MARCH 24
1928

WORLD'S RECORD SUPER 10

15
CENTS

RADIO WORLD

REG. U.S. PAT. OFF.

The First and Only National Radio Weekly

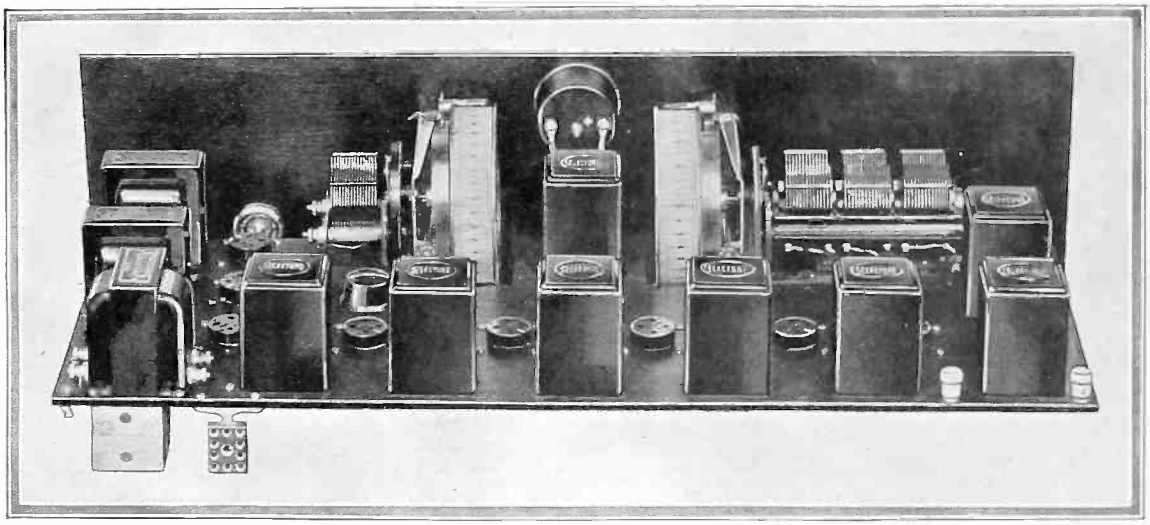
AC TUBE PROBLEMS

By R. H. Manson

LYNCH-HAMMARLUND FIVE

Set Builders to Incorporate

SET PENETRATES THE FAR DISTANCE!



Rear view of the Scott World's Record Super shows a fascinating arrangement of efficient parts in a circuit design that produces amazing results in distance reception. See page 3

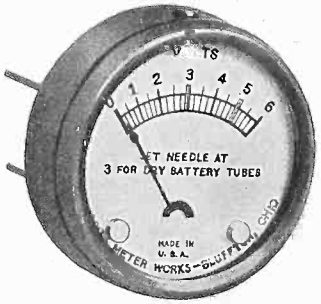
Power Plant for AC Operation	How to Make Versatile B Voltages	Pointers on Remote Control of Volume	Analysis of the Advance in AF Amplification

SEND NO MONEY

"Double R" Meters Improve Your Set

Use Them to Maintain Accurate Voltages and Currents So That Maximum Reception Efficiency is Assured

Pin Jack 0-6 Voltmeter for A Battery Measurement



This 0-6 voltmeter, No. 806, is especially useful for the No. 25 and No. 28 Radiolas, because it is equipped with pin jacks which fit into the plugs with which those sets are provided. The meters may be used in any home-constructed set, too, where the builder desires to place tip jacks on the front panel, so the meter can be plugged in for obtaining reading. The meter may be kept permanently in circuit, if desired.

No. 306, 0-6 volts DC..... **$2.50**

Also Track Down Trouble in a Jiffy and Permanently Cure It with the Aid of These Fine Meters

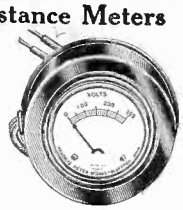
It is absolutely necessary to use a high resistance voltmeter in measuring the voltage of B eliminators, either across the total output or at any intermediate voltage. A low resistance meter at least partly short-circuits the eliminator and causes the voltage reading to be away off. Sometimes the reading is as little as 25 per cent of the total actual voltage.

All "Double R" meters are accurate to 2½ per cent, plus or minus, and all, except the ammeters Nos. 1 and 338, may be kept permanently in circuit.

Panel meters take 2 5/64-inch hole.

Our Complete Meter Catalogue is contained in this advertisement.

High Resistance Meters for B Eliminators



Here is the meter you've been wishing for! A 0-300 DC voltmeter with a very high resistance. Specially made that way so it will test the output voltages, from maximum to any intermediate voltage, of any B eliminator or grid biasing resistor. It also makes all the measurements of any other meter of its voltage range, hence will give correct readings of B batteries, C batteries, cells, or any other DC voltage source not exceeding 300 volts. Full nickel finish. Portable type (fits in sack coat pocket easily). Accurate to 2½ per cent, plus or minus. Fully guaranteed. Requires 35 different dyes to make. Furnished with long connecting cords and convenient tips. May be kept permanently in circuit. **$4.50**

No. 346 .....

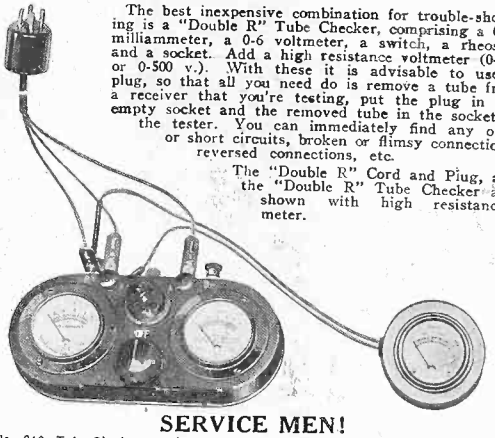
[Note: 0-500 volts, instead of 0-300 volts, is No. 347. Tests ALL power packs—Price $5.50.]

MULTI-TUBE SET MILLIAMMETER

Panel model. Recommended for sets having six tubes or more, particularly if a –71, –10 or –50 tube is used as the output. May be kept permanently in circuit. For DC measurements 0-100 milliamperes.

No. 390 ..... **$1.65**

TROUBLE-SHOOTING TEST SET



The best inexpensive combination for trouble-shooting is a "Double R" Tube Checker, comprising a 0-10 milliammeter, a 0-6 voltmeter, a switch, a rheostat and a socket. Add a high resistance voltmeter (0-300 or 0-500 v.). With these it is advisable to use a plug, so that all you need do is remove a tube from a receiver that you're testing, put the plug in the empty socket and the removed tube in the socket of the tester. You can immediately find any open or short circuits, broken or flimsy connections, reversed connections, etc.

The "Double R" Cord and Plug, and the "Double R" Tube Checker are shown with high resistance meter.

PANEL VOLTMETER FOR A BATTERIES

One of the most popular meters, the 0-6 panel voltmeter, DC. May be kept permanently in circuit. Panel model.

No. 326 ..... **$1.65**

PANEL AC VOLTMETERS

No. 351 For reading 0-15 volts AC $2.25
No. 352 For reading 0-10 volts AC 2.25
No. 353 For reading 0-6 volts AC 2.25
(See No. 348 under "Pocket and Portable Voltmeters.")

PANEL MILLIAMMETERS

No. 311 For reading 0-10 milliamperes DC $1.95
No. 325 For reading 0-25 milliamperes DC 1.85
No. 350 For reading 0-50 milliamperes DC 1.65
No. 399 For reading 0-300 milliamperes DC 1.65
No. 394 For reading 0-400 milliamperes DC 1.65

DC PIN JACK VOLTMETERS

No. 308 For No. 20 Radiola, 0-6 volts DC $2.50
No. 307 Desk type voltmeter with cord, 0-6 volts DC..... 2.50

6-VOLT A BATTERY CHARGE TESTER

No. 23 For showing when 6-volt A battery needs charging and when to stop charging; shows condition of battery at all times $1.85

PANEL AMMETER

No. 338 For reading amperage, 0-10 amperes DC.....$1.65

POCKET AMMETER

No. 1 For testing dry cells, 0-40 ampere DC scale pocket meter.$1.50

POCKET AND PORTABLE VOLTMETERS

No. 8 For testing A batteries, dry or storage, 0-8 volts DC scale $1.65
No. 10 For testing A batteries, dry or storage, 0-10 volts DC scale 1.65
No. 13 For testing A batteries, dry or storage, 0-16 volts DC scale 1.65
No. 50 For testing B batteries, dry or storage, but not for B eliminators, 0-50 volts DC scale 1.65
No. 39 For testing B batteries, dry or storage, but not for B eliminators, 0-100 volts DC scale 1.85
No. 40 For testing A and B batteries, dry or storage, but not for B eliminators; double reading, 0-8 volts and 0-100 volts DC scale..... 2.25
No. 42 For testing B batteries, dry or storage, but not for B eliminators; 0-150 volts DC scale 2.00
No. 348 For testing AC current supply line, portable, 0-150 volts 4.50

VOLTAMMETERS

No. 18 For testing amperage of dry cell A batteries and voltage of dry or storage A batteries, double reading, 0-8 volts, and 0-40 amperes DC..$1.85
No. 35 For testing amperage of dry cell A batteries and voltage of B batteries (not B eliminators); double reading, 0-50 volts, 0-40 amperes DC.. 2.00

SERVICE MEN!

No. 210 Tube Checker, consists of 0-6 volts DC Voltmeter, 0-10 DC Milliammeter, Grid Bias Switch, Rheostat, Socket, Binding Posts (with instruction sheet) $6.50
No. 21, cord and plug. For connecting meters in A and B leads of a receiver without any disconnections. Terminals correspond with posts on No. 210 tube checker.....$1.85
No. 346 DC Voltmeter (high resistance).....$4.50
No. 347 DC Voltmeter (high resistance).....$5.50

The cord terminals of the plug leads correspond with the binding posts of the tube checker.

Now connect the 0-300 or 0-500 volts high resistance voltmeter from A+ to B+ posts and you get all necessary readings. You can test plate voltage from B eliminators, or any other B supply, DC plate current and DC filament voltage, as well as the efficacy of the tube, by throwing the grid bias switch, for the plate current should change within given limits, depending on the type of tube.

Equip your testing outfit with the indispensable combination that constitutes the Trouble Shooting Test Set and Time-Saver. You quickly locate trouble while others flounder about.

Complete Combination Nos. 21 and 210 (with 0-300 Voltmeter, No. 346)..$12.00
Complete Combination Nos. 21 and 210 (with 0-500 Voltmeter, No. 347)..$13.00

PANEL VOLTMETERS

No. 335 For reading DC voltages, 0-8 volts.....$1.65
No. 310 For reading DC voltages, 0-10 volts..... 1.65
No. 316 For reading DC voltages, 0-16 volts..... 1.65
No. 337 For reading DC voltages, 0-50 volts..... 1.65
No. 339 For reading DC voltages, 0-100 volts..... 1.75
No. 342 For reading DC voltages, 0-150 volts..... 1.75
No. 340 For reading DC voltages, double reading, 0-8 volts, 0-100 volts..... 2.25

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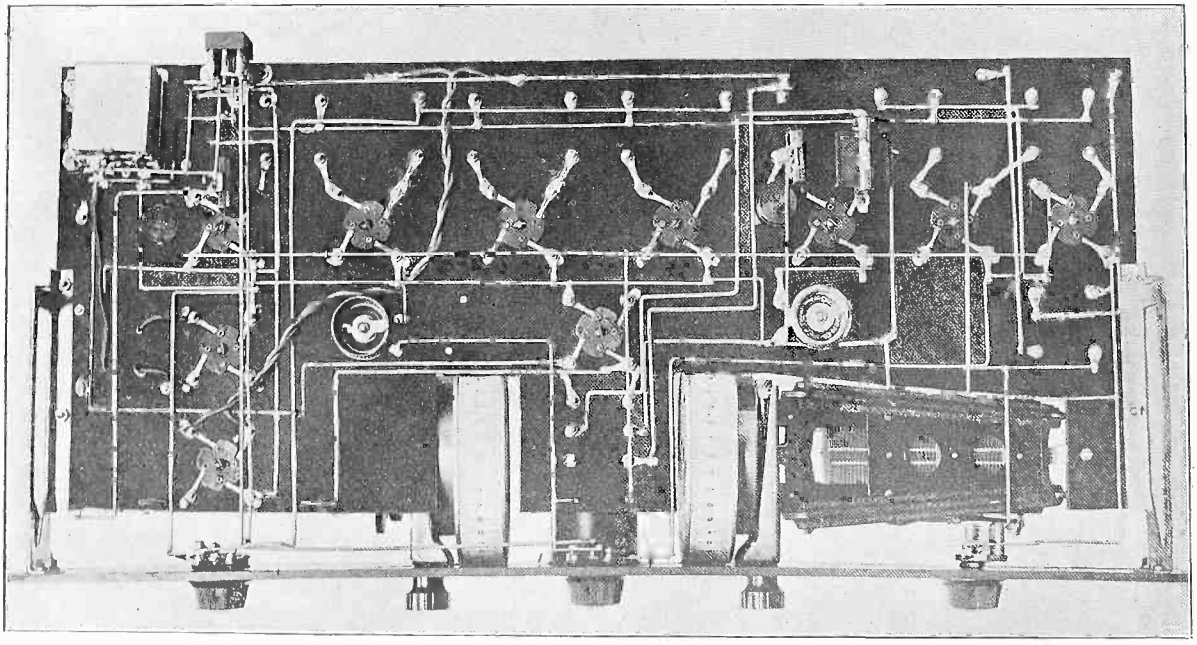
The World's Record Super Ten

By Brewster Lee



THE radio fan interested in getting a particularly effective receiver is well aware of the enthusiasm to which authors are subject and does not take it without dilution.

A fan who studies the principles on which a circuit operates so that he himself may judge, will profit by building an outstanding receiver.

The four cardinal virtues of any receiver are sensitivity, selectivity, fidelity and volume.

Sensitivity is the ability of the circuit to respond to extremely feeble electric waves about the antenna, and is usually expressed in terms of distance getting ability.

Selectivity is the ability of the circuit to discriminate between two waves separated by a small frequency interval, or its ability to suppress waves of all frequencies except the one desired.

Fidelity is the closeness with which the reproduced music and speech corresponds with the original, and is popularly known as tone quality.

Volume is the amount of energy delivered by the loud speaker connected to the set without appreciable distortion.

The first two of the cardinal virtues, sensitivity and selectivity, are both found in the greatest degree in the double detection type of receiver, that is, in the Super-Heterodyne. Even a poorly constructed Super-Heterodyne would excel the average circuit of single detector type in both of these qualities in the hands of a skillful operator. And a well designed and constructed Super leaves other receivers far behind on these two points.

The fidelity of the output depends mainly on the audio amplifier, but the frequency selector, or tuner, also affects it slightly. A high degree of fidelity is not confined to the Super in principle, but usually the parts chosen for an audio amplifier for a Super are of such high grade that fidelity and the Super are closely associated in practice.

Volume is also equally applicable in principle to both types of receiver, for it simply requires large tubes and high plate voltages, with appropriate minor adjustments in the circuit, to make the volume great yet free of distortion. Most Supers are provided with power amplifiers.

Thus the well-designed Super has all the cardinal virtues, and it has them in the superlative degree.

But what determines a well-designed Super? It must have a fairly high radio frequency selectivity and amplification. It must have a high intermediate frequency amplification and moderate selectivity. It must have a moderate audio frequency amplification with no frequency discrimination whatsoever. It should be easy to control, both with respect to sensitivity and to station selection. It must be well and adequaely powered.

Why should the Super have a fairly high radio frequency selectivity? Are not most Supers almost devoid in the attribute? If this is an imperative condition why has it been neglected in the design of so many Supers? Most Supers do not have a high radio frequency selectivity because the designers do not realize its importance, and therefore they choose to avoid the design complications which this feature involves.

What is the main advantage of the high radio frequency selectivity in a Super? The elimination of squeals from the output. That is enough to commend its use.

