

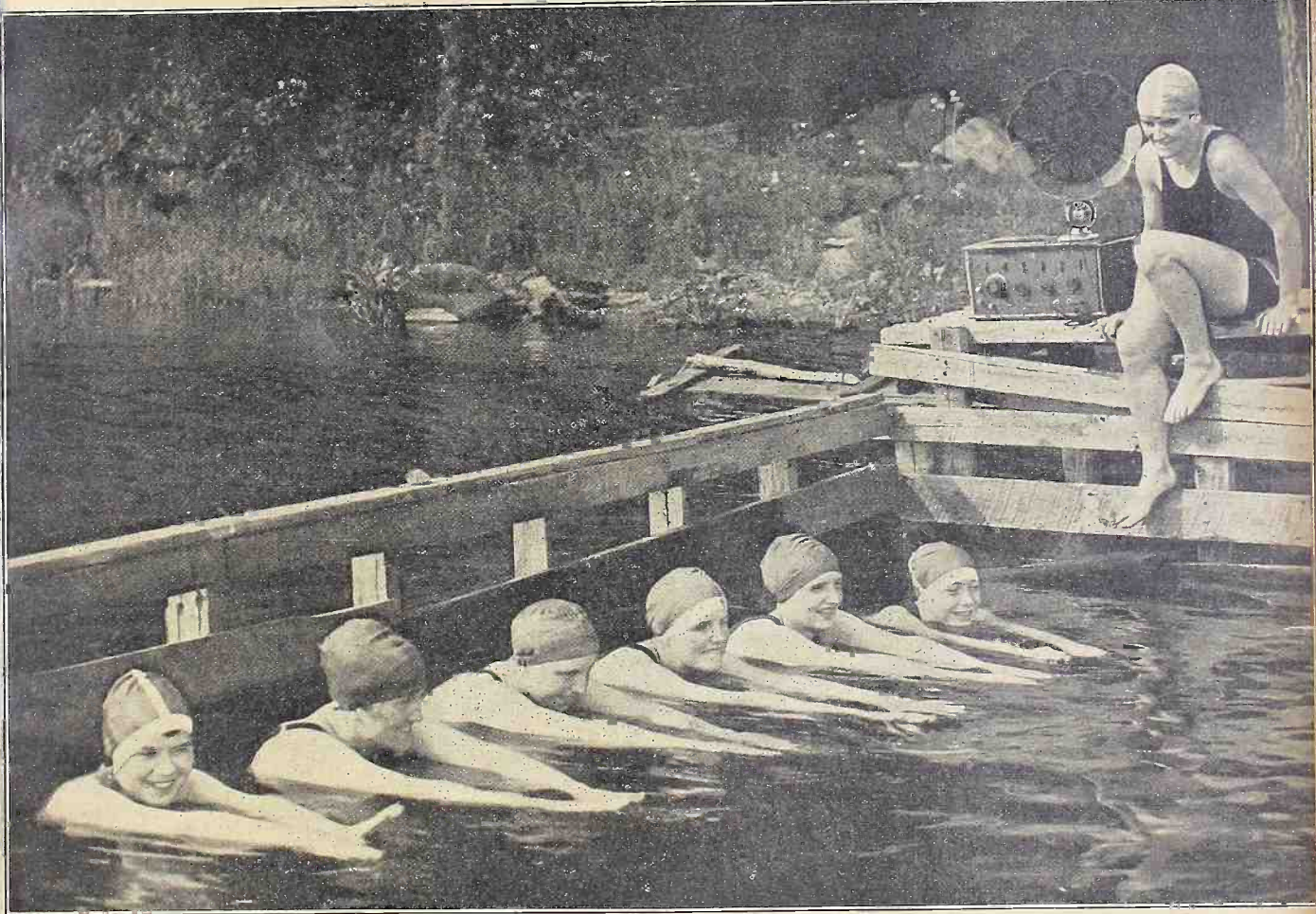
RADIO WORLD

Reg. U. S. Pat. Off.

Vol. 9. No. 19 ILLUSTRATED Every Week

TRF SET BALANCED
BY REVERSE FEEDBACK
—
THE PINK OF PERFECTION
IN AN AUDIO AMPLIFIER
—
HIGHER WAVES TAKEN
BY SEVERAL STATIONS

SWIMMING LEARNT BY BROADCAST



(Foto Topics)

BROADCAST swimming lessons prove of practical value. Six girls at a summer camp are shown ready for the starting directions from the expert at WOR, whose lessons are received through the speaker.

RADIO ENGINEERING AS A VOCATION

THE MAKING OF A STORAGE BATTERY

THEY ALL PRAISE THE **BRETWOOD** Variable Grid Leak

The Bretwood Grid Leak came with today's mail. It is now exactly 9:00 P.M. and the leak was installed about a half hour ago. This note is not only an expression of appreciation but also an attestation of the truth of your advertising. During the past half hour I have tuned in stations "ALL OVER THE DIALS" at leisure, and can adjust reception with the leak almost equal to a variable condenser. I feel constrained to add that while waiting for reply and then receipt of leak from you, there has been on the set a fixed leak and condenser of well known and thoroughly reliable make, and fairly good reception has been enjoyed, but during this half-hour-only test thus far the results are inexpressibly beyond expectation. Have been a radio fan only about four years, but feel I have sufficient knowledge and experience to recognize a good thing upon fair trial. Your promptness and desire to satisfy your trade, in this case has won for you another "BRETWOOD BOOSTER." Thank you.
The Rev. WALTER G. BARLOW,
Bishopville, Md.

Very many thanks for your kind letter of the 21st ult. and for the grid leak, which works perfectly. I have tried four different makes of grid leaks. The Bretwood "has 'em beat."
M. SAWYER,
Box 238, Los Gatos, Calif.

Received your grid leak and wish to say that none can compare with it when it comes to clearing up reception.
JOHN A. BLACKBURN,
5328 Warren Ave., Norwood, Ohio.

Enclosed find P. O. money-order for \$3.00. Please send me two of your Variable Grid Leaks. I am using one and it works fine. Please mail them as soon as possible.
W. H. PERRY,
119 Congress St., Buffalo, N. Y.

Received your grid leak and many thanks. It is the best \$1.50 that I have spent for radio equipment.
ED. JENKINS,
703 E. Main St., Louisville, Ky.

Enclosed herewith find check for \$1.50 for one Bretwood Grid Leak. I am using your leak and find it far superior to any others. This is my third Bretwood.
J. C. WHITE,
422 W. Wooster St., Bowling Green, Ohio.

Will you please send me by return mail two Bretwood Variable Grid Leaks. I enclose herewith check for \$3.25, the 25c. being for a special handling stamp, as these leaks are needed at once. The leaks are the only satisfactory instrument on the market. I find them absolutely essential in the construction and operation of sensitive experimental receivers.
ED. J. WHITTIER,
The American Appraisal Co.,
Milwaukee, Wis.

I want to thank you for your leak, it makes the set 100% better. I was going to have a Diamond of the Air built, but since I have added your leak to my set I am now down in the dining room of the first floor and the set is on the second floor. I can hear the set just as plainly as if I were up there. I can hear every player in any band or music which is on air. The first night I gave the leak a very good test, and I got four stations in Chicago, one in Detroit, one in Canada, one in Atlanta, Ga., and several others without any noise. All were good and clear. It is going to make me spend more money, as I will have to get a good loud speaker. The horn I have now is a Manhattan Jr., and is good and clear, but as soon as your leak is installed the howling present when using three tubes is immediately stopped.

LEON E. COLE,
5816 Tilbert St., Philadelphia, Pa.

Grid Leak received and tested out, and find it is the only variable leak I ever used that is really variable. Enclosed find \$1.50, for which please send me another one.
F. E. STAYTON,
Box 240, Ardmore, Okla.

Thank you for introducing me to the Bretwood Variable Grid Leak. I have installed one in my Three-Circuit Tuner, according to your instructions, and find that it does all you said it would—and more. I am now recommending the Bretwood to all my friends, and those who have used this wonder grid leak have nothing but high praise for it. The fact that it can be adapted for any hookup makes it invaluable to the experimenter. Although I have only used the Bretwood leak for three weeks I have pulled in several of the weaker stations which were inaudible before, and the microphonic noises which were decidedly pronounced before have entirely disappeared. Please accept my best wishes for your continued success and also for the Bretwood Grid Leak.

S. R. HUBBS,
180 Quincy St., Brooklyn, N. Y.

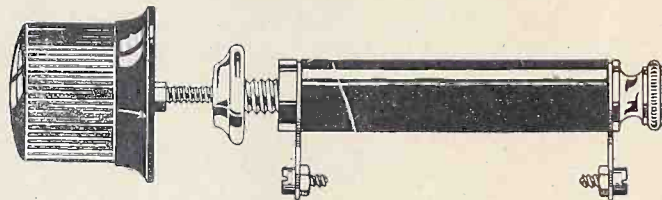
Let me say that the Bretwood Grid Leak improves the set 100%.
J. E. McGINNISS,
27 Lenox Rd., Brooklyn, N. Y.

I wish to take this occasion to thank you for your courtesy in furnishing me with your very excellent Grid Leaks. I have installed one with your Condenser on my own personal radio set, and am delighted with the results.

R. W. DeMOTT,
Experimenter Pub. Co.,
53 Park Place, N. Y. C.

I have received the Grid Leak you sent me and it is perfect. It is surely wonderful the way it works. Please send me another by return mail for a friend.

J. F. COOPER,
1029 Courtlandt St.,
Cincinnati, Ohio.



The Bretwood Variable Grid Leak

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Guaranteed Precision Range 1/4 to 10 Megohms

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

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

Fixed Reversed Feedback Balances Tuned R F Set

COIL AVOIDS EXTRA KNOB AS CONTROL

Even a Single Turn, With
Polarity Opposing that
of the Secondary Coil,
Serves as Stabilizing
Agency — Resistance
Coupled Audio Used,
Making the Set of 3-
Control, 6-Tube Type.

By K. B. Humphrey

VERY few fans or home constructors of radio receivers have investigated the possibilities of the metal panel, though manufacturers have taken it up.

Some qualms were felt at first as to whether it was desirable, but after some little investigation it was found that the proper metal could be obtained at almost any one of the larger hardware stores or at places which made a specialty of sheet

metal of various kinds. Brass was finally chosen, as it is susceptible to a greater variety of finishes than almost any other type of metal.

A brass panel is more easily drilled than almost any other type of material. There is no necessity of having an insulator for a panel. In fact by proper connections many wires are eliminated and the panel forms somewhat of a shield. No detrimental effects are experienced if the coils are kept slightly back from the panel.

Used Bronze Finish

In the set shown in Fig. 1 the panel was finished attractively in what is known as statutory bronze at a place which makes a specialty of finishing both brass and copper in different ways. Practically all the different finishes which may be seen on lighting fixtures and other metal work may be obtained.

The panel may also be painted and finished with the crackled surface which is so popular on metal work.

Almost any color may be obtained. In fact there is not another type of panel which lends itself so readily to the individual taste. The standard size of cabinet in most cases is 7" in height. Brass sheets come 6, 8, and 10" in width by any length that is wanted. This need not deter the fan as the panel can be easily cut to the desired size by the dealer from whom the metal is obtained.

Don't Have Scratches

Care should be exercised to see that the brass is not unduly scratched, as considerable extra labor may be required to remove them. The thickness of the panel should not be less than No. 18 gage. No. 14 or No. 12 can be used. The thicker panels cost more. They are more rigid,

but it is doubtful if there is any other advantage.

