufacturer by mentioning RADIO WORLD.

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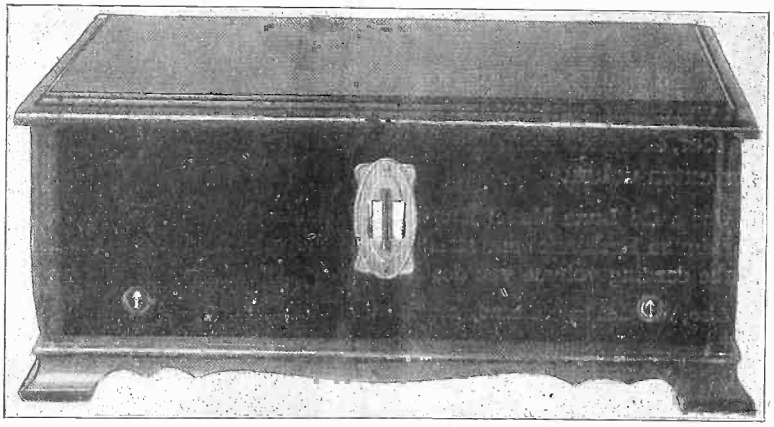

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