But here we have a Super receiver

LIST OF PARTS

One Remler .00035 Mfd. Variable Condenser.
One Remler 3-Gang .00035 Mfd. Variable Condenser.
Two Remler Universal Drum Dials No. 110.
Two Remler RF Chokes No. 35.
Two Selectone Transformers Type B500.
Two Selectone Transformers Type B510.
Two Selectone RF Transformers Type B520.
One Selectone Antenna Coupler Type B530.
One Selectone Oscillator Unit Type B540.
Two Thordarson Audio Transformers Type R200.
One Thordarson Speaker Coupling Transformer Type R76.
One Carter Imp 400-ohm Potentiometer.
One Carter Heavy Duty Rheostat, 1 ohm.
One Carter 15-ohm Rheostat with Switch.
One Carter 30-ohm Imp Rheostat.
Two Carter Tip Jacks.
Ten Benjamin Sockets.
Forty Feet Celatsite Covered Busbar.
One Box 100 Kellogg Soldering Lugs.
One Carter .00025 Mfd. Grid Condenser (with clips).
One Carter .002 Mfd. Fixed Condenser.
One Carter .0001 Mfd. Fixed Condenser.
One Silver-Marshall No. 340 Midget Condenser.
One Pair Benjamin Brackets No. 8629.
Three Tobe 1 Mfd. By-Pass Condensers.
One Tobe 3-Megohm Grid Leak.
One Jones 10-Wire Multiplug.
One Jewell 0-8 Pat. Voltmeter.
One Package Kester Radio Solder.
One Formica World's Record Super 10 Panel (7x26x3-16-.
One Formica World's Record Super 10 Base (10x25).
Four XL Binding Posts.

(*Continued from preceding page*)
which meets all the conditions which we laid down, and some additional desirable features besides. It is the World's Record Super 10 receiver.

Great Results

Do the results obtained with this receiver justify the principles of design used in the circuit? They do most emphatically.

The sensitivity of the circuit is so great that KFI was brought in at Chicago without ground or aerial, with loudspeaker volume. Several stations in the United States were received with loudspeaker volume by E. H. Scott in Tasman, New Zealand, with one of these receivers. These U. S. stations were not confined to the Pacific Coast but were spread over the entire country. Thus signals which had traveled nearly half way around the earth were picked up with the World's Record Super. What more could be asked of a receiver?

There are several features in this receiver which contribute to this astounding sensitivity. The first is the high radio frequency amplification ahead of the modulator. The efficient mixing of the signal and oscillator frequencies is another contributory factor to the sensitivity.

Adjusted Impedances

But perhaps the greatest factor is the amplification in the intermediate amplifier. The coupling in this amplifier is done by means of two Selectone L. W. transformers No. B500 and two Selectone L. W. transformers No. B510.

The impedances of these transformers have been adjusted carefully to take full advantage of the amplification property of the tubes, and they have been carefully adjusted to the same intermediate frequency so that all the stages amplify at exactly the same frequency. This not only boosts the amplification tremendously but it also sharpens the selectivity.

Textual Wiring Direction

The actual wiring up of the World's Record Super 10 is very simple. This shows where every wire is connected to the various parts. Before you can start wiring up, the parts must be assembled on the panel and sub-panel.

ASSEMBLING PARTS ON BASEBOARD

First—Attach the Benjamin brackets to each side of the baseboard.

Second—Assemble all Benjamin sockets, inserting a Kellogg lug under each nut. Do not tighten these nuts down at first, in order that you can move the lug or bend it as required when running the bus bar through. CAUTION: When assembling the Benjamin sockets, BE SURE, before tightening screw in center of socket THAT EACH OF THE CONTACTS IS ENTERED IN ITS PROPER SPACE OR SOCKET. It often happens that two contacts will be pushed into one space with the result that perhaps the grid and filament contacts will short against each other.

Third—Attach the two Thordarson R200 audio transformers to baseboard.

Fourth—Attach the Selectone transformers to baseboard, making sure that the P and G terminals face the P and G contacts on the sockets. The baseboard layout shows exactly where all Selectone units are placed. Place a Kellogg lug under each nut, but do not tighten nuts until you run bus bar through the lugs.

Fifth—Assemble binding posts for Ant., Ground, and for the A.C. filaments to the 210 power tube. Insert a Kellogg lug under each screw.

Sixth—Solder the three by-pass condensers together, then insert screw that goes in hole under the R76 output transformer, and with this screw fasten the by-pass condensers to baseboard. The screw that holds one side of the R76 to baseboard is also used to fasten the other side of the by-pass condensers to the baseboard.

Seventh—Assemble the two tip jacks on end of sub-panel.

ASSEMBLY OF PARTS ON PANEL

Assemble rheostat, Potentiometer and S. M. Midget condenser to panel, then attach panel to baseboard.

ASSEMBLY OF CONDENSERS

Assemble the Remler three-gang condenser to drum dial, then attach the drum and condenser to panel. Now assemble the single 00035 Remler condenser to drum and attach it to panel.

TESTING PARTS BEFORE WIRING

Now you have all parts assembled with the exception of the Voltmeter. Before assembling this on the panel, use it to test all parts to see that they are perfect before wiring. This may save a lot of trouble, and will, providing you follow the wiring directions correctly, guarantee that when you have finished your wiring, the set will operate as soon as the B Eliminator, A Battery and Speaker are hooked up.

To test the various parts, you will require, in addition to the voltmeter, a 7½ volt C battery and two lengths of flexible wire about 18" long. Connect the plus post of C battery to the plus post of voltmeter. Connect one end of length of flexible wire to the negative post on voltmeter. Connect end of other length of wire to the 4½ volt post on C battery. Now touch the end of the wires together and you should get a reading on the voltmeter.

First test the Primary and Secondary of each of the Thordarson transformers. To test the Primary touch the ends of wires to the P and B posts of the transformers. If O.K. you will notice a small deflection of the needle on the voltmeter. To test the Sec. winding touch the G and F posts on transformers and see that the needle moves slightly.

Now test the Primary and Secondary of all Selectone transformers. Test these by touching the screws projecting through the baseboard. You should get a reading on the Voltmeter when the P and B screws are touched and when the G and F screws are touched.

Next test all the sockets. Touch end of one wire to the plus then touch end of other wire to the P and negative contacts. There should be no reading on the voltmeter. Now touch end of one wire to the G contact then with the end of the other wire touch the negative and P contacts. There should be no reading on the voltmeter. Test all sockets in turn in this way. If you find you get a reading between any of the contacts, it shows that you have two contacts jammed into one space, so remove and examine.

Test Pot. by touching the two outside terminals to see that you get a reading.

The small fixed condensers can now be tested. The first time you touch the ends you may notice a slight movement of the voltmeter needle, but when you touch them the second or succeeding times the needle should not move. If you get a reading each time, condenser is defective.

TESTING BY PASS CONDENSERS

The By-Pass Condensers can be tested in the same way. However, a better test is to connect the ends of a 45-volt battery across the condensers for a few seconds, then wait for a minute. While waiting, disconnect the C battery from the voltmeter and connect the wire that was attached to the 4½ volt post to the other side of voltmeter. Now touch the contacts on the by-pass condensers while you watch the needle. If condensers are O.K. you will notice a slight deflection of the needle. If no deflection is noticed the condenser is leaking and should not be used.

TESTING CHOKES

Once more connect the C battery to the voltmeter. When the lugs on chokes are touched there should be a deflection of the voltmeter.

This completes the tests and the voltmeter can now be assembled on the panel.

WIRE TO USE

It will be found that No. 12 half hard, round tinned bus bar is the best for several reasons. It makes a very rigid job and at the same time has lower resistance than the smaller wire.

HOW TO SOLDER

If you want results from your set EVERY connection MUST be perfectly soldered. A cheap soldering iron does not usually give enough heat to make a perfect joint. Pay at least four or five dollars for your iron, then you will have a real tool. Use nothing but rosin core solder, or if you do use paste, use it VERY SPARINGLY and be sure to wipe each joint thoroughly immediately after soldering. Be sure to observe the following precautions:

Place the tip of the iron on connection to be soldered for a second, then touch end of solder to connection when it should immediately melt into the joint. Leave the tip of iron on joint for about two seconds after applying solder to make sure that it actually flows into every part of connection.

Poorly soldered joints are responsible for more than 80% of all troubles in a radio receiver. If connections are not soldered properly the slightest vibration will loosen the joint and cause noises in

or the World's Record Super 10

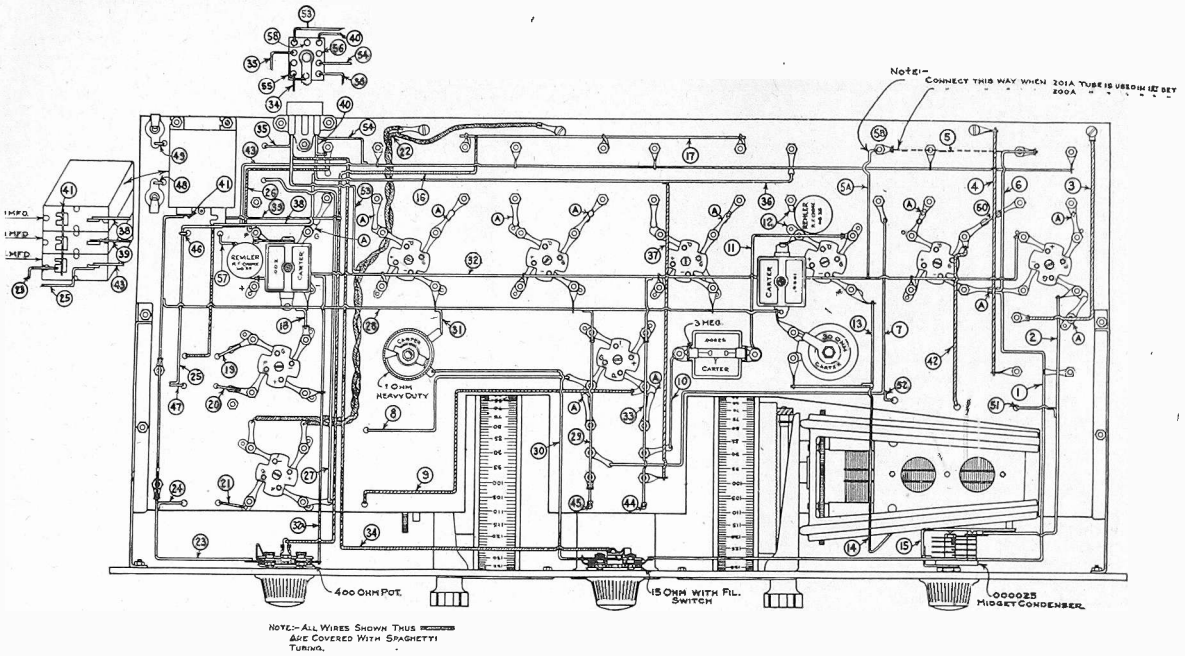


FIG. 2

PICTORIAL DIAGRAM OF THE WIRING.

the set that sound like static. Remember then, to thoroughly heat the joint before applying the solder and to leave the tip of iron on the joint for a second AFTER applying the solder.

WIRING UP SET

All wires are numbered on the baseboard wiring chart and it will be found easier if they are connected in the order in which they are numbered.

All points marked A should first be connected by soldering the two Kellogg lugs together.

Wire No. 1 connects to one side of the 15 ohm rheo in centre of panel, to lug on F post of B530 Selectone and to lug on negative contact of 1st RF tube. These two lugs lie flat on baseboard.

Wire No. 2 connects to lug on stator of midget condenser on panel and to lug which is bent up slightly on G contact of 1st RF tube.

Wire No. 3. Cover wire with piece of Spaghetti or use covered wire. Connects lug on P of B530 Selectone to lug under Ant. binding post.

Wire No. 4. Cover wire with spaghetti or use insulated wire. Connects lug on B of B530 Selectone to lug on Ground binding post.

Wire No. 5. Connects the lugs on F of the two B520 Selectones together, and is the correct connection to make when a 200A tube is used in the 1st Det. This puts a negative bias on tube.

Wire No. 5A. When a 201A tube is used in the first detector, connect lug 5B to wire No. 32.

Wire No. 6. Connects wire No. 5 to negative contact on 1st RF tube.

Wire No. 7. Connects lug on G of 2nd B520 Selectone to No. 1 on B540 Selectone.

Wire No. 8. Connects one side of Remler 00035 condenser to the lug on G contact of Oscillator tube socket.

Wire No. 9. Cover wire with spaghetti. Connects other side of 00035 condensers to lug on oscillator tube socket marked P.

Wire No. 10. Connects lug on No. 2 of B540 Selectone to one side of 00025 cond.

Wire No. 11. Connects other side of 00025 condenser to G contact on Det. tube.

Wire No. 12. Solder Remler choke coil lugs to lug on P contact of 1st Det. tube and to lug on P of B500 Selectone.

Wire No. 13. Connects lug on negative contact of 1st Det. tube to lug on one side of 30 ohm rheo.

Wire No. 14. Connects with wire No. 13 and to lug on Remler three gang.

Wire No. 15. Connects to wire No. 1 at point just above midget condenser to rotor of midget condenser and to both front lugs on Remler three gang.

Wire No. 16. This wire should be covered with spaghetti. Cut spaghetti so that wire No. 39 can be soldered to it at point shown. This wire connects to lug on F of B500 Selectone and to lug on center post of Pot.

Wire No. 17. Connects to lugs on F of two B500 Selectones and one B510.

Wire No. 18. Connected later.

Wire No. 19. Connects lug on G of 1st audio tube socket to G of R200.

Wire No. 20. Connects lug on P of 1st Audio tube socket to P of R200.

Wire No. 21. Connects lug on G of 2nd Audio tube socket to G of R200.

Wire No. 22. Use a good heavy flexible rubber covered wire twisting leads as shown. Connect ends to pos. and neg. of 2nd audio tube contacts and to lugs on two binding posts near sable plug.

Wire No. 23. The enamel should have been cleaned round hold on the R200s through which screw passes to hold transformer to baseboard and a lug placed under the nut. This wire connects to one side of Pot. to the lugs on the R200s and to bottom contact of By-Pass condenser.

Wire No. 24. One side connects to wire No. 23 and the other side to F of R200.

Wire No. 25. Connect to wires No. 46 and 47, and to bottom contact of By-pass condenser.

Wire No. 28. Cover with spaghetti. Connects to F of R200 and lug on F of B510.

Wire No. 27. Connects lug on P contact of 2nd audio tube to P on R76. Note this connection carefully and connect exactly as described. Although it is not shown as being covered with spaghetti, it is better to cover it.

Wire No. 28. Connects one side of 30 ohm rheo lugs on negative contacts of tube sockets on the IF tubes, 2nd detector and to wire No. 23.

Wire No. 18 can now be connected to lug on negative contact of 1st audio tube and to wire No. 28.

Wire No. 29. Connects lug on F of B540 Selectone lug on neg. contact of osc. tube and wire No. 28.

Wire No. 30. Connects one side of Fil. switch on 15 ohm rheo to lug on side of rheostat and to one side of 1 ohm rheostat.

Wire No. 31. Connects one side of 1 ohm rheo to wire No. 28.

Wire No. 32. Connects lugs on plus contacts of all tubes except audio tubes.

Wire No. 32A. This wire is not numbered on some prints. It connects to one plus side of Pot. to plus contact of 1st Audio tube and to Wire No. 32.

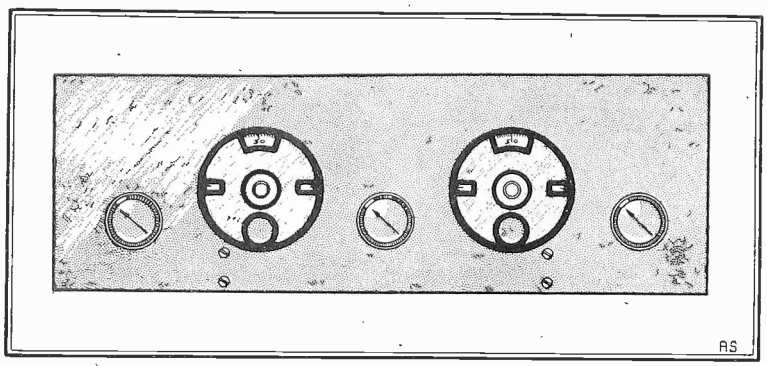
Wire No. 33. Connects to plus side of voltmeter, lug on plus contact of Osc. tube and to wire No. 32. Wire No. 44 is shown going through to hook up to voltmeter, but the one wire can be used.