The first step in building the receiver is to get the proper sized panel, that is 7x24" x No. 18 gage, the three condensers, a 6-ohm and a 15-ohm rheostat and a battery switch. All of these should be of the single hole mounting type, as that saves time in both drilling and assembly.

Pre-Drilling Advisable

The panel is laid out as shown in Fig. 2. Center lines may be drawn directly on the brass, the panel being finished later. It is much more practical to have the panel drilled before it is finished because it saves a lot of wear and tear and the final result is not so likely to be marred by scratches in the finishes.

An ordinary steel drill of proper size is used, the panel being laid out on a flat board so that no kinks result. Each hole should be centerpunched before an attempt is made with the drill.

All apparatus such as condensers, rheostats, switches, etc., should be mounted on the panel experimentally to see that they fit properly. Only the center holes are shown in Fig. 2.

Panel Job Takes Time

This receiver uses the Bruno vernier dials and these require an extra hole in the panel to prevent them from turning. A template is furnished with each dial. If another type of dial is used, such as the conventional 4" dial, a marker may be placed on the panel to indicate the reading. These markers or dial pointers may be obtained at almost any radio store.

The three holes near the bottom of the panel are used for mounting the baseboard. The seven other holes are used for screwing the panel to the cabinet. While the panel is being finished, which

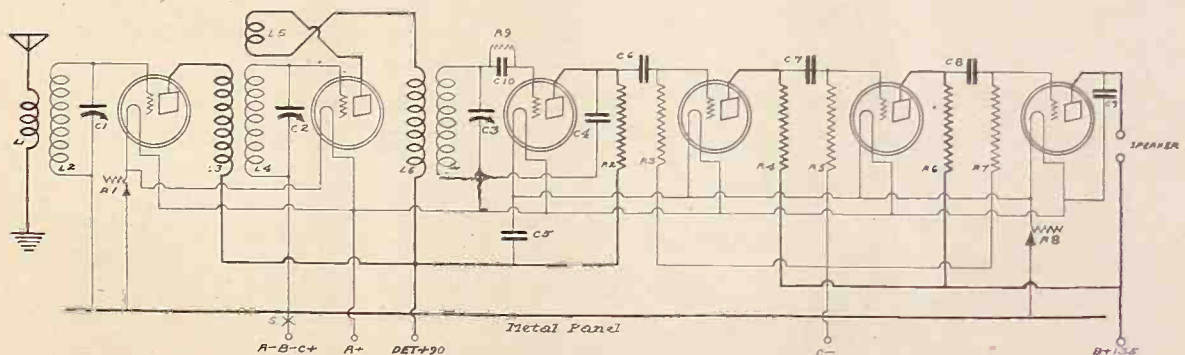


FIG. 1

The circuit diagram of the metal panel set, using reversed feedback to balance the receiver.

Shielding Effect Gained By Use of Metal Panel



(RADIO WORLD Staff Photo)



FIGS. 3 AND 4

The rear view and the panel view of the receiver.

COIL PLACED A FEW INCHES IN THE REAR

Large Variety of Finishes
Is Available—How to
Accommodate Stock
Sizes of Metal to Radio
Uses.

DX IS OPTIONAL

How Much Regeneration
Is Left, After Adjusting
Balancing Coil, Deter-
mines Range and Qual-
ity, Two Opposing Con-
siderations.

usually only takes a day or so, the builder may go ahead with the rest of the receiver.

Baseboard Directions

The baseboard should be made of well seasoned wood which will not warp. Plenty of room is provided and this board may be 1" in thickness. The size should be 6½" wide by 22" long and 1" in thickness, finished on all sides.

The sockets are placed in a straight line with the 0.1 mfd. coupling condensers in between them. A small strip of Bakelite is used for the binding posts and as a support for the different resistances needed. The sockets and condensers are screwed down firmly by means of brass wood screws.

The binding post strip is a small piece of Bakelite, hard rubber or other insulating material, 14" long, 1" wide and ¼" thick. The holes make provision for eight binding posts which may be of the Fahnestock clip type or regular binding posts, whichever the builder prefers. Fahnestock clips make good contact and a connection is easily changed.

They do not, however, provide a means

of marking, such as binding posts do. If they are used it is usually most advisable to mark out a wiring diagram on a piece of paper and paste it in the inside of the cover of the cabinet so that it will not get lost. The binding posts are as follows, looking into the set from the front and reading left to right: aerial, ground, A minus, A plus, B plus 90 volts, B plus 135, speaker plus, and speaker minus.

If a B eliminator is used, as was the case when the set was on test, the full voltage, which runs from 125 to 150, may be placed on both the binding posts.

This strip also provides a mounting for the resistances. These should be mounted and as much of the strip wired up as possible before it is screwed down to the baseboard.

A Hint on Supports

Small pieces of brass pipe or washers may be used under the screws for holding down this strip to keep it the proper distance from the baseboard. It is advisable to use some sort of rather flat socket in order that the resistances may be mounted more or less in a line. The photographs show the Pacent Isolantite sockets.

The flat type of coil is used and can be mounted by use of a peg slipped in between the wires. This peg should be made of a ¾" dowel, tapered off and rounded slightly so that the coil may slip on easily, without causing any damage to the insulation on the wires. The dowel is fastened to the base board by means of a No. 6 flathead screw, 1¾" long.

By-pass Condenser Mounting

While the method of mounting the small fixed by-pass condensers by means of small brass strips is not absolutely essential, it has been found that this is as convenient as any and saves time in soldering the connections.

These small strips can usually be found in the hardware store.

Five of them are needed, two each to mount two mica condensers and one to provide a mounting for the grid leak and condenser.

This completes the details of the mechanical features of the receiver. The next step is to proceed with the wiring.

Wiring Directions

The method used in neutralizing is the employment of a small reversed coil in the plate lead of the detector coil in conjunction with the second tuned radio frequency transformer. More details of this will be given later.

The first step is to wire up the binding post strip. Most of this can be done before placing it on the baseboard. In this particular set Veby resistances have been used, which come with convenient mounting springs fastened to them.

If separate springs and resistances are used the springs should be mounted facing in the direction that the resistors are placed. Separate springs allow the experimenter to change easily from one value to another and are an asset in this way. A wire 7" long is fastened underneath the strip on the A minus binding post. This later connects to the switch which is mounted on the panel.

One wire is run from the first audio resistance to the 135-volt binding post, then to the second audio plate and then to the speaker plus binding post. A wire 2¾" long is run from the speaker minus and will later be connected to the plate of the last tube. All wiring is done with No. 16 bus bar and covered with a good grade of insulating tubing.

While the use of spaghetti increases the internal capacity of the wiring in the set, there is less likelihood of trouble developing from a short circuit.

With all of the sockets and condensers mounted on the baseboard we may proceed with the wiring. Starting at the left-hand side with the panel screwed to the baseboard a wire is run from the 15-ohm rheostat to socket No. 1 F minus and thence to socket No. 2 F minus. This gives a common lead. Connect the post of the rheostat that is not grounded. The movable arm is connected direct to the panel through the mounting nut if it is of the single hole type.

Then starting with No. 3 socket a wire is run from the F minus, to the F minus of each succeeding tube, the end of the wire being connected to the ungrounded side of the rheostat on the right hand side.

Binding Post Strip Mounting

The next step is to mount the binding post strip loosely in place and connect the two wires which were previously placed on it, one running from the A minus post to the ungrounded post of the battery switch. The other, which is connected to the speaker minus post is run to the plate post of tube No. 6. The resistances may be fastened loosely. Tighten them down after the wiring is completed. A 1.0 megohm resistance is placed across the two terminals of No. 4 socket from grid to F minus.

The next step is the filament plus wire. Starting on No. 1 socket we run to No. 2 and to No. 3, then up to the filament plus (A plus) binding post on the strip, thence to F plus on No. 4 socket and likewise to No. 5 and No. 6. This completes the wiring of the filament circuit.

Next run a small piece of wire, not necessarily insulated, from the plate of No. 3 tube to the fixed bypass condenser. In a like manner the plates and grids of each tube are connected as shown.

Now, a .0025 mfd. fixed condenser is mounted across the plate and F plus terminals of socket No. 3. In the same

How to Construct Coils And Connect Them in Set

manner a condenser of .005 mfd. capacity is mounted across the plate and filament terminals of the last tube, No. 6. This condenser may be bent up so that it will not interfere when placing the receiver in the cabinet.

Wires may be used for connecting these two condensers.

Another small bypass condenser of .005 capacity is connected between the resistance on socket No. 3 to the F minus on the socket. This condenser may be of larger capacity, if desired.

How Panel is Grounded

A wire is now run from the ground binding post to the grounded side of the battery switch. This is just a simple method of grounding the panel directly rather than running the wire to the A minus. Next connect the grid leads to the variable condensers. In the straight line Pacent condensers used the stator plates are insulated, the rotor being connected to the panel by means of the one hole mounting nut. Run a piece of wire from the grid of socket No. 1 to the stator plates of condenser C1. Next run a wire from the grid binding post of socket No. 2 to the stator plates of C2. These wires should be placed so that they do not come closer than about 1" from any other wires. From the grid leak and condenser which is mounted on a small right angled bracket on the grid post of the detector, or No. 3 socket, a wire is run to the stator plates of C3.

Coil Directions

The coils are of the space wound type as shown in the photograph with the primary on the outside. Directions are given for this particular style of coil though others of the same general shape may be substituted as long as they tune with the standard .00035 capacity variable condenser. The coils are shown in the photographs, already mounted on the dowel pins, described before, perpendicular to the baseboard. The antenna coil has from 9 turns on the primary and 66 on the secondary. The wire is No. 24 double silk covered. The inside wire is connected to the grid post of socket No. 1. The outside wire of the secondary and the outside of the primary are connected to the ground terminal on the strip. The inside wire of the primary is connected to the aerial binding post. This completes the hookup of the first or aerial transformer.

The other coils are wound identically, having 4 turns on the primary and 68 turns on the secondary.

Where to Connect

The outside of the primary is connected to the plate connection in each case, except the antenna coil, the inside of the primary going to the plus 90 volt binding post on the strip. The inside of the secondary winding is connected to the ground binding post and the inside is connected directly to the condenser plates.

The outside primary wire of the third coil from left in Fig. 3 is extended by soldering on a piece of the same sized wire, made into a small coil 2" in diameter and placed flatwise on L4L5. The terminal of this auxiliary coil is connected to the plate of the No. 2 socket. The inside of the primary is connected directly to the plus 90 binding post. The outside of the secondary winding is connected to the plus filament terminal of last socket. This is done to give the detector tube a positive grid bias. The inside terminal of

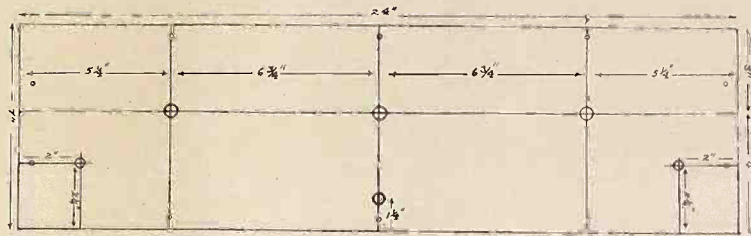


FIG. 2
Dimensional data for preparation of the panel.

the coil is connected to C3. Now by going over each terminal to see that it is tight and with a complete check of the wiring the receiver is completed. Too much stress can not be laid on the necessity of a thorough check-up of all the wiring.

Battery Leads

As resistance coupling is used in the audio circuit it is necessary to have at least 135 volts of B battery or the equivalent of three 45-volt batteries of the dry-cell type. A B battery eliminator works very well with this set.

Note that the negative A and negative B are hooked together, instead of negative B and positive A. This is done to preclude the possibility of a shorted B battery and perhaps some burned out tubes. In hooking up the batteries it is always wise to insert only one tube in the socket at first. Then connect up the A battery only and if the tube lights properly and is controlled by the rheostat in all probability the set is wired correctly. Then go ahead and connect the B batteries.

Some Advice On Aerial

Just a word in regard to the aerial and ground equipment. The best type of aerial is one about 90 feet in length from the set to the end of the aerial.

For places which are located some distance from the nearest broadcasting station lengths up to 150 feet may be used.

Too long an aerial will make the receiver non-selective on the local stations. A good ground connection is essential with this class of receiver and should be made on the cold water pipe by means of a good ground clamp.

In the city very good results were obtained on an inside aerial, but it must be remembered that an inside collector will not give the volume that an outside one will.

Should Use Good Speaker

It has often been said that the set is as good as the speaker. This is true and good tonal quality cannot be expected unless a good grade of speaker is used. The cone type works very well, as the receiver is capable of delivering tremendous volume. A power tube may be used in the last stage if trouble is experienced in the overloading of this tube. Provision is made for a C battery on the last two tubes and this should be regulated according to the B battery voltage being used and to the type of tube. A power tube takes more C battery than shown in the diagram.

Control of Oscillation

Any one of the flat type coils may be used whether the primary is wound on the outside, the middle or the inside.

There is a great variance of opinion

among engineers on this question. It will be noticed that all methods are all used with success by manufacturers. The principle of the reversed feedback is used to prevent oscillation.

Now, a certain amount of regeneration is wanted by the fan who likes to receive DX, though a squealer is not particularly loved by his neighbors. The small coil placed in the plate lead will prevent oscillation when properly adjusted.

After the receiver is ready for trial it may be found that it has a tendency to squeal and the left-hand rheostat controlling the brilliancy of the radio frequency tubes cannot be so adjusted as to cure the trouble. This may be due to two things. The feedback coil may be wound the wrong way. Try reversing it by simply turning it over. It will be found that one position will either eliminate the howls or greatly reduce them. If not, a turn or so may be added to the coil. When the coil is finally adjusted to the proper point there will be no further need to worry about it. This adjustment should be made on one of the lower wavelengths where usually a slight squeal is desirable.

For the fan who wants distance the number of turns in this auxiliary coil should be reduced. For the man who wants quality above all things an increased number of turns is desirable. L7 is the secondary of 3rd RFT.

LIST OF PARTS

- One brass panel 7x24" by No. 18 gage.
- One baseboard 6 1/2 x 22 x 1".
- Three Bruno Vernier Dials.
- One 6-ohm rheostat, single hole mounting (R8).
- One 15-ohm rheostat, single hole mounting (R1).
- One battery switch, single hole mounting (X).
- Three Pacent straight line frequency condensers, .00035 mfd. (C1C2C3).
- Six Pacent Isolantite sockets.
- Three Tobe 0.1 mfd. fixed coupling condensers (C6 C7 C8).
- One antenna coil (L1L2).
- Eight Fahnstock clips or binding posts.
- Two radio frequency coils (L3L4L5 L6L7).
- Three resistors, 0.1 megohm (R2R4R6).
- One resistor, 1.0 megohm (R3).
- One resistor, 0.5 megohm (R5).
- One resistor 0.25 megohm (R7).
- One 2-megohm grid leak (R9).
- One .00025 grid condenser and grid leak mounting (C10).
- Two .005 fixed mica condensers (C4 C5).
- One .0025 fixed mica condenser (C9).
- Miscellaneous wire, screws, brackets, etc., as explained in text; one binding post strip, 1x14x1/8".

The Pink of Perfection In An Audio Amplifier

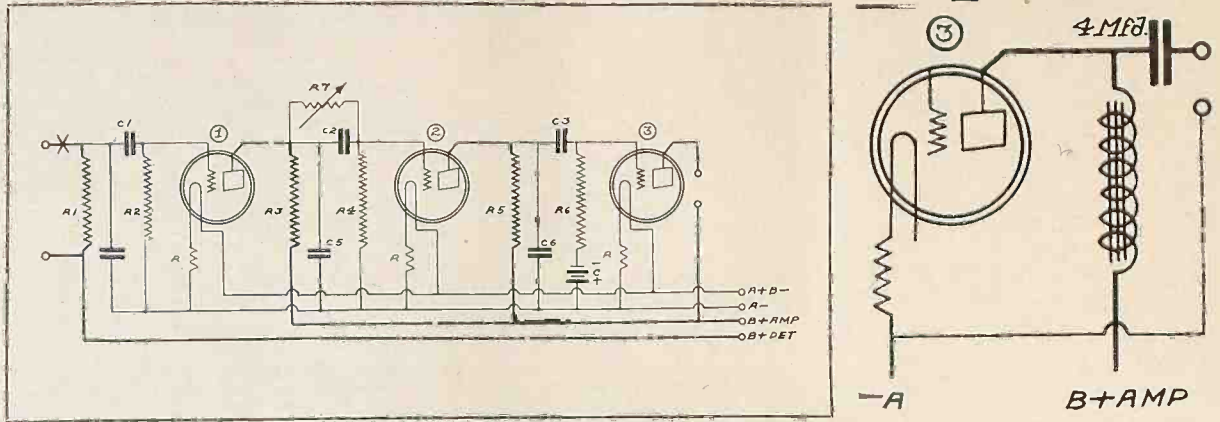


FIG. 1

Circuit diagram of a well-designed resistance coupled audio frequency amplifier. The variable resistor R7 is necessary only if a B battery eliminator is used. It cures the "steamboat" effect, a sort of throbbing sound. At X a radio frequency choke coil may be used to supplant the bypass condenser C4. At right the choke coil-condenser coupling to the speaker is diagramed. This method should be used where more than 135 plate volts are used on the last audio tube.

Three Stages of Resistance Coupling Preserve Original Purity of the Wave Form to Greater Extent Than Any Other AF Hookup, Says Bernard—B Battery Eliminator Sometimes Causes Throbbing Effect, Easy to Cure—Two Remedies Supplied.

By Herman Bernard

Associate, Institute of Radio Engineers

POSSESSORS of sets using resistance coupled audio frequency amplification, in conjunction with a B battery eliminator, sometimes find that a throbbing sound is produced in the audio amplifier. The suggestion of vibration has given rise to the expression "steamboat" effect to designate this trouble.

The total elimination of the effect is possible by introducing a resistor of the proper value, connected in shunt to the fixed condenser coupling the first audio stage to the second one. This should be a high resistance, somewhere between 5 and 10 megohms.

If a fixed resistor is used perhaps one will have to try several values before obtaining the correct one. A simple way out is to use a variable resistance, such as a variable grid leak. Once the proper setting is determined no further adjustment is necessary, hence it is not advisable to mount the variable leak on the front panel.

Fig. 1 shows the correct design of a 3-stage resistance coupled audio outfit. At left is the amplifier complete, while at right is shown the final tube, with speaker connected indirectly. The direct coupled method, as from tube 3 at left, is all right

if a plate voltage of not more than 135 is used for B plus amplifier, but if a greater voltage is employed it is highly advisable to protect the speaker windings by keeping out the direct current. Thus with the 171 tube or equivalent, with which 180 plate volts or more are commonly used, it would be folly to employ any other means of coupling than the choke coil and fixed condenser plan.

There are several choke coils on the market suitable for the choke at right. They cause the impedance to be more nearly like that of the speaker itself at some average frequency and with the high plate voltage and grid bias. It is very important to get the grid bias correct. The pamphlet in the boxes in which tubes are sold gives you the bias data, although one may depart from these as experience dictates, due to the fact that special circuit conditions may alter the circumstances by which the published bias was judged.

The coupling condenser in the choke coil method of establishing the current variations should be quite large. A popular capacity is 4.0 mfd. The inductance should be quite high, too. It naturally is, in the commercial products, such as those of General Radio and the National Company, because of the winding and of the iron, steel or other metal core.

The secondary of an audio frequency transformer usually has not sufficiently high inductance for this purpose and also tends to distort the wave form, when the effect is measured on an oscillograph. With some transformers, however, if the primary and secondary are connected in series aiding, then the inductance will be nearly high enough. If the connection is made in series opposing there will be a bucking effect, causing a drop in volume and some distortion as well. Sometimes one can tell the correct method by the ear test.

Another indicating method is to connect a milliammeter in series with the choke coil L, when the primary and secondary of a transformer are interconnected to constitute L. The needle will fluctuate more when the series opposing method is used than when the right method is followed, provided, however, the volume drop is not so intense as to make the needle stand still due to the feebleness of the audio fluctuations.

Resistor In Grid Circuit of Final Audio Tube Governs Quality and the Unit's Value in Ohms Should Be Found by Operating Test — What Tubes To Use To Gain Stated Ends—No Rheostats Necessary in Any Audio Hookup.

No general rule can be stated as to the P, B, G and F posts of the transformer, due to difference in the direction of the windings in transformers of different manufacture.

The complete audio hookup at left includes bypass condensers to keep the radio currents out of the resistors in the plate circuits. These are important. In fact, the one bypassing the detector plate resistor is vital. The capacity of this should be small, say about .00025 mfd. so as to avoid appreciable bypassing of audio frequencies. For the opposite reason the coupling condensers C1, C2 and C3 should be large. The original wave form is well preserved if the value of these coupling condensers is 0.1 mfd. or higher.

A popular value is 0.25, while in many instances still higher capacities are used.

The small bypass condensers are shown connected from plate to A minus, so as to bypass not only the resistors themselves but the batteries, too. However, good results are obtainable if the bypass condensers are connected from P to B plus, right across the resistor, and in some instances this is handier, especially in introducing them in existing sets. If you are starting anew it is well to have these connected as shown in the diagram, that is, from plate to A minus.

The most important leak in the 3-stage resistance coupled amplifier is R6, for the grid of the last tube is the one most

How to Cure Distortion Due to Tube Overloads

Milliammeter In Plate Circuit Responds to Strong Audio Fluctuations, Hence When Volume Is Intense Needle Will Not Avoid Deflections, Though Negative Grid Bias and Positive Plate Voltage Are Correctly Balanced.

likely to be overloaded. A method of overcoming this is to use a tube of higher power than the one you now employ. But in some instances, for example where you are using a 112 type power tube, the overloading may be pronounced, and you would then have to take the next step, which is a big leap indeed, calling for a 171 tube, requiring a negative grid bias of more than 40 volts and a plate current drain twice as great as that at all the other tubes in the set put together.

Limitations of the 171

Hence the 171 is practical only if a B battery eliminator is used, and even then the eliminator should be able to handle about 200 volts at at least 40 milliamperes.

This consideration excludes the 171 tube in most cases, hence some other remedy must be found. One need not seek far. Instead of the leak now employed for R6, which is likely to be somewhere around 0.5 to 0.1 megohm, use one that is between .05 meg. and 0.1 meg. The correct value should be determined when the set is receiving the local station that comes in loudest. The lower the value of resistance of R6 the greater the leakage path, hence the smaller the likelihood of the grid to swing positive, which it should not do, for then grid current flows and distortion is inevitable.