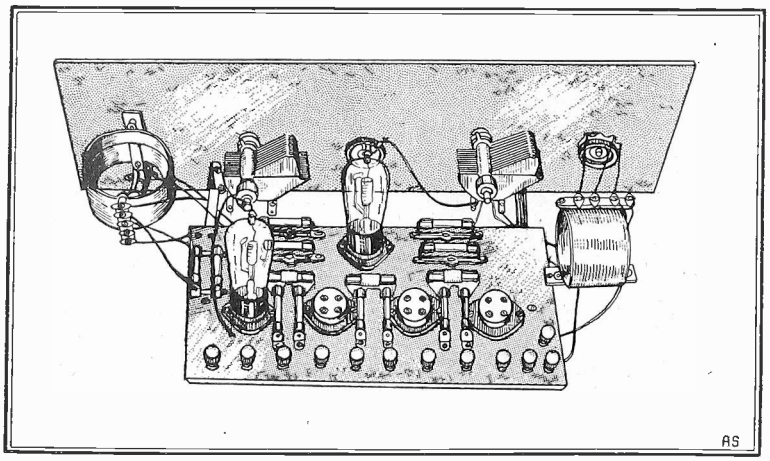
Wire No. 34. Cover wire with spaghetti. Connects one side of fil. switch on 15 ohm rheo. to the Jones plug. CAUTION: Be careful when soldering this wire that you do not allow the solder to run down between contacts as this will short the switch. If you find when you connect the cable to plug that the tubes cannot be turned off, it is more than likely that you have used too much solder

(*Continued on page 7*)

The Lynch-Hammarlund

By Spauldi





FRONT AND REAR OF FORREST'S SET

EVERYBODY knows that the new screen grid tube has an extremely high amplification factor. But not so many know that this property is not identical with voltage amplification.

Many have learned by this time that a high amplification factor does not tell the whole story of the performance of a tube in a circuit. Some of the fans who have played with the screen grid tube have found out that it is highly temperamental and will not tolerate any makeshifts.

The screen grid tube is a passive piece of apparatus. It will stand a good deal of abuse, but it will not release its best unless it is treated right. It is capable of a very high voltage amplification, but it will not give out this amplification freely. It must be wrested from it.

And how is the high voltage amplification wrested from the screen grid tube? By loading it up. And what does loading it up mean? It means to put a very high impedance in its plate circuit.

The load on the screen grid tube must be very high or the tube will not amplify. If the load has been designed for a —01A tube it may be entirely too low for the screen grid tube. The amplification with the screen grid tube can then be much less than that with the —01A tube.

The voltage output of the screen grid tube, as for all other tubes, is the signal voltage drop across the load impedance.

What is a load impedance? It may be a radio frequency choke coil. It may be a parallel tuned circuit. It may be the primary of an interstage radio frequency transformer. It may be a pure resistance. Or it may be any other impedance.

It has already been said that for a high voltage amplification the load impedance should be very high. But when is it high? When it is equal to or greater than the output impedance of the tube.

And that leads us to inquire about the value of the output impedance of the tube. What is it? About 150,000 ohms, and for all except the highest radio frequencies it can be considered a pure resistance.

The load impedance then should be much larger than 150,000 ohms at the frequency of operation.

If the load on the tube is a resistor its value should exceed considerably the value 150,000 ohms. Certainly not less than .25 megohm should be used. It is necessary to make the load resistance nearly .5 megohm before the amplification will be 75% of the total gain possible. This applies to all frequencies, from the lowest audio to the highest radio frequencies used in present day broadcasting.

Impedance Coil Load

A very satisfactory way of wresting the amplification from the screen grid tube is to use an impedence coil in the plate circuit. This is applicable at all frequencies provided that the proper size choke coil is used. For broadcast frequencies a choke coil of from 85 to 250 millihenrys is suitable. For an intermediate frequency of 70 kc a choke coil of 1 to 5 henrys would be all right. And at audio frequencies the inductance might well be up to 1,000 henrys.

When the parallel tuned circuit method is used the impedance will usually be high as compared with the output impedance of the tube provided that the tuned circuit is of itself very selective. However, when the tuned circuit is thus connected into the hook-up the selectivity decreases very greatly. Even so the amplification obtainable with a screen grid tube and a parallel tuned circuit is very high, but the selectivity at best is mediocre.

Transformer Coupling

The use of the screen grid tube with transformer coupling at radio frequency is quite feasible, and not only that but it is almost necessary in order to get the required degree of selectivity out of the receiver.

Now if the coupling between a screen grid RF amplifier and a detector is a transformer of the type used for the general purpose tubes practically no gain will be obtained in the amplification, although the selectivity will remain satisfactory. To take the amplification from the screen grid tube it is necessary to use a large primary. The number of turns on the primary, in fact, may be quite high.

But it is not always desirable to use such a high primary on account of the lack of selectivity. If the selectivity is obtained elsewhere all is well, but if the intertube transformer is to contribute an appreciable part of the total selectivity it is better to sacrifice some of the amplification by using a smaller primary, but in no sense a skinny one, and gain selectivity. There will be amplification aplenty even if the number of primary turns is only ¼ as great as that of the secondary.

Selectivity Gained

When existing RF transformers and three circuit tuners are chosen for use with the screen grid tube it is because they have large primary windings. Those having only a few turns are absolutely unsuitable. The Hammarlund R23 three circuit

Flexible Wire Aids Receiver in Longevity

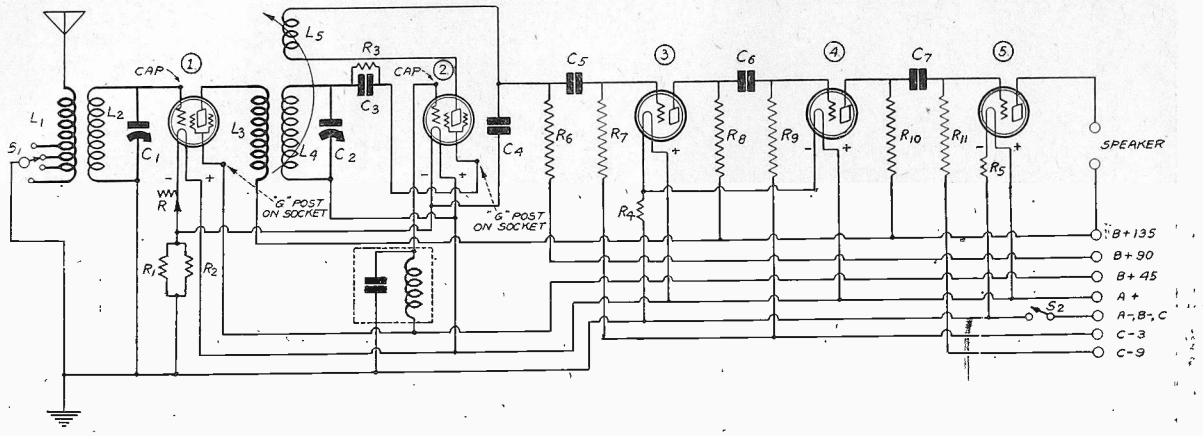
The use of flexible wire for connections is conducive to long set life and best operation, since such wire has a give to it, whereas stiff wire will break a joint, under pressure, if the joint is not as strong as the wire's resistance to bending.

Stiff bus bar is preferred by most purchasers of custom built sets, because so much of the wiring is in view that a better appearance results. Nowadays the underneath-the-subpanel method of wiring is growing in popularity, so that very few wires greet the eye.

Drilling, however, becomes quite an item.

Screen Grid 5 Receiver

rrest



THE RF CHOKE AND 1 MFD. CONDENSER IN DOTTED SQUARE ARE OPTIONAL IN THE L-H FIVE

LIST OF PARTS

L1, L2—One Hammarlund antenna coupler for HR23 (RF) .0005 mfd. condenser.

L3, L4, L5—One Hammarlund three circuit tuner HR23 for .0005 mfd. condenser.

C1, C2—Two Hammarlund Midline .0005 mfd. condensers.

R—One Carter 10-ohm rheostat with filament switch attached.

S1—One Carter four point inductance switch.

R1, R2—Two Type 25 Equalizors.

One Lynch Deck comprising: R3—One 2.5 megohm grid leak; R6, R8, R10—Three Lynch .1 megohm resistors; R7, R9, R11—Three .5 megohm Lynch grid leaks; C3—One .00025 mfd. Lynch grid condenser; C5, C6, C7—Three .006 mfd. Lynch isolating condensers; Five Eby sockets; One Subpanel.

Ten Eby binding posts.

All necessary clips.

Other parts not on deck:

Two Benjamin sub-panel brackets.

One 7 x 24 inch panel

Two Marco vernier dials.

Two type A and one F.

coil becomes a large primary coil by disregarding the center tap.

Additional selectivity, if necessary, may be gained by employing regeneration in the detector circuit and by coupling the antenna loosely to the first tuned circuit in the receiver.

The screen grid tube is a very effective detector when used before a resistance coupler and when employed as a space charge tube. Perhaps in this role the tube serves a greater purpose than when used as a screen grid amplifier tube.

A very effective receiver, such as the Lynch-Hammarlund Five, can be built by using two of the screen grid tubes as indicated in the preceding paragraphs. What should this receiver contain to be sensitive, selective and capable of high quality?

It should have a selective input tuned circuit with possibly an adjustable primary, as in L1, by means of S1. It should use a screen grid tube in the first stage with the various voltages suitably proportioned.

The screen grid tube should be followed with a three-circuit tuner with a large primary winding. The detector should be a screen grid tube operated as a space charge tube. The detector should be followed by a resistance coupler. The audio amplifier as a whole should be resistance coupled.

The receiver shown in diagram form in above meets with all of the conditions. The primary of the RF transformer L1L2 contains four taps, any one of which may be selected with switch S1. The primary used can be selected according to the needs.

Scott's Wiring Data On His 10-Tube Set

(*Continued from page 5*)

and some of it has run down into switch.

Wire No. 35. Connects B of R76 output transformer to the plug.

Wire No. 36. Connects lug on B of 1st B500 Selectone to plug. Note this connection carefully and make exactly as described.

Wire No. 37. Cover with spaghetti. Connect lug on B of B540 Selectone to wire No. 36.

Wire No. 38. Connects lug on By-pass condenser to wire No. 36.

Wire No. 39. Connects lug on By-pass condenser to wire No. 16.

Wire No. 40. Connects lug on F of B510 Selectone to plug.

Wire No. 41. Connects lugs on one side of By-pass condensers together.

Wire No. 42. Cover with spaghetti. Connects lug on centre of three-gang condenser to lug on G contact of 2nd RF tube.

Wire No. 43. Connects lug on By-pass condenser, lugs of B of both B520 Selectones B of both B510 Selectones and B of B500 Selectone between the two B510s.

Wire No. 44. See directions for wire No. 33.

Wire No. 45. Connects negative side of Voltmeter to wire No. 29.

Wire No. 46. Connects B of R200 to wire No. 25.

Wire No. 47. Connects B of R200 to wire No. 25.

Wires No. 48 and 49. Connects terminals of R76 output to tip jacks.

Wire No. 50. Connects lug on G of 2nd RF tube to lug on G of 1st B520.

Wire No. 51. Connects front lug of three gang condenser to wire No. 2.

Wire No. 52. Connects back end of three gang condenser to wire No. 7.

Wire No. 53. Connects No. 32 to cable plug.

Wire No. 54. Connects wire No. 43 to cable plug..

Wire No. 55. Connects yellow, green and black on cable plug.

The lug on other side of the 30 ohm rheostat should now be connected to end of wire No. 28.

The .0001 fixed condenser should now be soldered on, one side going to wire No. 28 and the other side to a lug coming up from P of 1st Det. tube.

Lug Connection

The lug from the F contact of the 2nd Det. tube should now be bent up. Solder one side of the 002 condenser to wire No. 28 and connect the other side by means of a short piece of wire to the lug on the P of 2nd Det. tube.

Next connect wire No. 57 to P post of the 1st R200 Audio transformer and bring it up through hole in baseboard and solder end to lug on one side of the Remler choke coil, soldering the other lug on choke to lug on the P of socket contact.

Wire No. 58. If you desire to use a 112-A power tube in the 1st stage of audio, cut wire No. 25 at point where No. 46 starts and run lead from wire No. 47 through to plug and connect at No. 58. Instead of running wire No. 26 to the lug on F side of the B510 Selectone, run it to contact at top of plug marked No. 56. Apply 135 volts through No. 58 and 9 volts C bias through wire No. 56.

(*This concludes the constructional article. Testing and operating data next week.*)

New Set Tunes in Stations with Switches

(Acme)

HARRY N. MARVIN, INVENTOR OF THE AUTOMATIC RADIO RECEIVER, OPERATING HIS RECEIVER. NOTE THE BUTTONS AND KEYS ON THE RECEIVER.

Harry N. Marvin, a former associate of Thomas A. Edison, recently demonstrated an automatic radio receiver in his home at Rye, N. Y. On this receiver stations are not tuned in by means of dials, but they are brought in by pressing buttons or turning levers. Thus WEAF is brought in by throwing one switch, WJZ by manipulating a second, WOR by a third, and so on. Provision has been made for ten different stations so that the operator of the receiver has the choice of any one of this number. Mr. Marvin contends that the average fan does not regularly listen to more stations.

But the receiver is not actually limited to ten local stations. By using the controls in the customary manner it is possible to tune in distant stations as well as local stations. It is only the automatic feature which is limited to ten.

While the new receiver was demonstrated in the inventor's home, it will not be demonstrated publicly until the Radio World's Fair, Madison Square Garden, September, 1928.

Mr. Marvin has been working for five years to perfect this invention. He declined to reveal the technical details to reporters.

Balloon Cloth Used In New Loudspeaker

By James H. Carroll

Contributing Editor: Associate, Institute of Radio Engineers

One of the first products developed by the Experimenters Radio Laboratories, 25 Church street, New York City, is a double diaphragm speaker made entirely of balloon cloth. It is the result of long research by Frank D. Mirabella, founder of the Laboratories. This speaker gives splendid tonal quality over the full range of frequencies.

In the march of radio progress, the loudspeaker has gone through some amazing steps. When radio reception first became popular the loudspeaker was in its raw stages of development, and the first speakers were of the wooden horn type. While people used them and liked them in their phonographs, they would not take to them for radio. Many materials, such as plaster, tin paper maché, etc., were used for horns, instead of wood.

Acoustics' Part

The old horn held sway for some time. Then came the paper cone, which gradually superseded the horn in favor. Meanwhile we had the cabinet type and console speaker with large tone chambers. The air column unit was supplemented by the pin and direct drive types.

Vibrating diaphragms then became the subject of experiment, and the appearance of a new, extremely light wood brought forth the flat wood diaphragm which gave a beautiful tone.

The single paper cone, the double paper cone, with and without baffles and damping means, all had, and have, their adherents. Silk, sheepskin, calfskin, leather, wood, rubber and even glass were tried out as vibrating media, with varying measures of success. The march of progress down to date has brought us to the era of the cloth speaker which is having the biggest run among home constructors to-day.

Engineers and experimenters had been working along these lines for some time, among them Mr. Mirabella and his colleagues In the search for efficient vibrating medium of highest tensile strength, yet of the requisite thinness and flexibility, they found balloon cloth superior.

Balloon Cloth Characteristics

Balloon cloth has inherent qualities of its own and special characteristics of its own. Mr. Mirabella said. While seeming thinner and more flexible than any similar cloth, it has been found under test to be stronger. It is not affected by climatic changes.

Its inherent shrinkage allows for quick adaptability to the atmosphere of the room. It gives a crisp response to every tone notwithstanding humidity. There is no dullness in response at any frequency. Under actual test it responded to the full range of useful frequencies with natural reproduction.

The medium having been chosen, the size of the diaphragms being figured accurately, the shape of the frame and the depth calculated and the speaker built, there remained the problem of the driving unit. Here, then, was another field of research which took time, thought and trial.