Effects Leakage Path

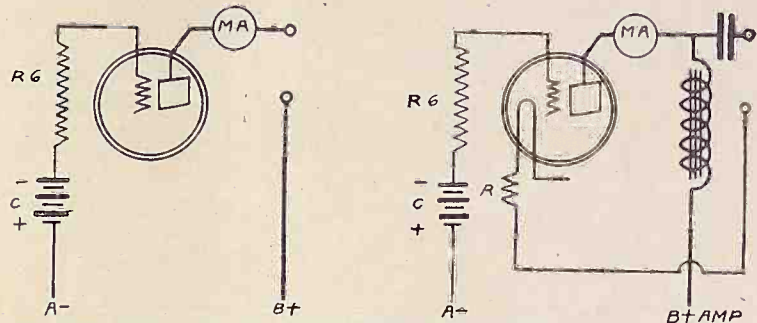
The change of value of this resistor is not made for the bias effect so much as for the greater leakage path for the excess electrons. Where something is too heavily burdened you lighten the load by drainage and this is the remedy you apply here. Try readjusting the grid bias after substituting a lower resistance unit for R6.

No rheostats are necessary in the audio circuit of this hookup. In fact it is hard to imagine a need for rheostats in any audio hookup. The tubes should be heated to their normal temperature, this being done by supplying the recommended voltage as given in the pamphlet enclosed in the tube box, and likewise printed on the box itself in most instances. R in Fig. 1 represents suitable Amperites.

Very fine results are obtainable when -01A tubes are used in the first two sockets of a resistance coupled amplifier, with a power tube in the last stage.

High Mu and Power Tubes

Indeed, the -01A tubes may be used throughout, if desired, although the volume that can be handled comfortably



The milliammeter in the plate circuit at left is to be read into Fig. 1, at tube 3, in the complete amplifier. If the choke coil-condenser coupling method is used, then the meter should be placed as shown above at right. Why the meter is not an infallible distortion test is explained in the text.

by the last tube will be less, hence the leak R6 will have to be of smaller resistance than if a power tube were used.

To preserve the full value of volume the power tube replaces the other in the final stage only. When the choke coil coupling method is used for speaker connection the last tube should always be a power tube, since the object of this method of coupling is to give best results where high plate voltages are required, and that applies only to power tubes. The -01A type will stand up to 135 volts without difficulty.

For greater volume from resistance coupled audio it is well to use high mu tubes in sockets 1 and 2. These have an amplification constant each of about 20, instead of the 6 obtainable with the -01A type of tube. As the coupling method produces no voltage stepup, but the tubes alone contribute the increase, the higher factor is the express means of obtaining greater volume.

RF Affects the AF Load

Many of the considerations affecting the audio channel are predetermined by the radio frequency circuit or tuner. Thus the condition of overloading that may exist in the final tube grid with one type of tuner will be present far ahead of this tube, for instance in the detector, or in the first audio tube grid, if some other tuner is used. This would be so if the radio frequency amplification were very strong, as in the Super-Heterodyne, where the second detector is called upon to handle an extremely heavy load, due to the tremendous radio frequency amplification that precedes the second detector.

With a stage of tuned RF and a regenerative detector the volume will be very satisfactory. Such circuits include the Diamond of the Air, the Browning-Drake, the Hammarlund Roberts and the like. The grids are pretty safe with these circuits up to the final audio grid.

Particularly in regenerative sets it is a good plan to use a radio frequency choke coil to keep stray radio currents out of the audio department.

Where to Put Choke

The choke coil would be inserted at the point (X) in Fig. 1. If a choke coil is used the bypass condenser need not be included, as the object it is intended to serve is better achieved by the choke coil.

Such a choke may consist of 150 turns of No. 36 single silk covered wire on a 1 1/2" diameter tubing. Keep the choke

coil out of inductive relationship to any other coil in the set.

It is well to remember that an RF choke will enable a set to be regenerated at the highest receivable wavelength, though that was not possible without the coil being included.

Do not confuse this type of choke, which is a radio frequency model, with the audio choke, of entirely different theory, purpose and construction, as shown at right in Fig. 1.

Resistors Most Be Good

In constructing a resistance coupled amplifier of this sort it is imperative to use resistors that will remain steady in their operation, and not undergo structural changes due to the use of different voltages than the manufacturer hoped would be used. Metallized resistors are excellent, as they are true to their rated resistance at given voltages and withstand the heavy duty they are called upon to perform.

High plate voltages should be used with resistance coupling, because of the voltage drop in the resistor. For instance, B plus detector may well be 90 volts or more, indeed even up to 135. If three 45-volt B batteries are your plate power supply, then you may use 135 for all four plate resistors. Otherwise be sure to use 135 for B plus amp. and at least 90 for B plus det.

As has been suggested, arbitrary values can not be recommended for all the resistors in the amplifier, especially as R6 is subject to experiment. However, the other resistors may be as follows: R1, 0.1 meg.; R2, 0.5 meg.; R3, 0.1 meg.; R4, 0.25 meg.; R5, 0.1 meg.

Bias and Distortion Tests

When using a milliammeter to aid in determining what should be the correct value of R6, or for any other purpose associated with curing overloadings and consequent distortion, remember that strong signals will cause the needle to fluctuate, hence the standstill test is merely a relative one and is most useful in determination of the correct value of negative grid bias.

If the needle kicks down, increase the negative bias. If it kicks up, decrease the bias.

Especially with power tubes, the grid bias will be critical, but once the correct point is found the problem is solved for good.

(Concluded on page 8)

Double-Grid Tube Called Big Advance

By Hugo Gernsback

One of the greatest advances in radio was the invention of the double-grid tube. This type of tube has for years enjoyed a tremendous popularity in Europe, but, strange to say, it has been sadly neglected in this country.

For the experimenter and the hook-up fan, for the set builder, and for even the set manufacturer, there is nothing more interesting and more efficient than the double-grid tube. There are so many great advantages in such a tube, that it is a mystery why it has not come into use much more than it has up to the present.

The double-grid tube has been described for years and it is—theoretically at least—well known to most readers. But how many have actually experimented with this excellent tube? It is not very much more expensive than the regular tube; but instead of having four connections, as does the single-grid tube, it has either five prongs or the usual four prongs, to fit any socket, plus an extra binding post attached to the metallic shell of the tube.

Use Made Simpler

Now that we here in America are beginning to use the European type of pin socket, which has no supporting sleeve, it becomes simple to use the double-grid tube with the extra connection on the shell. Perhaps this has been one of the difficulties considered insuperable up to now, but it certainly should be overcome immediately.

In "Radio News" in 1924 we described an excellent circuit in connection with a double-grid tube, the Solodyne, which makes it possible to use a vacuum tube without a B battery. There are, however, many other excellent circuits that can be used with such a tube; and I sincerely hope that our tube manufacturers will take advantage of the tremendous

Makes Better Fittings



(Hayden)

WITH THE aid of a plane, bought in any hardware store, it is possible to smooth down any rough points on the edge of the panel, baseboard or cabinet, so as to obtain better fittings.

demand that must be awaiting their product, once the experimenters and set manufacturers begin to see the great advantages of such a tube:

The present-day three-element tube, the one which we have used up to now, while a wonderful piece of apparatus, is yet very poor when compared to the double-grid type. The ordinary three-element tube on the market now amplifies about six or seven times, whereas the double-grid tube has an amplification factor of twenty or more, almost three times as much, and that without an increase in the internal output impedance. That, in plain English, means that the double-grid tube is, therefore, suitable as a power tube. Putting it in another way, one double-grid tube is almost as good as three of the present type.

One of the most injurious defects of the vacuum tube is a result of the capacity effect between the plate and the grid. For that reason it has not been possible to construct really efficient radio-frequency amplifiers that will cover the broadcast wavelengths. This defect can be overcome readily by means of the double-grid tube. Also, if our tube manufac-

turers were to turn out a good two-grid tube of the three-volt type, our experimenters would have the ideal tube for portable sets.

Furthermore, the demand in this country at the present time is for sets that may be operated on the house-lighting current. Great advantages are claimed for such sets, but most of them, up to now, have not worked out very well. The two-grid tube gives us an advantage here, because it becomes a rather simple matter to filter out or neutralize the hum, by means already known to the experimenter and set constructor.

Aside from this, the two-grid tube is very much more economical than the single-grid tube; and I am certain that as we go along, many new advantages and many new excellent circuits will be discovered by our experimenters.

Possible Static Relief

The tube holds out excellent promise for double-regeneration circuits, certain types of reflex, and especially in Super-Heterodyne work. For instance, Dr. Langmuir has discovered a circuit where the double-grid tube is used for simultaneous oscillation and modulation, both in a single tube.

It may even be possible, though we can not be too sure about this, that by means of the double-grid tube some progress can be made toward the elimination or partial suppression of static.

There is hardly a circuit now known that cannot be improved or bettered by means of the double-grid tube, and I am certain, as well, that many hitherto undreamt-of circuits will be found in the future, when employing the double-grid tube.

As far as we are aware now, we have reached about the ultimate in circuits. There are only five or six circuits to begin with, all the others being variations, but I am certain that by means of the double-grid tubes we shall in the future have circuits which in sensitivity and efficiency will outdistance anything that we think possible today. It will be possible to use a one-tube set with a crystal combination and without a B battery, to operate a loudspeaker for short distances.

Amplification High

That this sadly-neglected tube offers great possibilities can best be demonstrated by the fact that tubes that give an amplification factor actually above 900 have been constructed for laboratory purposes; which, when compared to our present-day tubes, giving only six- or seven-fold amplification, seems to be a tremendous improvement.

There is, in short, no reason today why double-grid tubes should not be used by every experimenter, nor why they should not be adopted by set manufacturers as well. As I mentioned above, such tubes can be made to fit any existing socket, and only slight changes are necessary to adapt the tube even to an existing set.

There is another important phase in the possibilities of the multi-grid tubes of which nobody seems to have taken sufficient cognizance; and that is their adaptation to the purposes of power amplification. In spite of all the work that has been done in the development of these tubes, they have so far been made only to operate on plate voltages somewhat lower than we are accustomed to use with the single-grid tubes.

Nowadays, a slight saving in B current is of little account. It would seem, therefore, that by making these two-grid tubes to operate on the higher plate voltages now in general use, and similarly as to the A voltages, it should be possible to produce amplifiers of power far exceeding anything we have hitherto seen.

The ideas expressed above are only a few of the thoughts aroused by the possibilities of the multiple-grid principle in vacuum tubes.

Quality Is Spoiled If Speaker Is Bad

(Concluded from page 7)

As C batteries afford variations only in steps of 1 1/2 volts you might increase or decrease the plate voltage to get the correct balance between plate voltage and grid bias. The higher the plate voltage the higher the bias should be. A variable resistor in the B plus lead affords fine adjustments. It can not be used in the grid battery as no current flows there.

Weak Signals Prevent Test

The reason why the standstill needle is not an absolute distortion test is that when the signal strength is relatively low the needle stands still although the distortion may be bad.

The audio variations are not strong enough to affect the needle, for if they were, the needle would wobble. The test may be deemed to be satisfactorily complete when the needle moves about equally on both sides of the current consumption reading, when one is receiving loud signals.

To determine the relative zero point, detune the set.

The needle will stand still absolutely. This gives the current consumption. Thus,

if 6 is the reading you must look for the variations on either side of 6. Then tune in the strongest station and watch the needle. Adjust the bias until the needle moves, if at all, equally on the two sides. The movement normally should not exceed a total of 1 or 1 1/2 divisions of the milliammeter.