Many units were tried and finally the Ensco direct drive unit was selected.

The Birth of a Speaker

Thus, the Altone Speaker was born and those who recognize pure tone at once acclaimed this balloon cloth speaker.

The Ensco unit, being direct drive, gives great power and assures full range of audio frequencies, not only on moderately powered sets but also on power amplifiers. This means that the fan with a small set using only 90 volts can get fine reproduction as well as the one who is using a multi-tube set with a 112 or 171 and 135 or 180 or more volts on the plate.

For those who use the most modern in power, however, such as the 210 and the new 250 with high voltage up to 1,000 volts, single or push pull, the new electro-magnetic unit, just perfected and placed on the market by Clyde J. Fitch, used in conjunction with the Altone speaker, proves a combination most remarkable. An outfit like this works in a thrilling manner hard to describe. It casts a spell over the hearer.

Buys Many Fine Units for Exponential Horns

The N. Y. C. Radio Sales Co. has acquired several thousand large units made by one of the foremost manufacturers of air column reproducers. These were intended for an expensive console project which was cancelled and the enormous buying power of the N. Y. C. Radio Sales Co. enabled the acquirement of the entire lot which they intend to sell direct to the consumer at a great saving. These are modern units adapted to power or low voltage sets equally well and give fine results in the exponential, straight horn, or cabinet type speaker. This concern is going into the mail order business on a large scale, working with special buys of this type and is preparing a bulletin of these offerings which may be had on application to them at 2230 Ocean Avenue, Brooklyn, New York.

AC Tube Problems

By R. H. Manson

Chief Engineer, Stromberg-Carlson Company

Line Voltage Fluctuation and Filament Overheating Satisfactorily Solved, Says Manson, but Hum Elimination Usually Cuts Off Audio at 200 Cycles—Wild Advertising Claims Attacked

THIS year the public has in its mind the word "electrified," which when analyzed means that the receiver must take its operating power from the house lighting circuit, and preferably not contain any batteries or other devices which must require frequent inspection, test or adjustment.

Of course, from a technical standpoint, all radio sets are electrical, even to the crystal set, and the words "electric" and "electrified" as applied to radio receivers are rather far-fetched.

Some news writers have tried to define an "electric radio receiver" as one in which the power unit is an integral part of the receiver, and have the term "electrified" apply to a receiver in which the power is supplied by an external device that is not included in the receiver cabinet.

Some Advertisers "Misinformed"

Some advertisers are carrying this discussion to the point where an electric set is defined as one having nothing but AC operated tubes in distinction to DC operated tubes.

Then, in order to complicate the situation, some misinformed advertisers have the nerve to state that there is no power equipment used with its AC tube receivers.

Under the above conditions it is to be expected that the radio public is somewhat confused and in the frame of mind to accept something which is far from what they are expecting to obtain in these new AC type receivers.

Three Kinds of Current Supply

To begin with, all radio receivers using amplifying tubes must have three kinds of current supply for the three-element tubes:

1. A means of heating the filament for producing electron emission.
2. A high voltage direct current for the plate supply. This can be from batteries or from rectified and filtered alternating current source.
3. A biasing voltage for the grids of some of the tubes, which must be direct current, taken from batteries or from a rectified and very highly filtered AC supply.

Where Similarity Exists

With so-called DC types of tubes it is customary to use a direct current to heat or energize the filaments, and this can be taken from a battery or from rectified and filtered alternating current supply.

Now, it may be a surprise to the majority of the public to know that the highly advertised AC type tubes require the same type of plate and grid current or voltage as supplied to the DC tubes, and that the same type and capacity of apparatus must be used in both cases for these two supplies.

The main difference in the two types of tubes is in the current supply for energizing the filaments.

In the case of the AC tube the rather high voltage of the house lighting circuit is stepped down by a special transformer to rather low voltage, suitable for heating the filaments of the tubes.

Step-down Transformer

Thus there must be provided a piece of apparatus for stepping down the voltage and in some cases to provide three different voltages, as there are three types of tubes used in some of these AC tube receivers.

In addition to providing apparatus for obtaining the correct voltages for the filaments or heaters of these AC tubes additional apparatus must be provided in the power plant portion of the receiver or in the receiver chassis for balancing out the AC hum.

Audio Quality

The question is often asked why the new AC type tubes are not used in the higher priced receivers in which audio quality is the important consideration.

It is no secret that one of the serious limitations of the AC tube operation is that if the audio system is designed to allow the lower audio frequencies, below 150 cycles, to pass through the receiver and loudspeaker with the same intensity as the middle range frequencies that the alternating current hum would be unbearable and would make good reproduction impossible.

By starting to cut the lower frequencies at about 200 cycles (just below middle C on a piano) it is possible to make the receiver "dumb" to the 60-cycle frequency of the lighting circuit and the 120-cycle frequency (harmonic), which otherwise would come through with loud volume.

The Limitation

Until such time as these AC tubes or the systems using these AC tubes are perfected so as to allow the lower audio frequencies to be reproduced without the extremely loud hum it will not be possible to incorporate these types of tubes in the higher quality receivers.

The introduction of AC operated receivers has brought to light the fact that large voltage variations exist in most homes, and in many cases these variations are sufficient to prevent efficient operation of these new types of receivers.

In some of these receivers the large variations in voltage are manifest by changes in volume of the loudspeaker, or by the indications of a voltmeter or ammeter on the receiver panel.

In other receivers, in which neither the volume indication nor a meter indication are provided, the effects of the voltage variation are to shorten the life of the tubes.

Don't Overheat Filament

All of the new tubes using coated filaments are very efficient if worked below the rated voltage on the filaments or heaters; however, a slight excess voltage causes a big decrease in efficiency, and if this is continued the life of the tube will be reduced to a very small fraction of that obtainable when correctly voltaged.

Thus, we have a peculiar condition existing, that of the over-voltage in one case making itself known so as to be under control of the operator and in the other case gradually reducing the efficiency of the receiver and rapidly shortening the life of the tubes without any immediate indication.

B Battery Parallel

The question naturally suggests itself as to whether the over-voltaging of the new AC tubes and other coated filament tubes is not similar to the results we have all experienced with the gradual wearing out of the dry cell B batteries.

The first day these batteries are installed we get maximum performance. Each day the output drops, and after a certain number of hours the batteries have to be replaced. If we over-voltage these new AC tubes the matter of replacements will be merely that of a different kind of material or apparatus and the frequency and cost of replacements may be about equal to that of dry cell B batteries.

This all leads us up to what the next development will be, as the voltage variation factor is one which seems to be a limiting one.

A Satisfactory Help

Voltage regulators or compensators have been provided in some types of radio sets and service as a satisfactory means for overcoming fairly large variations in voltage. Recent developments in these voltage compensators provide devices which will operate without ballast tubes, condensers, liquids or other objectionable apparatus, and which will allow these new AC type receivers to function satisfactorily on circuits which otherwise would not be suitable.

It is interesting to note here that the power companies are not at fault for all voltage variations.

Incidental Causes

In some cases the wiring in the building is not adequate to handle all of the electrical devices connected to the circuits.

Thus, when one of the big current consuming devices is turned on, the voltage of this circuit as well as other circuits in the house are changed.

Then there are cases where the original service wires or drop wires from the pole line to the house are overloaded by the adding of electric heating devices, electric motors and other heavy current consuming equipment, which was not contemplated when the original electric light service was connected by the power company.

Have Wiring Inspected

In all of these cases great improvement can be obtained by having the house wiring inspected and reenforced where necessary to take care of large current drains. In some cases the outside circuits must be reenforced also.

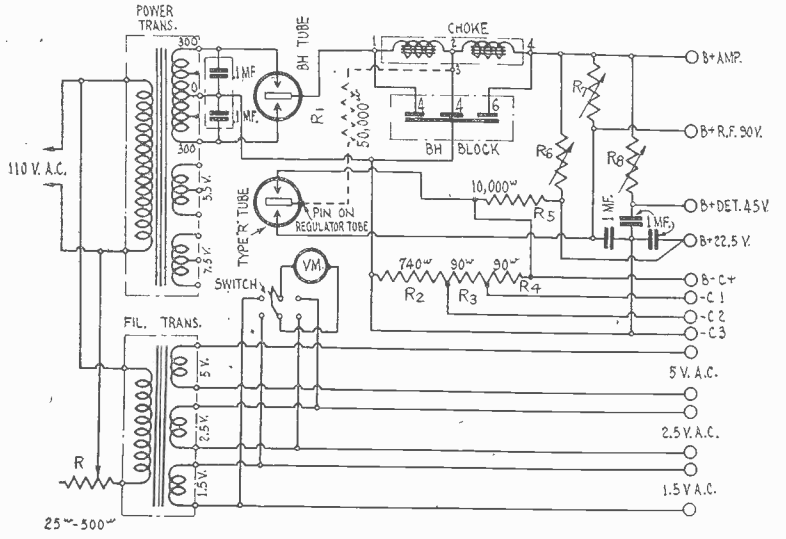
NEW NAME FOR DAVEN

W. H. Frasse, president of The Daven Radio Corporation, who is now in the South on a six months' vacation, announced the corporation will hereafter be known as The Daven Corporation.

JEFFERSON IN MERGER

The Jefferson Electric Mfg. Co. and the Chicago Fuse Mfg. Co., have consolidated. The new organization will be known as Chicago-Jefferson Fuse & Electric Co., with offices at Laflin and 15th Streets, Chicago.

A Power Plant



SCHEMATIC DIAGRAM OF THE WIRING

DC Sets May Be Adapted to Such Use with Aid of a Harness and the A and B Supply Described Herewith

By Perry S. Graffam

AC. adapter harnesses are attracting attention at present as they make it possible to convert one's tuned radio frequency set into a modern AC tube job without any changes in wiring. An excellent harness is the Carter, designed for use with an AC filament transformer which gives the three voltages common to the 26 and 27 type of tube including the power tube, i.e., 1½, 2½ and 5 volts.

As long as we are going into the elimination of the A battery why not combine this with a B eliminator and make a single job for the complete electrification of the set?

The writer has designed a power supply unit which does this exactly, a complete A, B and C eliminator to work with the 26 and 27 type of AC tube. This gives four B voltage taps, three C bias taps and three filament lighting taps. Such a unit can be used with the Carter harness or one can rewire their set and use this unit.

Line Voltage Stabilized

In the design of this unit it was decided that flexibility must be a feature if the utmost efficiency was to be obtained. Since one is making a custom built supply he may as well spend a little extra money and have the type of unit which could not be obtained commercially, since commercial production practice forbids the incorporation of such features.

Working along these lines a means is supplied for controlling the various filament voltages by the connection for line voltage fluctuation on the input side of the filament transformer. This is accomplished with a power Clarostat which is connected across the primary of this transformer. Any line voltage fluctuation may thus be compensated for and the filaments will receive the exact voltage they require.

On the National main power transformer used in this supply unit, two filament lighting taps are left unused but are available in case one cares to use a power tube such as the L-10 Ceco or other —10 tube.

Available for —50 Tube

The new —50 power tube will handle the same amount of energy as a —10 with only 250 volts of B and it uses this voltage tap for lighting its filament. Since the National B supply unit incorporated in this device will give nearly that top voltage, ths tube may be adapted to one s set with this A, B and C unit.

After the AC has been stepped up to a high voltage by the transformer the current is rectified into direct current by a BH tube. A certain amount of AC ripple still exists after rectification takes place and this is ironed out by the chokes coils and condenser block.

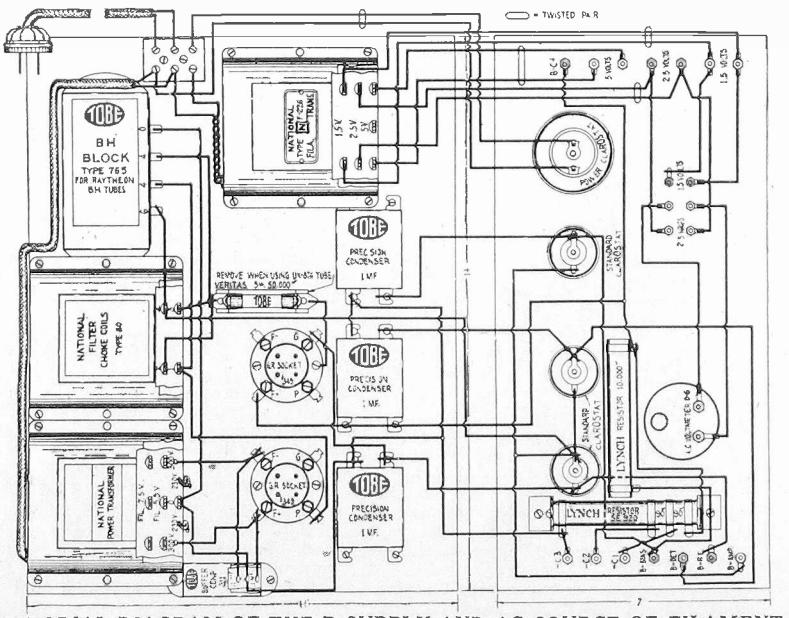
We now have a source of high voltage and need only make arrangements for tapping off at the points where certain voltages are desired. This is obtained through a series of Clarostats and a fixed resistance.

Function of Regulator Tube

An important point is the maintenance of the RF voltage at a given point and this is insured by use of a Raytheon regulator tube, or an 874 or 374. When the 874 or 374 type is used the 50,000 ohm resistance R1 shown in the diagram by a dotted line may be omitted.

Switch Controls Meter

The connection for this resistor is made to one of the mounting screws on the socket, the actual contact with the brass pin on the side of the tube being achieved by fastening a piece of spring on this socket mounting screw so that it will



PICTORIAL DIAGRAM OF THE B SUPPLY AND AC SOURCE OF FILAMENT HEATING FOR THE NEW AC TUBES

LIST OF PARTS

R—One 25 to 500 ohm power Clarostat.
R1—One Tobe Veritas 50,000 ohm resistor.
R2, R3, R4—One Lynch resistor type SE-920.
R5—One Lynch 10,000 ohm resistor.
R6, R7, R8—Three standard Clarostats.
One National filament transformer (1½, 2½, 5 volts), Type F-226.
One National power transformer.
One National filter choke, Type 80.
One AC voltmeter, 0-5 or 0-6 volts.
One Tobe BH condenser block.
Three Tobe No. 301 1 mfd. filter condensers.
One pair Tobe No. 311 buffer condensers.
One BH Raytheon rectifying tube.
One Type R Raytheon or one 374 or 874 voltage regulator tube.
Two General Radio UX-349 sockets.
Fourteen Eby binding posts.
Fifty feet flexible Celatsite wire.
One Celeron 7x14 inch panel.
One 11x14 Baseboard.
One double pole, double throw switch.

For AC Operation

press against the pin when the tube is inserted in the socket.

The AC voltmeter is controlled by a switch so that it may be thrown in or out of the circuit as the constructor may desire. This switch is so arranged that it permits a correct reading on either the 1½ or 2½ volt lines.

Obtain a piece of smooth board 11x14 inches for the subbase. The transformer, chokes and condensers are mounted as shown in the photographs. The front panel is a piece of Celoron 7x14 inches. The B supply binding posts are mounted to the left and the AC voltages at the right. The meter is at the left of center and the double pole, double throw switch at the right of center. The four Clarostats are mounted in line directly below. The two Lynch fixed resistors (R2, R3, R4, single unit, and R5) are mounted on the back of the subpanel.

Use Flexible Wire

We now have apparatus mounted on a subbase and front panel and each section may be so wired separately, sufficient length of wiring being left on the connections of the front panel to reach the parts on the subbase.

The wiring of the unit is made easier with the aid of Acme flexible Celatsite wire, which comes in varous colors (red, black, yellow, salmon, green, blue, etc.). The leads from the filament supply transformer should be pared and twisted together. Choose a different color for the 1.5 volt, 2.5 volts, etc. In this way any connections can be easily verified.

The leads from the B supply terminals to subbase may all be bunched together and then sewed into a small cable with No. 6 waxed linen cord.

The B voltages and AC voltages have been described. A word about the C voltages is also necessary. The Lynch SE resistor is in series with the B— return of the unit and when a drop in voltage resistor is caused by the set drawing plate current, a voltage will be available for use as minus C voltage as required, C1 giving about 4.5 volts, C2, 9 volts and C3, 40.5 volts..

The Final Audio Tube

Nothing has been said about why an AC tube was not required in the last audio stage. The reason is that the present power tubes may be operated either on DC or AC voltages and have the desired amplification constant necessary for the last stage of audio.

After completing the wiring of the National power unit, the next step is to test out the unit thoroughly.

Place a BH tube in the rectifier socket and a type R or 874 in the regulator socket and connect to the house supply. The glow tube should burn a pinkish color.

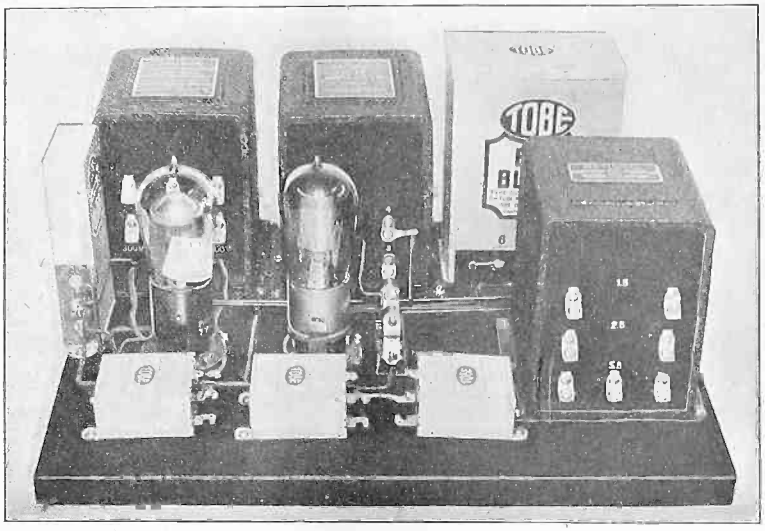
By means of the switch you may check the 1.5 and 2.5 volt AC supply and if the AC meter used is 0-6 volts you can check your 5 volt supply by means of two wires connected from the 5 volt post and connected across the middle post of the double pole switch.

Be sure the switch is in open position.

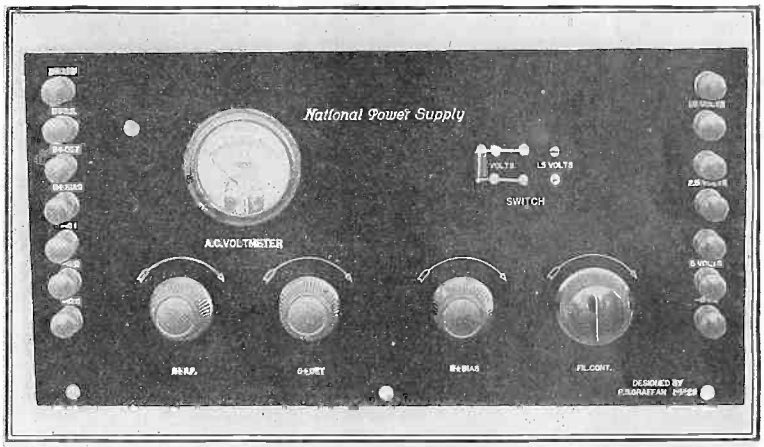
To test out the B voltages a 0 to 300 DC meter is required.

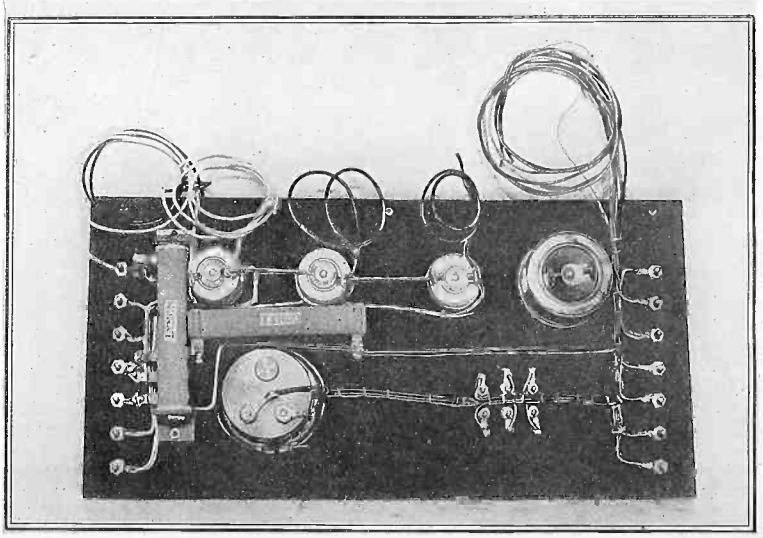
Adjust the various Clarostats to the various voltages required. It is not possible to measure your C minus voltages unless unit the set is in use of a load has been placed across the B minus and B plus leads. This requires an additional meter and may well be omitted.

For a closed circuit test, connect your DC voltmeter across the B plus and C1, C2, C3 posts respectively and a reading will be observed.



HOW THE COMPLETED POWER PLANT LOOKS





FRONT AND REAR VIEWS OF THE FRONT PANEL

B Voltage Versatility

By Billy Honduras

THE screen grid tube has put a new demand on B battery eliminators. This new demand is not so much one for more current as it is for a variable output voltage suitable for application to the screen grid or to the space charge grid.

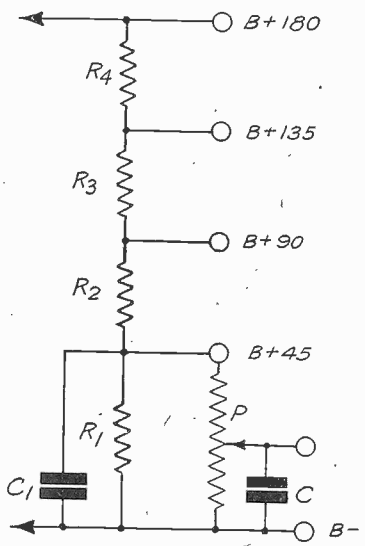
The screen grid voltage centers around 45 volts when the plate voltage is 135 volts. But in order to get the maximum effectiveness of the tube it is desirable vary the screen grid voltage. The optimum value may lie below 45 or above.

The space charge grid (inner grid when tube is used as space charge grid tube) centers around 22½ volts, but for greatest effectiveness it should be varied until the optimum value is found. This may be higher or lower than 22½ volts.

How can these voltages be obtained from a standard B battery eliminator in which there is no provision for the extra and variable voltage? That question frequently arises, and will arise much more frequently in the future unless the solution is given wide distribution immediately.

Variable Voltage Obtained

The solution is very simple and can be applied to any eliminator in a few minutes. At this time there are high resistance, wirewound potentiometers available. They can be used for the purpose. Suppose we wish to connect one of these, say one of 10,000 ohms, to a B battery eliminator so that any voltage value between zero and 45 may be obtained. Fig. 1 shows the connection. The potentiometer P is connected between the minus B binding post and the plus 45 post on the output strip on the B battery eliminator. The screen grid is then connected to the slider on the potentiometer and the slider set to the voltage value desired.



CIRCUIT SHOWING HOW TO GET VARIABLE INTERMEDIATE VOLTAGE FROM A STANDARD B BATTERY ELIMINATOR

When the extra resistance P is connected across the resistance R1 the voltage will drop slightly but not enough to affect appreciably the tubes connected to the 45 volt binding post. The value of 10,000 ohms was used to minimize this drop.

Higher Voltages

If the resistor R1 is accessible it may be replaced by a potentiometer of the same resistance value. For example if R1 is a 2,000 ohm unit then the resistance of P should also be 2,000 ohms. But the quickest way is to connect the high resistance potentiometer across the existing R1.

Now if the optimum voltage for the operation of the screen grid tube is higher than 45 volts it can be obtained by connecting the high resistance potentiometer across the 45 and the 90 volt posts on the B battery eliminator. The voltage between the slider and the minus B binding post will be some value between 45 and 90 depending on the position of the slider.

The knob on the potentiometer could be placed in an easily accessible position if desired so that it could be used as a volume control.

A by-pass condenser C should be connected between the slider and the negative side of the line as shown, but this condenser should be put as close to the tube and screen grid as possible and not in the eliminator. Its size would depend on the frequency at which the tube is operated. If at radio frequency the condenser might be .01 mfd. or more and if at audio frequency it might be 4 mfd. or more.

Remote Volume Control Gains Popularity

Radio joy is great or small, according to how the set is used. There are many homes in which radio is going full blast—and to pieces all conversation, reading, card playing, eating, dozing and other activities.

Yet the use of a suitable volume control, especially if arranged for remote operation, will change any radio set from a curse to a joy, by fitting a given program to any occasion. From dance music for shuffling feet to incidental music for the background of the dinner conversation, the radio rendition may be fitted to the occasion by means of a suitable—and handy—volume control.

Whether or not your set has a built-in volume control, there is decided advantage in providing it with a remote volume control. This function should be at your finger tops, so that whether you are holding a conversation, reading, dozing or doing anything else, you may instantly regulate your radio volume for the occasion, without having to get up and walk over to the set. For instance, you may be enjoying a radio program merely as a background to conversation or reading, when suddenly the program takes a turn and the subject matter becomes one of prime interest. Instantly the volume may be increased, and the radio feature fills the room and centers attention, only to be subdued when the program drops back again into secondary interest. Lack of volume is just as disagreeable when the radio feature is the center of interest, as excessive volume when the radio feature is of secondary interest. By having the volume control at your finger tips, however, the radio rendition is always ideal for the circumstances.

There are several methods of adding a volume control to the radio receiver, whether it be battery-operated or A-C operated. The simplest, generally, is to shunt a varjable high resistance across the antenna and ground terminals of the receiver. This method is proving highly satisfactory with sets employing the latest A-C tubes, and is more desirable than alternating the filament or heater current.

IN THE March 3 issue you described how to sew up a cable so as to hold the different conductors in the cable together. Could you illustrate in a diagram how this is done?—EDWARD TOWERMAN, Baltimore, Md.

Fig. 1 shows how the loops are thrown around the cable—first under from the right hand side, then over from the left hand side, and finally through the loop in the direction the sewing is done.

FIG. 1
THIS SHOWS THE PROPER WAY OF SEWING A CABLE. EVERY INCH OR SO A KNOT IS THROWN AROUND THE BUNDLE OF WIRES.

Another method is to place a variable high resistance across the secondary of the first audio transformer, although this method mellows the tone and therefore affects the tone as well as the volume. A third method is to shunt a variable resistance across the loud-speaker, which is often the most convenient for remote operation.

Few radio enthusiasts realize the enjoyment which comes from having their set under control by means of remote volume control. The loud speaker rendition may be controlled from the dining table, the bridge table, the easy chair, the davenport, the sick-room table—anywhere you may choose. If the house is wired for radio to allow the use of loudspeakers in any room, the volume control may be plugged into the same wiring or the volume control may be connected to the loud-speaker cord.

In addition to volume, there is also the question of pitch or tone control Some features, such as speech, distant music, jazz and band selections require extreme sharpness for satisfactory rendition. The usual loudspeaker generally provides this extreme sharpness. On the other hand, certain other features sound better if muted or dulled, just as certain piano selections sound better with the soft pedal. For such selections it is well to employ a radio "soft pedal," consisting of a variable high resistance in series with a ¼ mfd. condenser, the combination being shunted across the loudspeaker, so as to obtain any degree of "soft pedalling."

Radio University

A FREE Question and Answer Department conducted by RADIO WORLD for its yearly subscribers only by its staff of Experts. Address Radio University, RADIO WORLD, 145 West 45th St., New York City.

When writing for information give your Radio University subscription number.

I HAVE purchased a —50 power tube for use with my high power eliminator, from which I can get any desired voltage between 200 and 500 volts. Will you kindly publish curves showing what the normal plate current in milliamperes and the maximum undistorted power output in watts should be for various plate voltages.

AMOS BRACH,
Zanesville, Ohio

(1)—The curves in Fig. 609 give the information you ask for. The longer curve of the two is the power curve. The power in watts is obtained by dividing the plate current reading by 20. Thus at 100 the longer curve reads 5 watts.

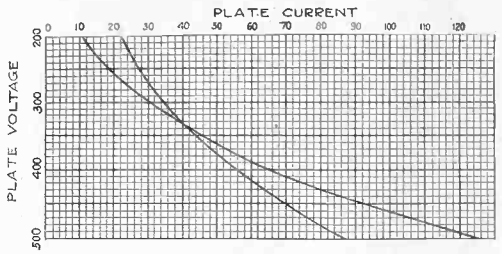


FIG. 609

TWO CURVES SHOWING THE PLATE CURRENT IN MILLIAMPERES AND THE OUTPUT POWER IN RELATIVE VALUES FOR VARIOUS PLATE VOLTAGES IN THE NEW —50 POWER TUBE. THE SHORTER CURVE IS THE CURRENT CURVE. THE OUTPUT POWER AT 450 VOLTS ON THE PLATE IS NEARLY 5 WATTS.

* * *

WHY IS IT necessary to use a high resistance voltmeter for measuring the output voltages of a B battery eliminator?

(2)—Is it not possible to put a high resistance in series with a low resistance voltmeter and thus improvise a high resistance voltmeter?

(3)—What is the essential difference between a high resistance and a low resistance voltmeter?

CLARENCE CHATTERTON,
Des Moines, Iowa.

(1)—A low resistance voltmeter takes too much current to operate, and this current causes the voltage of the B battery eliminator to drop. The meter may take as much current as the entire set. In that case the voltage indications may be down 50% of the actual voltage when the meter is not connected.

(2)—No, that would not lead to the desired results. It would simply reduce the reading on the meter for a given voltage. That is, it would extend the range of the voltmeter. But for a given deflection of the needle the current through the voltmeter would be the same as before.

(3)—The essential difference between a high and a low resistance voltmeter is the sensitivity of the moving mechanism. A high resistance voltmeter gives full deflection on a very small current, while the low resistance meter requires a comparatively high current for full deflection. A meter having a resistance of 50 ohms per volt takes 20 mills for full deflection and a meter having 1000 ohms per volt takes only 1 mill for full deflection.

* * *

IS IT PRACTICAL to build a portable Super-Heterodyne using the screen grid tube?

(2)—If it is, will you show how?

(3)—Is the screen grid tube a good amplifier in a resistance coupled receiver? If so, how should it be used?

DILWORTH PRENDERGAST,
New Orleans, La.

(1)—It is when the receiver will not receive rough usage.

(2)—That will be shown in a near future issue.

(3)—It is very good for this purpose, but it overloads quickly. It should be used as a screen grid amplifier with 135 volts or more on the plate (not G. of) and 45-volts on the new grid post. (G. of socket). The latter voltage should be varied for best results. The cap grid must also have a grid bias of about 3 volts.

* * *

I BUILT an 8-tube Super-Heterodyne receiver exactly as you described it yet I cannot get a thing from it. I have checked everything and I am sure that the wiring has been done all right. I used an old loop which I had on hand. Do you suppose that this is the cause of my trouble?

(2)—I am using an old B battery eliminator on the set. This eliminator gives fine results on my four tube Universal so that I know that it is all right. Could it be that the eliminator and the Super are not matched?

FREDERICK W. OTT,
Harrisburg, Pa.

(1)—The old loop may not be just right but it is not the cause of the trouble. You should get some results on any loop.

(2)—You may call it lack of matching if you wish. Probably the eliminator you have cannot deliver all the current the circuit needs and at the same time keep up the voltage. The voltage on the oscillator is not enough to make that tube function. Boost the voltage and your troubles will end.

* * *

WILL YOU show in a simple diagram how the field winding in an electro-dynamic or an electro-magnetic loudspeaker can be used as one of the choke coils in the B battery eliminator filter?

EMORY C. DILLINGHAM.
Honolulu, T. H.

See Fig. 610. L2 is the field coil.

* * *

CAN THE fuelless motor which is supposed to have been developed in Pittsburgh be used to furnish power to a portable radio receiver? If it can, will you please give the details?