Get a Good Speaker

A point seldom stressed is that although resistance coupled audio amplification is unqualifiedly the purest and most faithful possible, much is lost unless a good speaker is used.

Speakers have their limitations. If pitched too low, as some cheap cone speakers are, the highest frequencies in the audible range sound unnatural, indeed are distorted.

If you are purchasing a speaker in a store you should have a comparison made for you in your own presence and then you can determine which one you like best, but be sure that the set used as demonstrator has the same type of audio amplification as your own. In the absence of these opportunities, buy only speakers of reputable manufacture.

Radio As a Career Offers Opportunities

Specialization Is Necessary, Due to the Tremendous Scope of the Art—Knowledge of Electrical Engineering Is Prerequisite

By Leon L. Adelman

The Chas. Freshman Co., Inc.

The rapid development that has witnessed the progress of the radio art has created a vast field for further productive research. New and useful improvements have been constantly appearing and there has been a growing tendency among radio manufacturers to simplify the operation and increase the efficiency of their radio receivers.

Behind the scenes, as it were, are the radio technicians, the radio engineers and the laboratory staffs who are directly responsible for the marketed product. The fruits of their efforts, combined with the efficiency of systematic production, are the main factors which allow one to purchase a good receiver at a reasonable price. Although there are many good receivers, there are, also, some which are very poor indeed, both electrically and mechanically. The receiver itself is evidence of good or bad engineering practice. Nor is this mute evidence in any way. By its performance you shall know it, and as you listen-in, you can readily tell whether it oscillates uncontrollably, distorts the music horribly, or is so extremely insensitive and tunes so broadly that it is wrong to call it a product of engineering skill and design.

Sets Much Better

The day of the poorly designed set is quickly passing, and those types which have given cause for concern, such as those which radiate powerfully and produce inexcusable noises, are losing popularity. No longer will the public have to contend with radio receivers which do not warrant being called such. For this, we have the progressive radio laboratory staffs to thank.

Radio engineering is becoming more and more one of the most important professions. Its scope is already so large that no one engineer can hope to learn

everything on the subject. Engineers, to keep up with the times, have found it necessary to specialize. And in specialization is sounded the keynote for their individual and collective success.

The young and ambitious man desirous of studying radio engineering as a profession must first study electrical engineering. It is most essential that he do this, for without the sound and basic fundamentals of electricity there can be no competency in a radio engineer.

In fact, of the few college courses that are now available in which to learn radio engineering, none will accept as students those who do not hold a degree in electrical engineering or a similar equivalent. Without electrical engineering there could be no radio engineering. The sound training which an electrical engineering course teaches will be found very necessary to the aspiring radio engineer.

"What particular phase of radio engineering shall I study?" is a difficult question to answer directly. It all depends upon the individual who asks it. If one is adept at mathematics, he should invariably make good in practically any phase of the art. The designing of audio and radio frequency transformers, variable condensers and inductances, etc., will be found relatively simple work. On the other hand, one may be imbued with a good knowledge of chemistry, in which case, the development and perfection of permeable alloys for transformer cores and other apparatus will present an attractive field.

An individual having a good musical ear stands a good chance to use his developed aural faculties for the perfection of good quality-reproducing loudspeakers. This is one of the most needed inventions—a loudspeaker which will reproduce the voice and music without distortion.

Patent Law Attractive

Again, the radio engineer, in his ambition to make a name for himself, and if he has a liking for law, should by all means take up the study of patent law, giving particular attention to the radio patents. From out of the present mass of radio litigation we may be surprised that in a not far-distant day some wide-awake lawyer will discover a disputable technicality on which million-dollar-corporations will have to acknowledge another's priority or other similar claim for patent rights.

Even in the face of the many legal suits which radio manufacturers are waging

Clips Are Convenient



(Radio World Staff Photo)

HEAVY CLIPS are better to connect cables to the storage battery terminals than the bare wire alone. Using the nut for connecting to wire is less convenient too.

against one another, it appears almost miraculous that there has not been more of a mixup. In almost every case the lawyers are capable radio experts who of necessity have given careful study and consideration to this rapidly growing art. Some of them have taken up the study of special angles of radio, so that they may be better fitted to wage controversy.

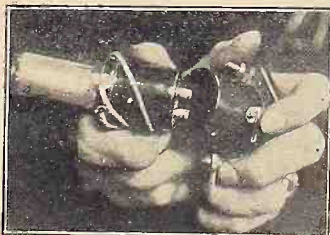
The Ideal Set

There is a great number of major improvements still to be made in radio. The set of the near future will be a self-contained affair, operating from the lighting circuit and having the antenna and other equipment within its cabinet. It will have two controls—a logical number; one for tuning, and the other for volume. The quality of its reproduction will be well-nigh perfect. Preserved overtones and harmonics, often cut off, will add to the timbre and richness of the music. In fact, radio broadcasting will reach a stage where people will content themselves with staying at home, rather than going to the opera. And with the advent of television, who knows but that the majority will want to stay at home altogether?

It is up to the radio engineer to fulfill these dreams. He alone can accomplish these things. Each in his chosen field of endeavor adds to the ever-growing progress of the art.

Since the beginning of broadcasting we have witnessed the coming and near-obsolence of the crystal set. A demand brought forth the one-tube regenerative receivers, but insistence for a better product soon replaced the rather frail filament tube which consumed almost 5 times as much current as do the present-day tubes. Then came the 2, 3 and 4-tube receivers, which to a large degree have been replaced by the 5-tube radio frequency sets.

Power Tube Adjunct



(Photo Courtesy Alden Mfg. Co.)

YOU DO NOT have to take your set apart to install a C battery. A Connectorald, made in all sizes to hold all types of bases on present day tubes, solves the problem. By simply installing this socket in the stage where the C battery and extra B voltage are to be placed, proper connections can be made directly to leads that are already attached. In this way a power tube, for instance, may be used in any set without rewiring.

Pryor Band to Play Classics on Sunday

WOR's Sunday evening program will be opened at 8:30 with forty-five minutes of exceptional music by Arthur Pryor's Band, broadcast from the Arcade at Asbury Park, New Jersey.

For his Sunday evening program Mr. Pryor will select some of the greatest masterpieces of musical composition. Descriptive and light numbers have their very proper place, but the famous bandmaster feels that the Sunday evening program should be devoted to none but the very highest form of classic music.

Music Fellowship Won By Mathilde Harding

Mathilde Harding, the most recent addition to WEAF's studio staff, has been notified by the Juillard Musical Foundation that following a recent competitive examination she has been awarded a Fellowship in the Juillard Graduate School for the season of 1926-27 in the Department of Piano. Miss Harding is elated over the fact and is already looking forward to a season of hard study, which is certain to result in pleasing piano accompaniments and solos on WEAF's wavelength of 492 meters.

How to Plot Curve Of Coupling Effects

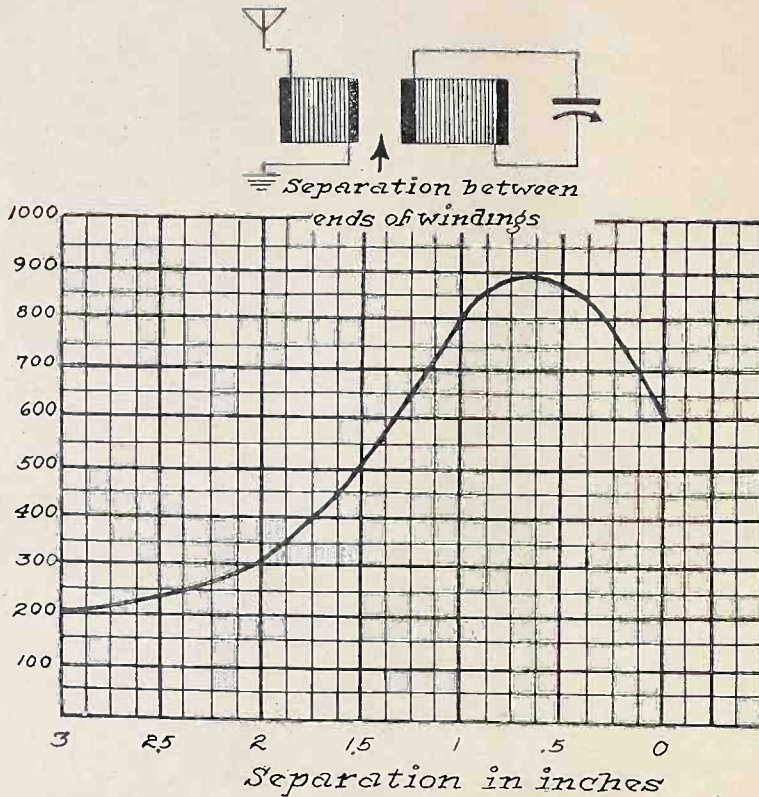


FIG. 5

CURVE SHOWING the coupling plotted against signal intensity. The hump shows that beyond a certain point, called the peak, closer coupling means less energy transfer. The horizontal line is known as the abscissas and shows the separation between coils in decimal inches. The perpendicular line is the ordinate and shows readings of the meter M in Fig. 4, hence relative signal intensity.

Deflections of Meter Indicate the Intensity of the Signal—Simple Measuring Circuit Is Used.

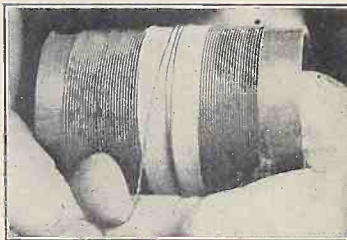
[A series of articles is being published in RADIO WORLD on how to build a laboratory inexpensively and what experiments to conduct. Previous articles were published June 19, June 26 and July 24. The following is the conclusion of the July 17 article on "How to Measure Coupling."]

By John F. Rider

Member, Institute of Radio Engineers

The coupling then is measured in arbitrary yet accurate figures according to the indicator deflections. To obtain these data we set into operation our radio frequency amplifier, using the variable coupling device for the input tuner.

The radio frequency transformer which normally would be connected between the output of the radio frequency amplifier and the input of the detector is put into position. The detector tube is replaced with a crystal-milliammeter combination as is shown in Fig. 4. The reading on this meter is an indication of the radio frequency energy which is transferred to the grid of the first R F tube. The crystal is a Carborundum fixed crystal unit, and



(RADIO WORLD Staff Photo)

FIG. 6

THE RADIO frequency transformer is wound with primary over the middle of the secondary. Empire cloth is between the coils.

the meter is a Jewell 0-to-1 D C milliammeter. If a microammeter with a maximum deflection of 500 microamperes is available, it may be used to advantage.

To obtain the coupling curve, a 3" separation is used between the primary and secondary of the input tuner, and a powerful local broadcaster is tuned in. The meter indication is then jotted down, and along side of it is marked the coupling in inches. For example: 3"—200; 2½"—225; 2"—300; 1½"—500; 1"—775; ¾"—875; ½"—850; ¼"—775; 0"—600, etc. To plot this in curve form we make the abscissas the coupling separation and the ordinate the meter deflection and obtain the curve shown in Fig. 5.



(RADIO WORLD Staff Photo)

FIG. 7

AN EXAMPLE of loose coupling. The rotary coil's field scarcely cuts the stationary coil's field at all.

Audience Can Not Tell Radio From Phonograph

In a recent impromptu and interesting experiment conducted by Dr. A. N. Goldsmith, chief broadcast engineer of the Radio Corporation of America, it was found that broadcast quality of transmission had become so perfect that the average audience could not distinguish it from phonographic reproduction.