AMATO CUNEO,
Brooklyn, New York.

No, the flurry will probably soon blow over. The earth's magnetic field is a force, not energy. You need energy to operate your set.

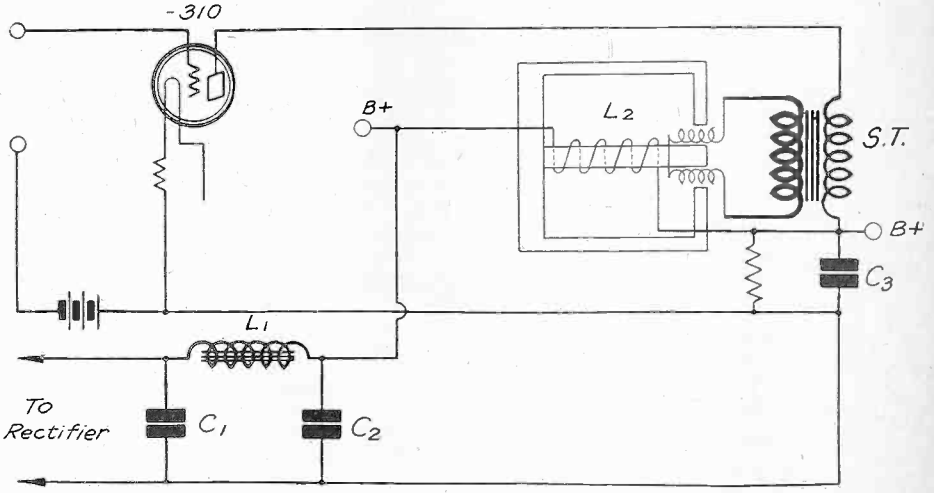


FIG. 610

CIRCUIT REQUESTED BY EMORY C. DILLINGHAM.

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Have your name entered on our subscription and University lists by special number. Put this number on the outside of the forwarding envelope (not the enclosed return envelope) and also put at the head of your queries. If already a subscriber, send $6 for renewal from close of present subscription and your name will be entered in Radio University. No other premium given with this offer.

[In sending in your queries to the University Department please paragraph them so that the reply can be written under or alongside of each query. Write on one side of sheet only. Always give your university number.]

RADIO WORLD, 145 West 45th Street, New York City.
Enclosed find $6.00 for RADIO WORLD for one year (52 nos.) and also enter my name on the list of members of RADIO WORLD'S University Club, which gives me free information in your Radio University Department for 52 ensuing weeks, and send me my number indicating membership.

Name .....

Street .....

City and State .....

RESULTS

EDITOR RADIO WORLD:—

May I take this opportunity of expressing my satisfaction in the operation and the results obtained from the Adams 1-2-3 Super Heterodyne receiver, described in February 11 issue, by Dana Adams. It is one of the most sensitive receivers.

My poor location, with four powerful local stations just across the river from me and my aerial not the best in the world, nevertheless enabled results that not only surprised me but every one else who has heard the set.

I am giving you below a copy of my radio log up to the time I got tired of keeping account of the stations. All of these stations, including forty local stations not in the list, were received between the hours of eight and eleven p.m., with all local stations on the air, with loudspeaker volume, using a Silver Marshall 660-171A Unipac as a source of current supply.

WIOD Miami, Fla.	CNRM Montreal, Can.
WSB Atlanta, Ga.	WMBF Miami, Fla.
WTAS Batavia, Ill.	WORD Batavia, Ill.
WMBB Chicago, Ill.	KYW Chicago, Ill.
WEBH Chicago, Ill.	WCFL Chicago, Ill.
WGN Chicago, Ill.	WEDC Chicago, Ill.
WIBO Chicago, Ill.	WHT Chicago, Ill.
WLIB Chicago, Ill.	WJAZ Chicago, Ill.
WBBM Chicago, Ill.	WLS Chicago, Ill.
WJJD Mooseheart, Ill.	WOK Chicago, Ill.
WOC Davenport, Ia.	WCBD Zion, Ill.
WHAS Louisville, Ky.	WHO Des Moines, Ia.
WBAL Baltimore, Md.	WFIW Hopkinsville, Ky.
WJR Detroit, Mich.	WBZ Springfield, Mass.
WCX Pontiac, Mich.	WWJ Detroit, Mich.
WMOX St. Louis, Mo.	WCCO St. Paul, Minn.
WPG Atlantic City, N. J.	KSD St. Louis, Mo.
WOAX Trenton, N. J.	WCAM Camden, N. J.
WMAK Lockport, N. Y.	WGR Buffalo, N. Y.
WGY Schnectady, N. Y.	WHAM Rochester, N. Y.
WHAZ Troy, N. Y.	WFBL Syracuse, N. Y.
WKRC Cincinnati, Ohio	WADC Akron, Ohio
WTAM Cleveland, Ohio	WLW Cincinnati, Ohio
WHK Cleveland, Ohio	WEAR Cleveland, Ohio
WEAO Columbus, Ohio	WAIU Columbus, Ohio
WCAU Philadelphia, Pa.	KDKA Pittsburg, Pa.
WLIT Philadelphia, Pa.	WFI Philadelphia, Pa.
WSM Nashville, Tenn.	WCAE Pittsburg, Pa.
WSAZ Huntington, W. Va.	WRVA Richmond, Va.
	KOA Denver, Colo.
WWNC Ashville, N. C.	WTIC Hartford, Ct.
WDRC New Haven, Ct.	WNAC Boston, Mass.
WEAN Providence, R. I.	KTNT Muscatine, Ia.
CFRB Toronto, Can.	CKAC Montreal, Can.

J. R. ALLEN,
622 West 179th St., New York, N. Y.

* * *

EDITOR RADIO WORLD:

I have constructed the Adams 1-2-3 and have had it working since then. I have not had time to put up an antenna. The antenna my set is working on is an improvised one that amounts to something akin to nothing, merely to satisfy some that I could get WEAF and some local music.

The following list will no doubt show what this makeshift rig has done, and that your claims have not been represented extravagantly. I, for one, stand ready to bock you in your claims plus the confidence that I will receive a great deal more with a real aerial. All local stations in New York and vicinity have been received. While the locals were on during the hours of 6 p.m. to 12 p.m., I have logged the following stations (without interference)

KDKA, WRVA, WAIU, WBBM, WBZ, WBZA, WCDD, WCX, WDAF, WOK, WFI, WLW, WGN, WGY, WHAM, WIP, WJJD, WJR, WLIB, WLIT, WLS, WLBW, WIOD, CFCA, WOO, WPG, WSAI, WSB, WSM, WTAM, WWJ, and WJBC.

Between 12 p.m. and 1 am. I have logged KMA, WSUI and KHJ at 12:45 p.m. with real good loudspeaker volume.

The 1-2-3 has IT, and by that I do not mean maybe.

LEON I. REBHUN,
Care American Blank Book Mfg. Co.,
150 Lafayette St., N. Y. City.

* * *

EDITOR RADIO WORLD:

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I am giving you below a copy of my radio log up to the time I got tired of keeping account of the station. All of these stations, including forty local stations not in the list, were received between the hours of eight and eleven P. M., with all local stations on the air, with loud speaker volume, using a Silver Marshall 660-171A Unipac to supply the current for the receiver.

J. R. ALLEN:
622 West 179th St.,
New York, N. Y.

Expert Pays Tribute to Audio's Advance

By Prof. Paul G. Andres

Chief Engineer, Temple, Inc.

The audio frequency amplifier, because of its application not only in radio receivers, but also in telephone repeater circuits, phonograph reproduction, broadcasting and other uses, has received intensive study.

The three forms of audio amplifiers, resistance, impedance and transformer coupling, together with modifications have vied with one another for supremacy with high quality reproduction as the primary goal.

Transformers Larger

The consumer's demand for better and better quality has brought about the use of larger coupling transformers with more perfect reproducing ability, particularly on the low end of the frequency spectrum.

Tuned impedance coupling circuits have been developed which give the coupling device characteristic a decided gain on low frequencies and permit a gain on the high frequencies to obtain a more uniform sound output with the given speaker.

Distortion Causes

The causes of distortion in the audio frequency amplifier may be summarized as follows: Coupling circuits having more or less resonant characteristics; regeneration; operation too near either of the bends of the tube characteristic; overloading of tubes; frequency discrimination in the output filter or transformer.

Resonance effects in coupling devices are invariably present in audio frequency amplifiers due to self capacity of the winding.

The tendency has been to minimize their effect by throwing them either below or above the audio frequency range.

Question of Space

Space requirements in the modern set have made close placement of equipment imperative which in many cases has resulted in regeneration, causing certain sections of the overall response characteristic to show decided gain. Regeneration in the audio system is one of the bugbears of the designer. It is caused primarily by coupling between stages and also by common impedance in the plate circuit. The use of B battery eliminators unless properly designed aggravates this condition.

A common offender in audio circuits in preventing high quality reproduction consists in operating the tubes to near either of the bends in the grid voltage plate and current curve, that is, the C bias is incorrect.

Depends on Plate Voltage

The proper value of bias is not a definite value for any given tube, but depends on the plate voltage.

Current supply devices operated from socket power have aided materially in maintaining the plate potential at the proper and fixed value with a definite grid bias depending on that plate potential.

The development and application of power tubes within the last year or two have largely removed the limitations of overshooting the straight part of the amplifier tube with a strong input signal.

Quality Increased

The gain produced by these tubes in improving quality of reproduction is primarily noticeable on low frequencies. In this connection it may be mentioned that the linear part of the tube characteristic is dependent on the output impedance and hence the output circuit should be designed to operate most efficiently in conjunction with the tubes.

Push pull amplification previously used in a limited way has been extensively revived recently; the advantages of this type of amplification for the last audio stage are numerous. It permits a greater input signal before overloading of the tubes occurs and in this way gives an undistorted output considerably in excess of twice that of the single tube.

Low Impedance

The impedance of the combination is low which has some advantages when operating into the present day loudspeaker. In addition to this, this type of amplification can be used to advantage on socket power operated sets and amplifiers, since hum is reduced to a minimum.

The use of power tubes calls for a speaker filter or output transformer to keep the plate current from flowing through the loudspeaker winding, causing saturation effects and possible burn-outs of the speaker windings.

Like a Power Transformer

The output transformer in this case closely approximates that of the conventional power transformer with the provision that it should pass the entire audible frequency band without modification. This condition has been achieved by the large output transformers now on the market.

The complete isolation of secondary from primary is advantageous in preventing high voltages which may reach values in the neighborhood of 400 to 500 volts from being connected to the loudspeaker.

The speaker filter consisting of a choke and condenser offers another solution to the problem particularly in those cases where the plate potentials are low or where the speaker is located in proximity to amplifier. It has an excellent frequency characteristic.

—From "The RMA News"

Excess Voltage Used for Getting C Bias

With the use of the more recent rectifier tubes, such as the Raytheon BH in place of the old B type, and the 280 filament rectifier in place of the 213, there is usually a higher voltage obtainable from the B power unit than is required for the operation of the —71 type power tube.

The output voltage, with the average current drain, may often run as high as 220 volts, or 40 volts higher than is required for the maximum safe operation of the —71 power tube. This being the case, a C battery eliminator or grid-biasing tap is not only desirable in connection with the radio power unit, but is actually a precautionary measure, since it reduces the total voltage available to safe limits.

The C bias is obtained by removing the A+ or A— connection from B minus and inserting between these leads a Clarostat, across which is connected a 4 mfd. or 6 mfd. condenser to protect low-note reproduction. Variable bias is thus obtained. Turn the knob until an ear test discloses the correct setting.

Table Model Clarostat Is Put on the Market

Providing precise variable resistance in the form of an accessory rather than as a radio part, together with sufficient current handling capacity for reliable and long-life operation, the Table Type Clarostat has just been placed on the market.

It comprises a micrometric variable resistor of from zero to 500,000 ohm range, mounted in a metal stand, together with two flexible conducting cords provided with standard cord tips as well as a connection block to take the usual loud-speaker cord tips. The metal case is finished in nickel and bronze, with a bakelite knob. The bottom is provided with a soft felt pad.

It may be employed as a volume control for electric phonographs. It may be used in connection with AC tube harness. It may be applied in many experimental and laboratory set-ups.

Tuned in Australia, Worcester Man Reports

Worcester, Mass.

Anthony Reno, a radio enthusiast of this city, tuned in his six-tube receiver at 5:25 o'clock one morning and listened to radio broadcasting taking place at 8:02 o'clock in the evening of the same day in Sydney, Australia.

Reno said that he heard distinctly the Australian announcer say "2 FC, Sydney, Australia." The program from Sydney included vocal numbers .

CROSLEY WINS CONE SUIT

That the Crosley Musicone, a loud-speaker, does not infringe upon the patents of the Lektophone Corporation of New York City, was the finding in U. S. District Court by Judge Smith Hickenlooper in Cincinnati.

NEW CORPORATIONS

De Leo & Donati Radio and Electric Corp., North Pelham, N. Y.—G. M. Fanelli, New Rochelle, $20,000.

W. J. K. Radio Fans League, Buffalo, N. Y., radios—A. C. Ueck, Buffalo.

Robbins Radio Co.—W. R. Altman, 291 Broadway, N. Y. City, $20,000.

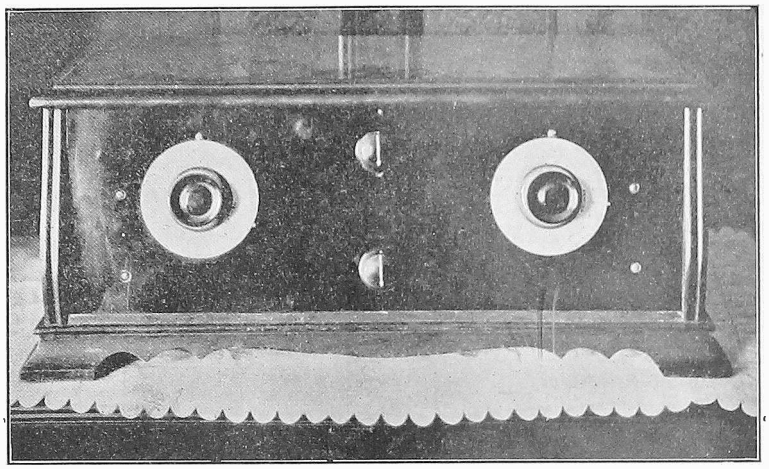
Sanford Radio Corp.—D. L. Spurg, 7 East 42d St., N. Y. City, $50,000.

York Laboratories, radio sets—B. Barondess, 1440 Broadway, N. Y. City.

Hartley, radio service—A. B. Samuels, 120 Broadway, N. Y. City, $10,000.

TRF Set Converted to Super-Heterodyne

By Tim Turkey



THIS IS ANOTHER OPTIONAL FRONT FOR THE SUPER

[*This article, begun last week, March 17, is concluded herewith.*]

Last week you saw diagrammed three intermediate coils M1, M2, M3. There are TWO stages, I said, and that stands. The third coil merely couples the second intermediate stage to the second detector tube (socket 4 to socket 5) and that's that.

At the second detector output is a radio frequency choke coil, inductance value what-have-you, and with two condensers connected in series with each other and maybe in parallel with the coil L. I said maybe because it's an engineering conundrum and nobody in the First knows the answer, so neither do I. It depends, I suppose on your eyesight. If you are myopic, then C8 and C9 are in series with each other and with the choke coil L—the three are links in a roundhouse chain. That's the tuned circuit idea, and there's something in the nature of a tuned circuit there, you can bet.

If you're astigmatic, then looking out of the plate circuit C8 is in series with LC9 combination. If you suffer from myopic astigmatism I don't know what to say.

Photographs "Tell All"

The first stage is resistance coupled, because that's a fine sort of audio coupling, and the volume is plentiful for the input to the transformer stage.

You use what tubes you have—assuming of course a power tube goes in the last stage. If the power tube is of the 71A type, or larger, or has more than 135 plate volts at the source, you'd better put some sort of coupling device, either condenser-choke or output transformer—at the phone tip jack points (PT), instead of connecting direct to speaker.

How I rebuilt an old set into the diagrammed design was shown in the photographs. You may use this general outline, if you desire, or follow your own, if you've one better. Going me one better seems to be other people's choice delight. More power to 'em, say I, especially on the last tube.

The front panel will show the tuning dials and the two volume controls. The one marked R3 in the diagram is the lower one at center of the front panel. The one marked R7 has the switch S attached to it, which to my mind is a good plan. But the set will work just as splendidly if the switch is entirely separate, physically as well as electrically, from the audio volume control, believe it or not.

A few words of caution: If you use coils designed for .0005 mfd. tuning, please use condensers with .0005 mfd. maximum capacity. Don't use .00035 condensers with .0005 mfd. type coils and then write me that the set is fine, but it doesn't tune in anything above 425 meters! And don't use .00035 mfd. condensers coils with .0005 mfd. condensers, and tell me that all the stations are crowded over the lower two-thirds of the dials, and nothing comes in above 67!

Oscillator Tuning

And don't tell me that the oscillator setting may be either one or two numbers for most stations. This repeat tuning of the oscillator—two different divisions nearby that bring in the same station—is orthodox and should be, either for all the dial, or part of it, as I do not expect you to use so-called one-spot intermediate frequency transformers, as my circuit is not adapted to such. Use from 20,000 to 150,000 cycle transformers, for this set—no higher intermediate frequency. My set therefore works on about 95% of all the intermediate transformers made.

My tubes are all of the 5-volt type, the last tube is a 71A, the rheostat easily carries the 1¾ amperes, and see that the one you put in does, and mount it on the subpanel.

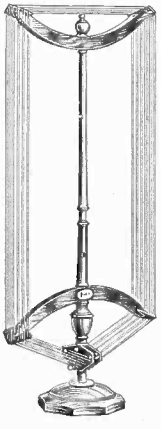
If you want to wind coils for yourself, use what diameters you have and what wire you have. For instance, for a 3 inch diameter, put on 53 turns of, say, No. 24 silk wire, or the like for both secondaries, S. In the case of the antenna coil, P may be wound next to S, and consist of 10 turns, whereas P for the oscillator coil, in the same relative position may as well have 32 turns, to be sure of oscillation. These values are for .0005 mfd. tuning. For .00035 mfd. the primaries may be the same as set forth, but the secondaries should have 60 turns. You may wind the primaries as close to the secondaries as you like, but no more than ¼ inch separation between the two in the case of the oscillator. For the antenna coil even ½ inch separation is all right.

AIR BRIDE

THE WEDDING CEREMONY OF A. LLOYD GILL, RADIO EDITOR OF THE WASHINGTON "TIMES," AND MISS PAULINE BLAKE OF NEW YORK CITY, REV. SAMUEL E. ROSE OFFICIATING, WAS BROADCAST FROM STATION WMAL.

Wood Turning Works Markets Fiat Loop

The Artistic Wood Turning Works, 515 North Halsted Street, Chicago, Ill., is now in full production on the new Console Fiat Loop, type C, and is now able to catch up on orders. This loop is also a handsome piece of furniture, of beautiful lines, made of solid American walnut with metal plates and trim of rose gold. The patented method of bank winding enables its small size to afford the highest ratio of inductance to distributed capacity, insuring an unusual degree of sensitivity. It is fully guaranteed. It may be had in two types, one to tune with .0005 mfd. and one for .00035 mfd. Ben Director, 142 Liberty Street, New York City, is the exclusive distributor for the metropolitan territory and will furnish more information on application.



Ground Reduces Hum

If a B supply, particularly one operating from an alternating current source, causes a hum this often may be reduced by grounding A minus. For safety, including DC eliminator examples, a fixed condenser is connected between A minus and ground.

Reader Misses Joke, but Here's New Fodder

A reader who signs his name and identifies himself further as "E. E. & R. E. Student, Massachusetts Institute of Technology," writes:

Editor, Raidio World:

Kindly turn to page 13 of the February 25 issue and read, under "DX Reception":

"The distance ability of some radio sets often is the cause of coincidence. Many Middle West fans at the close of a particularly likeable program, sponsored by a national advertiser, start angling for a Western station to hear the program again. THIS IS POSSIBLE BECAUSE OF THE DIFFERENCE IN TIME, etc., etc."

The bonehead who put that statement in what purports to be a semi-scientific magazine doesn't deserve a place on anything but a tabloid newspaper where the readers generally have no particular intelligence and therefore the staff need not bother themselves about the sanity of their associates or themselves. I had hoped that the staff of RADIO WORLD was somewhat above that class. Would you be so kind and INTELLIGENT as to put such notices on the joke page hereafter and put the writer of that article in an asylum where he can do no further harm."

Two Sourdough Stories

We envy the fans who can listen to a good program from an Eastern station and then get it a second time from a Western station. We do not live where "the difference in time makes this possible." It must have been for that reason that we failed to pick up the singing of DeGorgorza from a Western station after the conclusion of the General Motors recent treat.

This man reminds us of the two Klondyke sourdoughs who told how cold it was in that northern region.

One said it was so cold that the flame of a candle froze solid the instant it was lit, taking the form and color of a strawberry. So hard were these clumps of frozen flame that they did not thaw out until early in the Summer when the strawberries were ripe. The sourdough sponsoring this story averred that he himself had accidentally picked up these frozen flames in place of strawberries, always with painful results.

The other sourdough claimed that it was so cold in Klondyke that words spoken froze the instant they left the lips, and that it was necessary to wait until Spring to find out what the person had said. If the person was not at the proper place when the words thawed out he missed them altogether.

Some things are said and played over the radio now that ought to be frozen beyond all possibility of thawing out.

Where Time Meant Riches

Anent difference in time being a dominant factor, has not our complaining reader heard the story of the man who made a "killing" at the races by sending a cable westward round the world? The schemer waited at a New York race track until the end of a particular race. Then he sent a telegram to the Pacific Coast, to be routed by cable westward, addressed to himself at the track and advising himself to bet on the winner. Due to the full day's difference in time around the world he received his own tip almost a day before the race started, bet on the horse heavily, and "cleaned up."

Practical Methods Needed, Says Hogan

John V. L. Hogan, Past President of the Institute of Radio Engineers, in speaking before the Radio Manufacturers Association at a meeting in Hotel Commodore, New York, warned the manufacturers that progress in radio would come to a standstill if they did not cease to take the "easiest way."

"In any line of endeavor we frequently come to a dead end or rut, but we can dodge it in radio by stressing originality and not imitation," said Mr. Hogan. "It is not enough merely to invent or get the idea on which the Patent Office will give a 'piece of paper.' Radio needs more of the men who furnish the stuff to make the idea workable—to put into practice and operation that which science has given."

Sales During 1927 Put at $500,000,000

This and other estimates are based on information compiled from a survey of the radio stocks in the hands of dealers throughout the country. The information was gathered by direction of Marshall T. Jones, chief of the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce in co-operation with the NEMA, Radio Division. The average radio dealer did a business of $11,000 in 1927, according to the interpretation of the returns.

Loudspeakers, socket power units and AC tubes and sets showed a slight increase in this survey, as of January, 1928, in comparison with October, 1927. A slight decrease is to be noted in battery operated receivers, dry cells, and direct current types of radio tubes, according to Mr. Klock. Radio sets in use today are estimated to be 8,000,000 of which the committee figures that at least 1,000,000 are AC tube sets.

Certain relationships can be made as a matter of interest, between the number of sets sold and the amount of broadcast power used by transmitting stations, in given regional areas in the country.

The survey shows that dealers located in the New England, North Atlantic and Great Lakes region have approximately one-half the total stocks of battery-operated sets, and amout three-fourths of the stocks of AC tube-operated sets. In these same regional areas, the committee is advised, are three-fourths of the AC sets.

Equal Franchise Bill Adopted by the House

Washington.

The House passed the radio bill (S. 2317) as amended by its Committee on Merchant Marine and Fisheries to require of the Federal Radio Commission "an equal allocation of broadcasting licenses, wavelengths and station power." This amendment has become known as the Equal Franchise bill.

The action of the House was taken after a record vote of 236 to 133 on Section 4 of the bill which had been written into the Senate measure by the Committee and amended on the floor.

The bill went to the Senate, where approval was necessary if the Board was to be continued at all. The Senate considered the bill.

Text of Amendment

The full text of the amendment, as it was passed by the House follows:

"Sec. 4. The second paragraph of Section 9 of the Radio Act of 1927 is amended as follows:

"The licensing authority shall make an equal allocation to each of the five zones established in section 2 of this act as broadcasting licenses of wavelengths and of station power; and within each zone shall make fair and equitable allocation among the different States including the District of Columbia and the territories and possessions thereof in proportion to population."

Move to Kill It Fails

An effort to eliminate Section 4 by means of a point of order was defeated when the House 168 to 140, declined to sustain the ruling of the chair.

Representative White (Rep.) of Lewiston, Me., in charge of the bill, then offered the amendment to Section 4 that includes the District of Columbia and the territories, and the section as amonded, was adopted by a vote of 175 to 83.

Debate on the radio bill centered largely on the Davis amendment, which was described by Representative Clancy (Rep.), of Detroit, Mich., as designed to change the basic radio law.

Charges South Suffers

Representative Davis (Dem.), of Tullahoma, Tenn., who proposed the amendment, contended that the Federal Radio Commission has discriminated against the South in the distribution of wavelengths and power. He argued that New York City has twice as much power as the four other zones combined.

He reiterated his previous charges in the House that the Commission was dominated by a radio monopoly, headed by the Radio Corporation of America and affiliated companies.

Representative Clancy read into the record a letter from Commissioner Sykes, the only member of the Commission confirmed by the Senate, quoting Senator McKellar (Dem.), of Tennessee, that the South had not been discriminated against.

Industry Threatened

Representative Clancy praised members of the Commission, and added that the proposed Davis amendment threatened the life of one of the greatest industries.

Representative Boylan (Dem.), of New York City, denied that New York City was getting more than a fair share of the national quota of wavelength and power distribution. Representative Boylan stated that millions of dollars were invested in radio broadcasting in New York City.

Representative Newton (Rep.), Minneapolis, Minn., said he was in harmony with general radio legislation, but advocated further classification in existing law covering the distribution of power. Representative Kading (Rep.), of Watertown, Wis., also favored clarifying the law along the same line.

Present Situation Bad

Representative Griffin (Dem.), of New York City, declared that it was not the intent of Congress to place a mandatory clause in the law governing the distribution of power, without taking into consideration the question of population.

Representative Clancy, in opposing the allocation amendment, said it would mean a general "shakeup" of the radio industry of the country within 90 days. He added:

"I favor that portion of this bill which extends the life of the Federal Radio Commision another year, but I am strongly opposed to Section 4 of this bill which provides for an equal allocation to each five zones of broadcasting licenses, of wavelengths, and of station power.

"Will Wreck Radio"

"It is true that the present radio situation in this country is unsatisfactory, but this drastic and destructive equal allocation provision will not remedy the situation. Moreover it certainly fearfully damages radio, and I honestly believe that the members of the Radio Commission and practically all the experts of the radio industry are correct when they say this provision will wreck radio."

Representative Davis declared that there was an "iron-clad" radio monopoly.

Representative Clancy stated that it was mechanically and mathematically impossible to equalize the distribution of licenses under the Davis amendment.

White Backs Bill

Representative Brand (Rep.), of Urbana, Ohio, spoke in opposition to the amendment.

Representative White, (Rep.), of Lewiston, Me., chairman of the committee, told the House that the country had reached a point where a policy must be declared regarding the control of the air.

He favored the equal allocation amendment, he said, because there was danger in establishing vested rights in radio.

Those opposed to the amendment, Mr. White explained, were the big broadcasters and those now having stations who want to hold on to what they have.

Too Many Stations

"There is no doubt," said Mr White, "that there are too many broadcasting stations. Who will say that there should be 70 stations alone in Illinois and 50 in the vicinity of New York City?

"If the Federal Radio Commission had grappled with the problem in the beginning and cut off a number of stations with the idea of carrying out the equitable distribution of service section of the Radio Act of 1927, we might have made start on the problem of cleaning up the situation.

"I, for one, am in favor of making that procedure mandatory upon the Commission now."

La Guardia for "Square Deal"

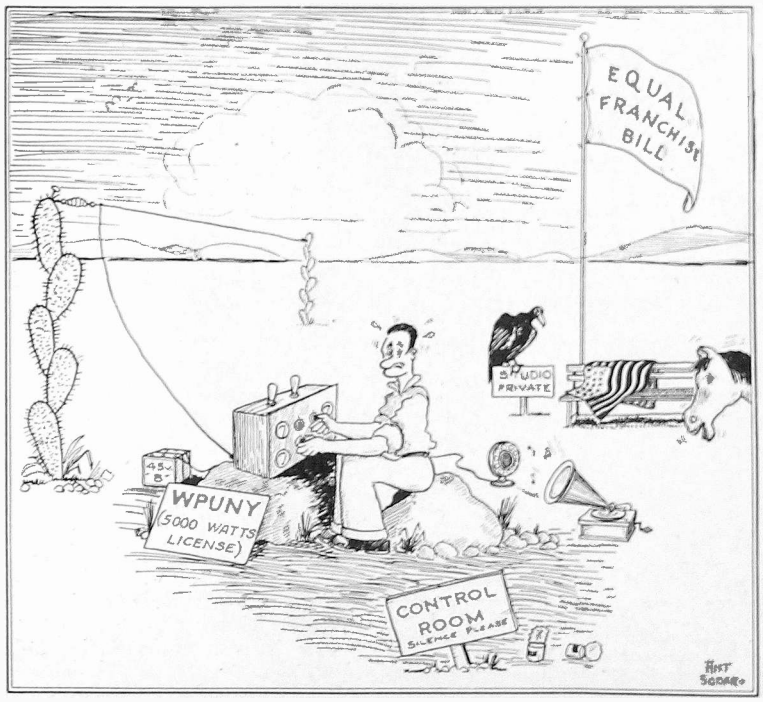
New York City is in favor of giving the rest of the country a square deal, said Representative LaGuardia (Rep.), of New York City. He said that it was absurd to define equality in radio as equality in receiving.

"This is a national question," said Mr LaGuardia, "and there should be no vested rights to the air. I am in favor of this amendment."

Representative Quinn (Dem.), of McComb, Miss., spoke in behalf of the amendment and Representative Crowther (Rep.), of Schenectady, N. Y., against it. Mr Crowther said that the establishment of many stations in the big cities was due to the enterprise of interests who put up the money and acquired licenses.

"Radio stations in the United States, you will find," said Mr. Crowther, "are distributed about the same as income taxes are paid."

A PARADISE IN THE DESERT



HAVING BEEN VOTED EQUAL POWER WITH THE BIG STATIONS, BY CONGRESSIONAL ENACTMENT, THE CACTUS KID CELEBRATES THE RECEIPT OF A 5,000-WATT FRANCHISE BY ADDING 45 MORE VOLTS OF B BATTERY.

A THOUGHT FOR THE WEEK

WOULDN'T it make you mad if, while you are contentedly, even rapturously perhaps, listening in on a Rachmaninoff number of beauty and power, to have your young son mutter something like "Boloney!" and then tune in one of those raucous-voiced announcers and hear him threaten you with a song by the Nasal Quartet bellowed from the smoky air of the Plug Ugly Night Club? Wouldn't it, now?

SEVENTH YEAR

RADIO WORLD

The First and Only National Radio Weekly

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

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

CLASSIFIED ADVERTISEMENTS

Ten cents per word. Minimum 10 words. Cash with order. Business Opportunities, ten cents per word. $1.00 minimum.

Custom Set Builders Plan to Incorporate

Steps were taken recently toward the actual formation of a club of custom set builders, as proposed by RADIO WORLD, and counsel consulted as to the best method of legal procedure. Counsel advised that a corporation be formed, and it was decided to put this proposition before the prospective members, who constitute that large group of enthusiasts whose names have been and are being published in RADIO WORLD.

This week another batch of names appears, while next week will appear the largest single list ever published in these columns—close on to 500 names!