During the broadcasting of the Maxwell Hour from WJZ, Dr. Goldsmith had a number of friends listening to a combined radio and phonograph machine in his library. The announcer of the hour stated that a certain selection would be played by the orchestra and Dr. Goldsmith happened to have the same selection on a record made by the identical orchestra.

He placed the record on the turntable of the machine, and when the orchestra started at the station, alternated from the phonographic reproduction to the radio and vice versa. After the shift had been made several times so that the audience forgot which was which, the effort to distinguish the radio reproduction from the phonographic were useless.

Scots Are Generous, Bonnie Laddies Find

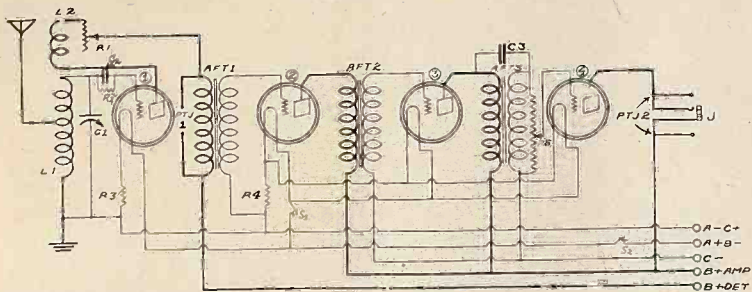
The Bonnie Laddies who broadcast with the Sundial Serenaders from Station WJZ at 9 o'clock every Friday night have come to the defense of the Scotch in the matter of generosity. With certain theatres banning jokes on prohibition and other matters, the Bonnie Laddies contend that the modern jokesters have been forced to turn to the Scotch for a source of clean humor. As a result, they claim that the race has been unduly slandered and that they are by no means as close in money matters as the general public is being led to believe. As a proof for their opinions they offer the applause mail which they have received since broadcasting through station WJZ.

Because of their name, the Bonnie Laddies have undoubtedly attracted the attention of the Sons of Scotland, and in the mail which they receive, a large portion of which is from that clan, are numerous gifts. Each of the boys has a real "tam o' shanter," the gift of a member of the clan. Numerous other trinkets have been given to them. Scotch food-stuffs have come to them aplenty.

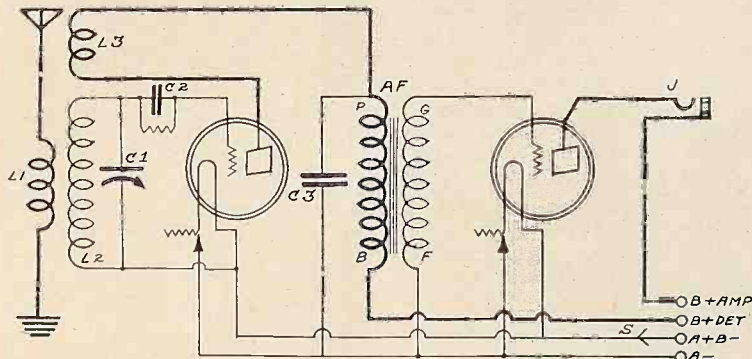
NAVAL RADIO IN CIVIL SERVICE WASHINGTON.

According to an order just issued by the Navy Department, the naval radio service is on a competitive basis similar to gunnery and engineering.

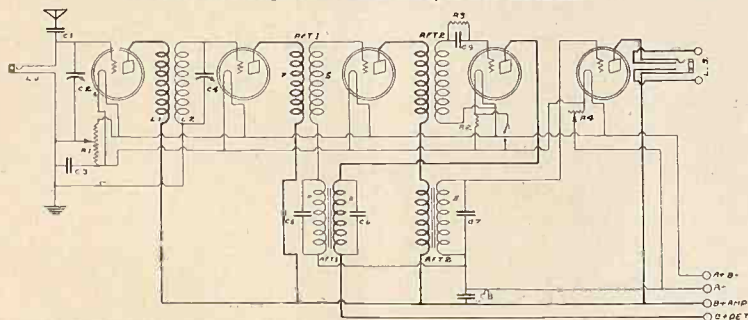
Hookups for Constructors



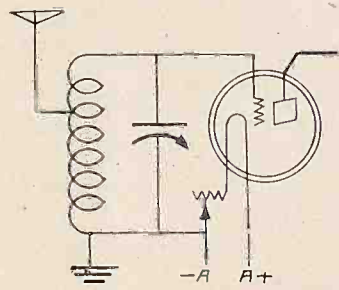
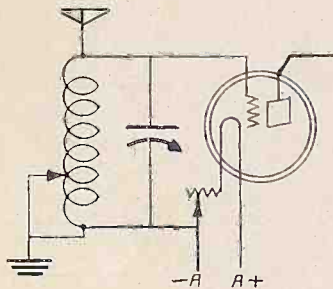
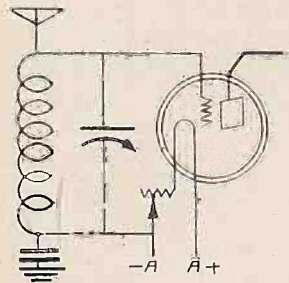
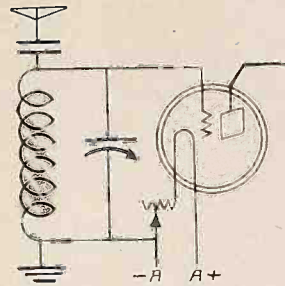
THE CIRCUIT DIAGRAM of a receiver which can be used as a portable, with a short antenna. The complete, set batteries, loud speaker, antenna and ground wire can be placed in a 7x24" cabinet. The set itself can be placed in a 7x12" panel with the batteries and the speaker to each of the sides. Such a method was described in the July 3 issue of Radio World. Three stages of transformer AF amplification are used.



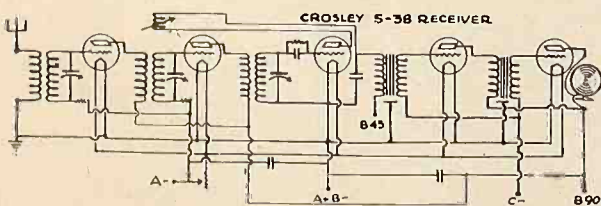
A 2-TUBE RECEIVER, employing a regenerative detector and one stage of transformer coupled AF amplification. The popular 3-circuit tuner is used in the detector circuit. Rheostats control the filaments of both the detector and AF tubes. If the -01A type tubes is used, the 10-ohm type rheostats will do. C3, the by-pass condenser, may be either of the .001 or .005 fixed type. The filament switch, inserted in the A plus B minus lead, is not essential.



THE DEFOREST D-17 Reflex Loop Set, using a tube as a detector instead of a crystal. Three stages of radio frequency amplification, a non-regenerative detector and two stages of AF amplification are employed, using 5 tubes. The third tube is both an RF and an AF amplifier. A potentiometer, R1, controls the oscillatory action of the first two RF tubes.



ALTHOUGH THE use of a single inductance in the antenna with a condenser shunted across for tuning usually gives very loud signals, a large condenser is necessary to tune in the entire band. By inserting a fixed condenser, having a capacity of less than half of that of the antenna, either band may be covered with a smaller variable condenser. However, some volume is sacrificed, so that this system is equal to the usual untuned primary. The method shown in the third diagram from the top will increase the volume. The tap is placed at the low potential point of the coil, about one-third the way up. The unused part of the coil is shorted.



THE CROSLY 5-38 RECEIVER, wherein two stages of tuned radio frequency amplification, a regenerative detector and two stages of transformer coupled AF amplification are employed. Note the odd placement of the tickler.

The 1-Tube Aeriola, Sr., Set

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., N. Y. City.

When writing for information give your Radio University subscription number.

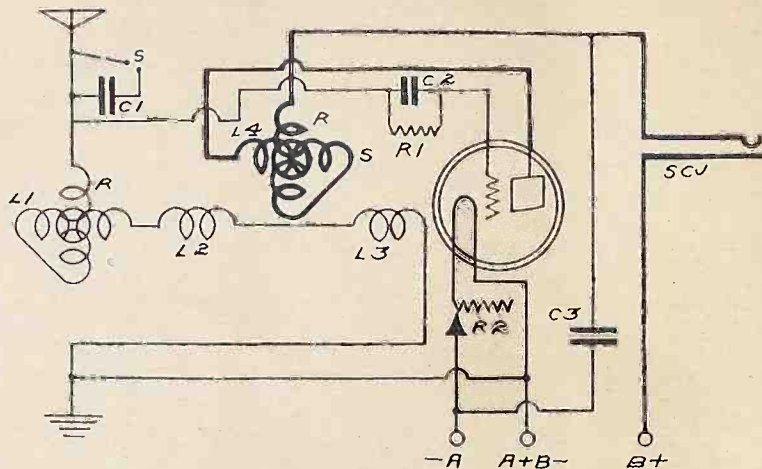


FIG. 386

The circuit diagram of the Aeriola Sr., a 1-tube receiver, using a -01A type tube.

PLEASE GIVE the circuit diagram of the Aeriola, Sr., stating the constants and the manner of hooking up. I wish to use the -01A type tube. Harriet Simpson, Kansas City, Mo.

Fig. 386 shows the circuit diagram of this receiver. Variometers are used for tuning the grid and the plate circuits. C1 is a .0005 mfd. fixed condenser, which may be connected to the antenna or shunted out, so as to receive higher or lower wavelengths. Binding posts are provided here. The stators, S, of both the variometers are wound on one tubing about 3/4" in diameter and 7" long.

The stator of L1 consists of 32 turns. The stator of L4 also consists of 32 turns. On both sides of the stator winding of L4, five turns (L2 and L3) are wound. This winding is a continuation of the L1 winding. The rotor of the antenna variometer consists of 38 turns. The rotor of the plate variometer consists of 40 turns. Both these are wound on tubings 2 3/4" in diameter. No. 22 or 24 double cotton covered wire is used throughout. C2 is a .00025 mfd. grid condenser. R1 is a 2 megohm grid leak. R2 is a 20 ohm rheostat. C3 is a .001 mfd. fixed condenser. SCJ is a single circuit jack. The beginning of the rotary winding of L1 is brought to a binding post and to one terminal of C1. The other terminal of C1 is brought to another binding post. The antenna is brought to a pair of binding posts. Filament switches may be employed instead of the binding posts, as indicated in the diagram by S. The beginning of the rotary winding of L1, is also brought to one terminal of C2 and R1. The other terminal of this combination is brought to the grid post on the socket. The end of the rotary winding of L1 is connected to the beginning of the stationary winding of L1, the end connected to the beginning of L2. The end of this winding is continued on to the beginning of L3. The end of this winding is brought to the ground post and to the A plus B minus post. It will be noted that L2 and L3 are connected in series with the stationary winding of L1. The beginning of the stationary winding of L4 is brought to the end of

the rotary winding of L4. The beginning of this rotary winding is connected to the top terminal of SCJ and to one terminal of C3. The other terminal connecting brought to the plate terminal of the sockets. The other terminal of C3 is brought to the arm of the rheostat, R2. The resistance terminal of this rheostat is connected to the F minus post on the socket. The F plus post on this socket is connected to the A plus B minus post. A filament switch may be inserted in series with this latter lead. The rotors of the variometers are installed at the two ends of the stator tubing. Care must be taken that the two intermediate windings L2 and L3 are placed in between the windings of the plate variometer. The filament adjustment of this set is quite critical. This applies to the plate coil also. About 45 volts B potential will do. Audio stages may be added.

1-Tube Tuner Hook-up For Use With Amplifier

I HAVE an Atwater Kent 2-stage audio frequency amplifier which I would

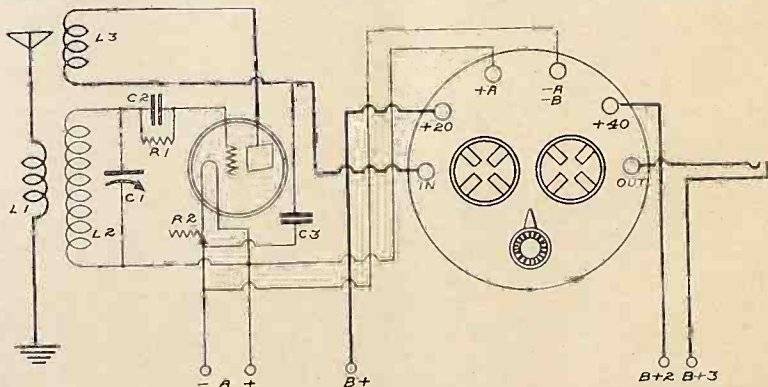


FIG. 387

The circuit diagram of the 1-tube regenerative receiver hooked up to a 2-stage Atwater Kent AF amplifier.

like to attach to the output of a single tube regenerative receiver, employing a 3-circuit tuner. The circuit diagrams and a brief wiring description are desired.—Harris Canter, 1385 Franklin Ave., N. Y. City.

Fig. 387 shows the circuit diagram of the combination 1-tube receiver hooked up to the Atwater Kent 2-stage audio frequency amplifier. The primary of the tuner consists of 10 turns. The secondary consists of 45 turns. Both these windings are placed on a tubing 3/4" in diameter, using No. 22 double cotton covered wire. The tickler L3 consists of 36 turns of No. 26 single silk covered wire, wound on a tubing 2 3/4" in diameter. C1 is of the .0005 mfd. variable type. R2 is a 10-ohm rheostat controlling the filament temperature of a -01A type tube. C3 is a .001 mfd. fixed condenser. C2 is a .00025 mfd. grid condenser. R1 is a 2-megohm grid leak. The end of the tickler winding is connected to the IN post on the amplifier. The plus 20 post on the amplifier is connected to the plus 45-volt post on the B battery. The plus A post is connected to the A plus post of the battery and the set. The A minus and the B minus posts are connected to the A minus and B minus posts of the set and batteries. The plus 40 volt post is connected to the 90-volt post. The top terminal of a single circuit jack or a phone tip is connected to the OUT post. The bottom terminal of the jack or the other tip is brought to the 90-volt post also. The rheostat on the amplifier unit controls the filaments of both tubes, which are of the -01A type. Should you desire to use a power tube in the last stage, it will be necessary to install a C battery connection, via a special socket, such as are now in the market. That is you will not be able to make the conventional break in the F minus lead of the AFT, due to the mechanical construction of the amplifier.

R. C. A. 5-Tube Set and Speaker for It

WHAT IS the model number of the 5-tube receiver manufactured by the R. C. A.? (2)—Please give a brief description as to its characteristics. (3)—What is the model number of the R. C. A. speaker usually used in conjunction with this 5-tube receiver? (4)—Please print cuts of both the set and the speaker.—Benjamin Varet, Haines Falls, N. Y.

(1)—Radiola Model 20. (2)—It is a balanced receiver so made that regeneration can be used by the adjustment of a knob. The antenna used with this set

The 5-Tube Neutrodyne

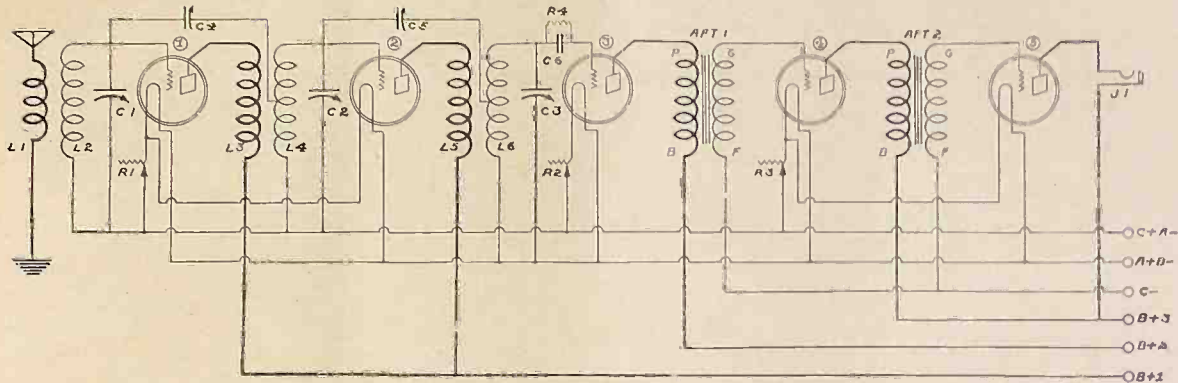


FIG. 388

The circuit diagram of the receiver that Charles Nedwood desires to build in an ample cabinet.

should be about 75 feet long. However, provision is made to adapt the set to antennas of various lengths. Drum type dials are employed. Dry batteries are used. The UX-120 power tube may be used in the last stage. (3)—Radiola Loudspeaker Model 100. (4)—Both these models are shown in Fig. 389.



FIG. 389

The Radiola 20 and Loudspeaker Model 100.

Cabinet for Large Set With Speaker Provision

I AM going to build a 5-tube receiver, consisting of two stages of neutralized radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio frequency amplification. The -99-type tube is to be used. I would like to build a cabinet for this set so that the batteries and speaker could be placed in special compartments on the sides or above. The only things I wish to show on the panel are window type dials and a pilot light. The speaker jack and rheostat are to be placed on a sub panel, in the rear of the set. A photo or diagram of such a cabinet with a brief description would be greatly appreciated. The coils, which have 10-turn primaries and 60-turn secondaries, wound on tubings $3\frac{1}{4}$ " in diameter, with No. 22 double cotton covered wire, are to be placed at the regular Neutrodyne angular position, e.g., 53.7° . The secondaries of these condensers are shunted by .00035 mfd. straight line frequency variable condensers. These require space, due to the elongated rotary plates e.g., at least 6". This means that the condensers will take up 18" of the space, without any space between them. I suppose, therefore, a 7×24 " panel will be required.—Charles Nedwood, Mount Kisco, N. Y.



FIG. 390

Design for cabinet desired by Charles Nedwood.

sole models, is included. A standard curved shaped horn, which stands erect, may be employed. The pilot light and switch is shown in the exact center of the panel, with the three windows for the dials below. The knobs controlling the rotary plates of the condensers and on which are placed the dials behind the windows are at the bottom. To the left the B batteries are placed, while to the right, the $4\frac{1}{2}$ -volt dry cells or storage A battery are placed. The antenna, ground and speaker connections are made in the rear. Rubber feet should be placed at the bottom of the cabinet.

honeycomb coil type. L1 may be wound on a tubing 3" in diameter and consist of 65 turns, while L2 may be wound on another tubing 3" in diameter and consist of 90 turns. No. 22 double cotton covered wire should be used. A -01A or power tube may be used. The plate voltage should range from 90 volts up, depending upon the volume desired and the tube used. The greater the voltage, the more critical the set to adjust, although the signals will be louder also. The controlling of the filament is not critical. The resistance across the condenser bank, R3, is very critical. No ground is needed. The set is very selective, requiring very careful tuning. The beginning of the antenna inductance L1 is brought to the antenna post and to one terminal of the grid condenser and the grid leak. The other terminal of this combination is brought to the grid post on the socket. The end of this coil is brought to the rotary plate connection of the variable condenser, to one terminal of C3, to one terminal of C5 and to the resistance terminal of R3. The beginning of the antenna coil is also connected to the stationary plate connection of C1. The other terminal of C3, which is connected to one terminal of C4, is connected to the A plus B minus post and to the F plus post on the socket. The other terminal of C4 is brought to the other terminal of C5, to the B plus post and to the bottom terminal of the single circuit jack, SCJ. It is also connected to the arm of R3. The beginning of the plate inductance L2 is connected to the plate post of the socket. The end of this coil is brought to the top terminal of the jack. The rheostat is connected in the negative leg of the filament.

Both the antenna and the plate inductances may be variable. The grid leak may be variable also.

A photo of a cabinet, with the suggestions you offered, is shown in Fig. 390. This cabinet is difficult to build, but with patience, a good job can be made of it. No expensive tools are required. Pine can be used for wood. Hardwood makes a cleaner looking job. The entire cabinet is 32" long, 10" high, excluding the speaker, and 10" wide. The speaker portion at its highest point is 7" from the top of the cabinet. This means that from the bottom of the center of the cabinet to the top of the center of the speaker portion is 17". The cabinet is, of course, very large, but provides ample space for all the parts. A smaller cabinet can be used, but jamming of parts, which will make it difficult for wiring, etc., will result. A special shape horn, such as used in con-

Super-Regenerative Set Designed By Flewelling

A CIRCUIT diagram of the New Flewelling Circuit, with all constants and a wiring description, is desired.—Karl Smith, Hunter, N. Y.

Fig. 391 shows the circuit diagram of this receiver. L1 is a 50-turn honeycomb coil. L2 is a 75-turn honeycomb coil. C1 is a .001 mfd. variable condenser. C3, C4 and C5 are all .006 mfd. fixed condensers. R3 is a 0.5 to 1 megohm resistance. C2 is a .00025 mfd. grid condenser. R1 is a $\frac{1}{2}$ megohm grid leak. R2 is a 10 ohm. rheostat. The coils need not be of the

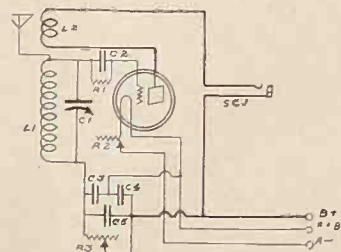


FIG. 391

The circuit diagram of the new Flewelling super-regenerative set.

Tapped Primary Aids Set

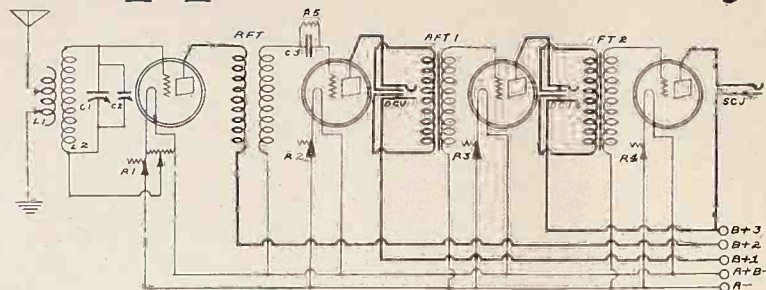


FIG. 392
The circuit diagram of the Federal Type 59 receiver.

I WOULD like to have the wiring diagram of the Federal Type 59 receiver, with approximate constants of the coils, etc. A wiring description is wanted, also. I have two double circuit and one single circuit jack, which I would like to use in the set.—Erwin Lemmings, Atlantic City, N. J.