A questionnaire is being framed, and will be published in that issue, which, by the way, will be the sixth anniversary number of RADIO WORLD. This questionnaire will take up an entire page, and prospective members will be asked to fill out the blank and return it to me. Thus will a ballot be taken on important questions of organization, name, administration and service.

Co-operative Expert Consulted

As to benefits to be bestowed by the club on its members, a bold but an attractive plan has been devised and will be set forth fully in an early issue. An expert who dealt with the organization of farmers into a united and co-operative body has been consulted, and his ideas were heard with interest.

All matters will be laid before the prospective members. Naturally, as decisions will have to be made before the actual legally constituted body can ratify, those who profess interest will cast ballots, and perhaps that interest will be marked by a binder of some sort. Then, later on the official organization can ratify what the applicants voted, which they would be glad to do, since about the same persons who constituted the applicants actually will comprise the membership.

It is recognized that an organization of this kind can wield a powerful influence to the benefit of not only its members—that will be the first consideration at all times—but also in support of the radio parts market. Manufacturers have been following these preliminary skirmishes with great interest, indeed many have wanted to "do something" themselves about the custom set builder, recognizing him as the chief outlet for the sale of parts, but not knowing exactly what to do, principally because of difficulties engendered by the existing trade structure.

More Than Mere Pat

Hence a club such as we fellows are forming, not being embarrassed by merchandising dilemmas, can constitute itself along lines that will assure just economic consideration to the principal outlet for the sale of radio parts. That position of eminence of purchase commands more than a mere pat on the back, and more than a mere pat will be received!

No doubt the organization expenses will be underwritten by some interested individuals who have no profit-making objectives, these outlays being subject to refund when the organization raises money through initiation fee, dues and other sources. Underwriting is standard practice.

Some radio expert with large executive experience will be necessary to conduct the club as president or executive vice-president, and should be some $15,000 a year man whose altruistic keenness for radio and custom set builders will prompt him to devote time without receiving money. He should be able to produce some plan that will enable the club to be a profit-making medium for members, so that they get back each year in money more than the dues or other money they pay in, and get the service besides. The search for such a man is now on.

I am very busy myself in my custom set building enterprise, but I will find time to devote to the interests of the club and its members. I originated the idea, I shall follow it through to its gloriously successful organization, indeed to its benefit-producing perfection, but I must admit that while I am a demon with the soldering iron, I do not possess enough large executive experience to steer such a great undertaking through the difficult channels of law and commerce.

Surely Send in Coupon

I am airing my own personal views, but in fact my voice won't count any more heavily than yours will, for I'm simply going to fill out a questionnaire, the same as you are, next week, and after the tally is taken we'll see where we're at.

Meanwhile I'm scouting around to discover if any radio executive has enough confidence in the proposition to offer at least some of his time every day toward making this enterprise the most successful and most powerful agency in the radio parts industry, with branch offices in several large cities throughout the country, and perhaps with a representative at Washington, D. C., to protect the custom set builders' interests before the legislative and executive branches of the Federal Government.

There's room for only a few of the names received this week. They're on the next page. Don't forget to fill out and mail the attached coupon NOW if you haven't sent one in.—McCord.

New Electrad Book Analyzes B Supplies

Under the title "What B Eliminator Shall I Build?" there has just been published an interesting book, consisting of thirty-two pages, which gives instructions and illustrations on the use of variable wire wound resistances in such nationally known power supply units as Thordarson, Samson, National, Amertran and Silver-Marshall.

Of the many advantages gained by the use of good variable wire wound resistances, the most important is the fact that definite detector, radio frequency and audio B voltages can be obtained for various sets, making the power supply devices more universal in their use. This is very important with Super-Heterodyne sets, because the 45 and 90 volt taps should be variable. Electrad, Inc., 175 Varick St., New York, will be very pleased to send this book upon request, if you mention RADIO WORLD.

Seventeen Names Suggested

Here are seventeen suggestions for a name for a custom set builders' club as sent in by readers:

The Professional Set Builders Club of America.

Society of Master Custom Radio Set Builders.

Custom Set Builders Guild.

Radiotricians, Inc.

The Association of Radio Technicians.

The Custom Set Builders of America.

The Custom Set Builders of the World.

Custom Radio Builders Club.

Nacuset Builders' Association.

Naraset Builders' Association.

American Radiotricians.

Custom Set Builders Club.

Master Custom Radio Receiver Constructors' Guild.

Master Custom Radio Receiver Constructors.

Master Radiotricians' Guild.

Guild of Master Radiotricians.

Institute of Master Radio Receiver Constructors.

American Radio Set Builders Association.

Radio Set Builders Association.

129 More Enlist in Service Club Movement

W. R. Hofmeister, 7435 Race St., Pittsburgh, Pa.
F. J. Bates, 2053 Rehman St., Pittsburgh, Pa.
David E. Basler, 5859 Hadfield Ave., Philadelphia, Pa.
Clyde Morre, 3500 Roberts Ave., Dallas, Texas.
Ralph G. Klipec, 3592 E. 157th St., Cleveland, O.
Corwin Crosby, 436 Manhattan Ave., New York City.
R. G. Jeffery, 502 West 135th St., New York City.
Morris Weinstein, 661 E. 170th St., New York City.
J. Richard Kearns, Rock Valley, Iowa.
W. B. Thompson, Prather Cadillac Co., 2213 Commerce, Dallas, Texas.
E. M. Williams, K. of P. Bldg., Oskaloosa, Iowa.
W. E. Wright, 1319 3rd Ave., N. W., Roanoke, Va.
Harry G. Finlay, 5077 Page Ave., St. Louis, Mo.
Lawrence F. News, 1433 Edgmont Ave., Chester, Pa.
C. Holehep, 415 E. 71st St., New York City.
W. L. Winning, Beltone Labs., 1361 Madison Ave., Indianapolis, Ind.
E. E. Erickson, 769 Paul Brown Bldg., St. Louis, Mo.
Frank A. Linder, 7 Byrd Ave., Watching Res., Scotch Plains, N. J.
R. E. Porter, 2908 Hampton St., Ashland, Ky.
Chas. H. Pansing, Box 1382, Orlando, Fla.
Charles Schmidt, 55½ Gotthardt St., Newark, N. J.
W. D. Billings, Box 420, Holbrook, Mass.
H. M. Coshun, 98 Church St., Wallingford, Conn.
James J. Gonoud, 49 Payson Ave., New York City.
A. A. Behmdt, 1002 S. Oakland St., South Bend, Ind.
James C. Somers, 1265 Broadway, Somerville, Mass.
Ralf E. Hockens, Arrinston, Kansas.
J. W. Routh, 1025 Fairmount Ave., St. Paul, Minn.
E. W. Carlson, 9 No. Washington St., Spokane, Wash.
H. G. Rydholm, 321 Main St., Sauk Centre, Minn.
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White Radio Shop, 69 Lusk St., Johnson City, N. Y.
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E. H. Keller, 322 Austin St., Toledo, Ohio.
Charles Guess, 3807 Kennerly Ave., St. Louis, Mo.
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William S. Graham, 51 Frank St., Providence, R. I.
Kelsey G. Gregory, 460 78th St., Brooklyn, N. Y.
William Gregory, 1267 Broadway, Flint, Mich.
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Louis Schaaf, 85 Palmetto St., Brooklyn, N. Y.
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Edward G. Gibbs, 20 White St., Mt. Holly. N. J.
H. L. Davis, 2167 Chestnut St., San Francisco, Calif..
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W. J. Rix, 335 West Olive, Monrovia, Calif.
George D. Coupland, 309 47th St., Union City, N. J.
P. McDonald, 290 Sumpter St., Brooklyn, N. Y.
Harry Dodes, 106 West 46th St., New York City.
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Harry E. Stroh, 1067 Park Ave., New York City.
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Chester L. Masser, 911 S. 60th St., Philadelphia, Pa.
L. Widenski, 187 Bedford Ave., Brooklyn, N. Y.
Henry Krier, 43 W. 86th St., New York City.
Marvin C. Williams, P. O. Box 353, Rantoul, Ill.
Charles S. Horton, 25 Helen St., Saranac Lake, N. Y.
Herman J. Dupre,. 907 Clinton Ave., Irvington, N. J.
Howard D. Nichol, 554 Central Ave., East Orange, N. J.
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J. Harvey Hall, 30 W. Southampton Ave., Chestnut Hill, Philadelphia, Pa.
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Geo. M. Gordon, 294 Pool St., Biddeford, Me.
William Vossler, 156 Hazelwood Ave., Buffalo, N. Y.
A. J. Coleman, 29 McPhillips Ave., Mobile, Ala.
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Kepcoil Labs., 2048 E. Wishart St., Philadelphia, Pa.
Cy Sperling, 135 E. 34th St., New York City.
Donald L. Eiler, 336 Dock St., Schuylkill Haven, Pa.
John J. Yeager, 2316 W. Oakdale St., Philadelphia, Pa.
E. G. Hastings, 16 Kenilworthy Ave., Charleston, S. C.
Russell H. Shafer, 16 Morningside Ave., New York City.
Max J. Wachter, 10 Walnut Road, Inwood Park, L. I., N. Y.
Alexander Mego, P. O. Box 376, Braddock, Pa.
M. C. Herrman, State Sanatorium, Md.
L. F. Hewlett, 8713 Colonial Road, Brooklyn, N. Y.
O. Martin, 2219 French St., Erie, Pa.
E. F. Gumbert, 1815 Weston Ave., Niagara Falls, N. Y.
Joseph J. Simpson, 8714 129th St., Richmond Hill, N. Y.
R. J. J. Good, 160 Park St., Kirkfield Park, Man., Can.
Hyman Sobel, 2047 73rd St., Brooklyn, N. Y.
R. D. Detweiler, 1916 Farragut Ave., Chicago, Ill.
Stanley Flansburg, 219 92nd St., Brooklyn, N. Y.
A. H. Hunter, 555 25th St., Newport News, Va.
John Weare, 1558 Mass. Ave., Cambridge, Mass.
William C. Greene, 747 West Main St., Mt. Pleasant, Pa.
H. V. Landers, 6. Kress St., Binghamton, N. Y.
Fred E. Arnold, 103 Penna. Ave., Binghamton, N. Y.
W. F. Selle, 700 Gates Bldg., Kansas City, Mo.
J. W. Brewer, Sinton, Texas.
Grover C. Freeman, 2003 McLemore Ave., Memphis, Tenn.
Vern. L. Guess, 1606 Ohio Ave., East St. Louis, Ill.
Earl Walrod, Box 119, Sapula, Okla.
Albert G. Zinman, 221 East 30th St., New York City.
A. R. Stewart, Home Radio Serv., 1131 Hand Ave., St. Paul, Minn.
Gustave Simmons, 228 Wyoming Ave., Billings, Mont.
Ovid Panabaker, 518 Sherman St., Wausau, Wis.
James Millen, 28 Wedgemere Road, Malden, Mass.
F. M. Cornwell, Webster, S. D.

RADIO WORLD,
145 West 45th Street, N. Y. City.

Attention Mr. McCord

I am a custom set builder and would like to join you in the formation of a national organization of custom set builders. Please list my name and address. I am one of the indorsers. This does not obligate me in any way.

Name .....

Address .....

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

Suggestion for Club's Name .....

Bureau Studies Aerial Capacity Measurement

Washington.

Calculation of the capacities of radio antenna and their resultant wavelengths or fundamental frequencies are explained by the Bureau of Standards in a new scientific paper (No. 568) just issued by the Department of Commerce. A statement based on the study follows in full text:

"Different forms of antenna are compared in the new paper and the designs necessary to produce given capacities are illustrated. The first part discusses different methods which have been proposed for the calculation of antenna capacity. Two methods, that of Howe and the inductance method, are shown to agree with one another. The inductance method, however, does not apply to all cases.

"In the second part of the paper is included a collection of formulas for the important common forms of antenna, based upon these two methods and presented in a form suitable for numerical computation. Tables of values of capacity for single-wire horizontal and vertical antennas and two-wire horizontal practical problems.

"This paper (No. 568) may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 20 cents per copy."

DC Sets Show Drop; AC Tube Stocks High

WASHINGTON.

Radio set and accessory jobbers average a $218,000 business annually, according to a survey of jobbers' stocks throughout the country by the Electrical Equipment Division, the Department of Commerce announced. The statement in full text follows:

The 375 jobbers reported the annual volume of business done by jobbers in New York, New Jersey, and Philadelphia, averaged $298,000. New England jobbers came next with an average annual business of $264,000 and then the Great Lakes region jobbers, averaging $245,000. The jobbers in Kentucky, Tennessee, Alabama and Mississippi reported the lowest average amount of trade, $118,000.

Considering the number of jobbers reporting on both dates, actual stocks on hand of battery operated sets showed a marked decline on January 1, 1928, as compared with October 1, 1927, whereas the number of AC operated sets greatly increased.

Stocks of loudspeakers approximated the total number of sets on both dates. Holdings of batteries, both storage and dry, were considerably lower on January 1, 1928, than on October 1, 1927. Socket power units, that is, eliminators, showed no particular variance as to number on hand. Stocks of receiving tubes of the storage battery-operated type were very markedly lower on January 1, 1928, whereas there were many more AC tubes on hand on that date than on October 1, 1927.

Mack Moves Office; Features Converter

Pearcy W. Mack, well known to the New York trade as the Acme live wire, moved his office and staff from 231 West 29th street to 122 Greenwich street, New York City.

Mr. Mack reports that Acme business is good, as usual, and is ready to demonstrate to the trade Acme's newest achievement, an AC converter unit. This, the R280, is a fine piece of apparatus, he said, up to the high Acme standard. It is small, compact and sturdily built. It provides filament current for nine of the new AC tubes, e.g., six 226 type, one 227 and two half ampere power tubes. It also has four B taps, for 45, 70, 90 and 135, also two C taps, 9 and 40. Further information may be had by addressing Mr. Mack at the Greenwich street address.—J. H. C.

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A Unipac for the New —50 Tube, by Brewster Lee.

Improvements I Made in My Set Without Any Cost, by Billy Honduras.

Coils for Shield Grid Circuits, by Knollys Satterwhite.

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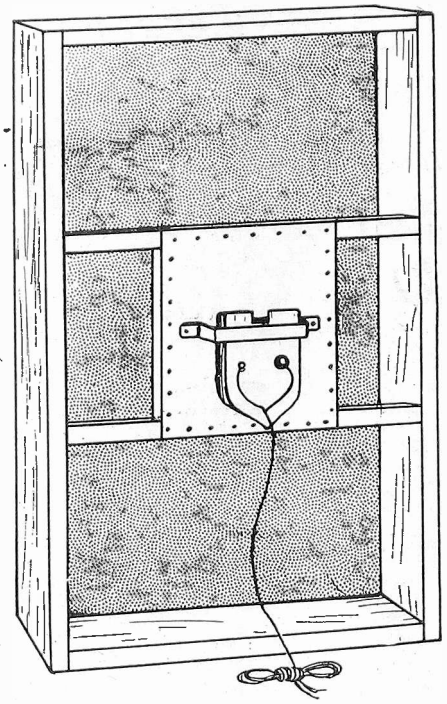
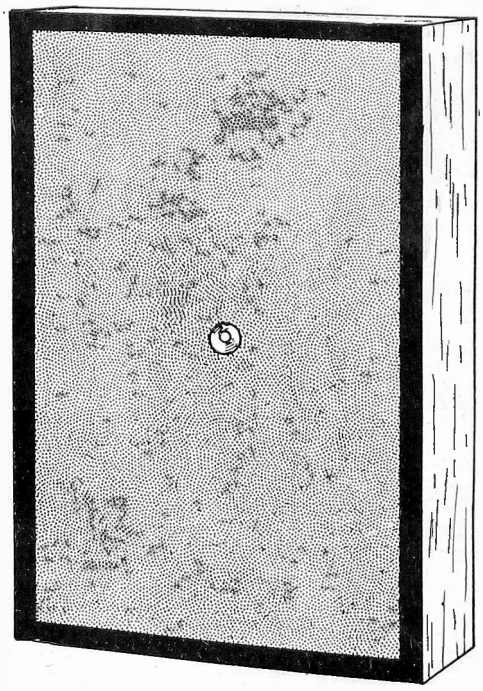
Airplane Cloth Speaker





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