Fig. 392 shows the wiring diagram of this receiver. One stage of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio frequency amplification are employed. The output of the RF tube is coupled to the input of the detector stage by means of an untuned RF transformer. This transformer has air instead of iron as core. However, either may be used. The primary L1 consists of 20 turns, tapped at every second turn, wound on a tubing 3/4" in diameter, using No. 22 double cotton covered wire. The secondary L2, which is wound on the same tubing, with a 1/4" separation, consists of 45 turns, using the same kind of wire as for the primary winding. A .0005 mfd. variable condenser, C1, shunts this secondary. A vernier, having a capacity of .00004 mfd. shunts this condenser. P is the potentiometer, having a resistance of from 200 to 400 ohms. The grid leak R5 has a resistance of 2 megohms, while the condenser C3 has a capacity of .00025 mfd. R1, R2, R3 and R4 are all 10 ohm rheostats. Both AFT used are of the low ratio type. The potentiometer controls the oscillatory action of the RF tube. The antenna post is brought to one switch arm. The ground post is brought to another switch arm. Five taps are connected to switch points, connecting with the antenna post, these being from the beginning of the coil. The other five taps are connected to switch points, which will connect with the ground post. These taps should be taken from the end of the coil. The end of the secondary winding L2 is brought to the stationary plate connections of C1 and C2. It is also connected to the grid post on the first socket, which carries the RF tube. The beginning of this winding is brought to the rotary plate connection of the condensers and to the arm of the potentiometer. One resistance terminal of this variable resistance is brought to the F plus post, while the other is brought to the F minus post. All the rheostats are connected in the F minus leads. When connecting the potentiometer be sure that the minus post connection is brought to the F minus post on the socket and not to the A minus post of the battery. The P post of the RFT is connected to the P post on the RF socket. The B plus post is connected to the B plus 67 1/2 volt post. The G post on this RFT is connected to one terminal of the grid leak-condenser combination. The F

post on the RFT is brought to the F plus post on the socket. The plate post of the detector tube socket is connected to the top terminal of the double circuit jack. The bottom terminal of this jack is brought to the B plus volt post. The upper inner spring is connected to the P post on the AFT, while the only spring left is connected to the B plus post on the AFT. The G post on the transformer is

connected to the G post of the first audio socket. The F minus post on this AFT is connected to the F minus post on AFT2. The plate post of the socket carrying this first audio tube is connected to the top terminal of the second double circuit jack. The bottom terminal of this jack is connected to the B plus 90 volt post. The top inner spring is connected to the P post on AFT2. The lower inner spring is connected to the B plus post on this AFT. The G post of AFT2 is connected to the G post on the last socket. The plate post of this socket is brought to the top terminal of a single circuit jack. The bottom terminal of this jack is brought to the B plus 90 volt post. No provision is made for the installation of a C battery. Using the fixed RFT, this receiver will not give very strong signals from DX stations. It is purely a powerful receiver for local stations only. Good DX can be obtained, when using the phones. With the addition of the tuned RFT, loud speaker volume on DX stations will be obtained. The -01A type tubes should be used throughout the set. The rheostats in the audio filament circuits, may be discarded and ballast resistors, of the 1/4 ampere type, substituted.

Electrical Constants For the Crosley XJ

THE CIRCUIT diagram of the Crosley XJ receiver is desired. Please give the approximate number of turns on the coils, as well as other constants. The description of the wiring of the antenna and detector input circuit is also wanted.—Robert Huntley, Garden City, L. Is., N. Y.

Fig. 393 shows the wiring diagram of this receiver. The antenna coil L1 consists of 45 turns of No. 22 double cotton covered wire wound on a tubing 3" in diameter. L2 consists of 45 turns of No. 22 double cotton covered wire, wound on a tubing 3" in diameter. C1 and C2 are both .0005 mfd. variable condensers. C3 is a .00025 mfd. fixed condenser. R5 is a variable grid leak. However fixed resistances from 1 to 3 megohms may be tried with success. The rheostats, R1, R2, R3 and R4 are all of the 10-ohm type and placed in the negative leg of the filament and A circuit. The antenna coil is tapped at the 7th, 15th, 23rd and 30th turns, from the beginning of the winding. The detector is non-regenerative. Transformer coupled AF amplification is used. The antenna is connected to the stationary plates of C1. The rotary plate connection of this condenser is brought to the grid post on the first socket and to the switch arm. The taps of the coil are brought to

switch points. The end of the coil (this being the twenty turn portion of the coil having no taps) is brought to the ground post and to the A minus post. The beginning of L2 is brought to the plate post on this first socket and to the stationary plate connection of C2. The end of this winding is brought to the rotary plate connection of C2 and to the B plus 67 1/2 volt post. The plate post of the first socket is also connected to one terminal of C3. The other terminal of this condenser is brought to one terminal of R5 and to the grid post on the detector socket. The other terminal of this resistor is brought to the F plus post on the socket. A double circuit jack is inserted at the output of the first stage of AF amplification. The plates of the AF tubes should receive about 90 volts. The F posts of the AFT are brought to the A minus post. The output of the second stage of audio is made through a single circuit jack, SCJ. Very loud signals both on local and DX stations should be received with this set. The tuning might be a bit broad, if the set is too close to a high-powered station. This can be cured by shunting the condenser in series with the antenna, with a 45-turn coil, wound on tubing 3" in diameter, using No. 22 double cotton covered wire. It will be noted that the grid leak is not shunted across the grid condenser. If this is done,

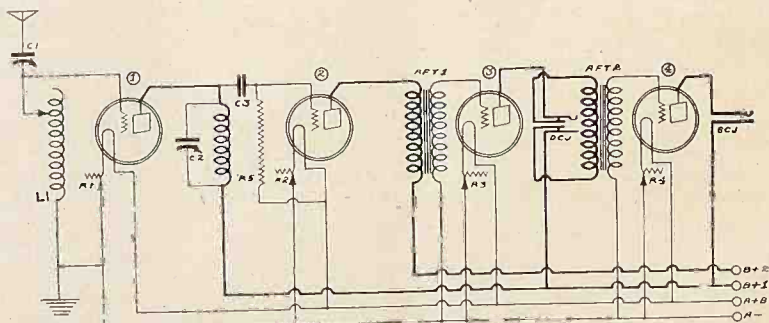


FIG. 393
The electrical diagram of the Crosley XJ Model.

A Single-Control Receiver

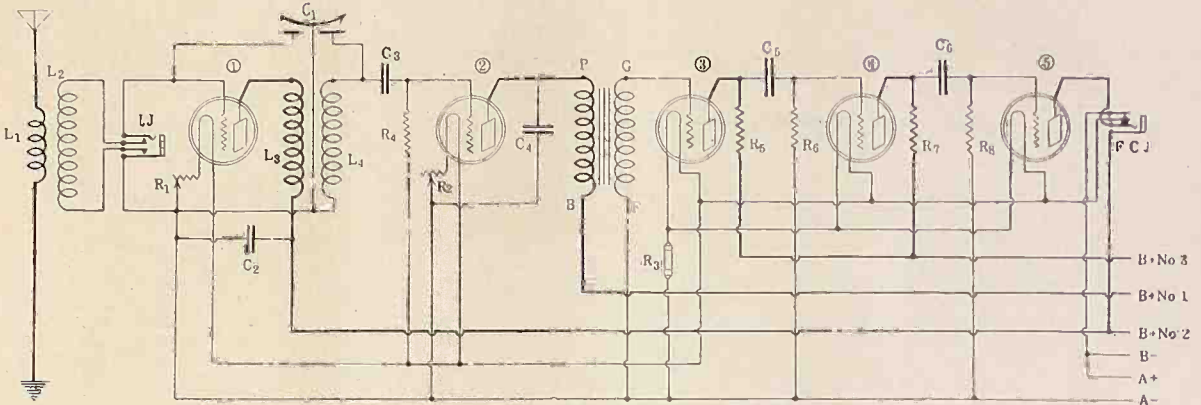


FIG. 394
The circuit diagram requested by Francis Transfers.

then you will have no grid return. The tuning of this set is not simple. C2, tunes the plate and can cause the tube to oscillate. It is very tricky, requiring the utmost care.

* * *

How to Wire 5-Tube With Single Control

I HAVE a double condenser, having a total capacity of .001 mfd., with each section of .0005 mfd. capacity. I would like to use this in a set having one stage of radio frequency amplification, a non-regenerative detector, one stage of transformer coupled AF amplification and two stages of resistance coupled AF amplification. I also have two 10 ohm rheostats, as well as a single circuit filament control jack. Please give the wiring diagram of such a set, with the constants of all the parts.—Francis Transfers, Fallsburgh, N. Y.

Fig. 394 shows the electrical diagram of this receiver. It is designed so that a loop or an antenna may be employed with the aid of a double circuit jack for switching purposes. The RFT used are of standard make. The primaries, L1 and L3, consist of 10 turns. The secondaries, L2 and L4, consist of 45 turns. Each primary and secondary is wound on a tubing 3/4" in diameter, using No. 22 double cotton covered wire. C2 and C4 are bypass condensers having a capacity of .001 mfd. The filaments of the RF and the detector tubes are controlled by the two 10 ohm rheostats. The filaments of the amplifier tubes are controlled by a ballast resistor. If the -01A tubes are used throughout this portion, then this resistor is of the 3/4 ampere type. However, if hi-mu tubes are used in the first two stages and a lo-mu tube in the last stage, then you will have to use a 1 ampere ballast resistor. C3 is the grid condenser and has a capacity of .00025 mfd. R4 is the grid leak, having a resistance of 2 megohms. R5, R7 and R8 all have a fixed resistance of 1 megohms. R6 has a resistance of .5 megohms. C5 and C6, the two stopping condensers, both have a capacity of 25 mfd. For best results use the -01A type tubes in the RF and the detector stages. C1 is the double condenser. The rotary plate connection is common, going to the beginnings of both secondary windings. One stationary plate connection is brought to the grid post of the RF tube. The other stationary plate connection is

brought to one terminal of C3. The grid leak is not connected in shunt to the grid condenser. Instead it is connected in shunt to the grid return circuit. The rheostats and ballast resistors are connected in the negative legs of the filament and A battery circuits. When the plug is inserted in the filament control jack, all the tubes are lit, and when it is taken out, the filaments of the tubes are turned off. B plus 1 equals about 45 volts. B plus 2 equals about 67 1/2 volts. B plus 3, equals about 135 volts. All of these voltages are variable, depending upon the tubes used.

* * *

Resistor Will Prevent Blowout of Tubes

I HAVE a 100 ohm resistor, which I am informed by a friend can be used as a device for preventing the blowing out of tubes. However, I have no diagram which will show me the method of connecting up. I have a 4-tube set, in which I would like to place the resistor.—Henry Wallace, Kennedy, N. Y.

The method of hooking this unit up is shown in Fig. 395. The resistor is placed between the negative leg of the A battery and the B battery. It may be placed in between the positive leg of the A battery and the negative leg of the B battery. This depends upon the actual connections

in the set. It is taken for granted that you are using 1/4 ampere tubes, the total drain being only 1 ampere. The bypass condenser across the protector is of the .5 mfd. fixed type. However, you may use 5 tubes, as illustrated in the diagram, and still employ the 100-ohm resistor. Even if a power tube is used in the last stage, the 100-ohm resistor may still be used.

* * *

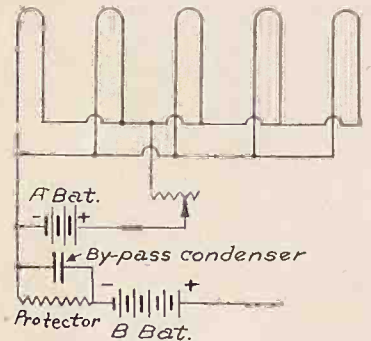


FIG. 395
The wiring diagram illustrating the method of protecting tubes.

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RADIO WORLD, 145 West 45th Street, New York City.

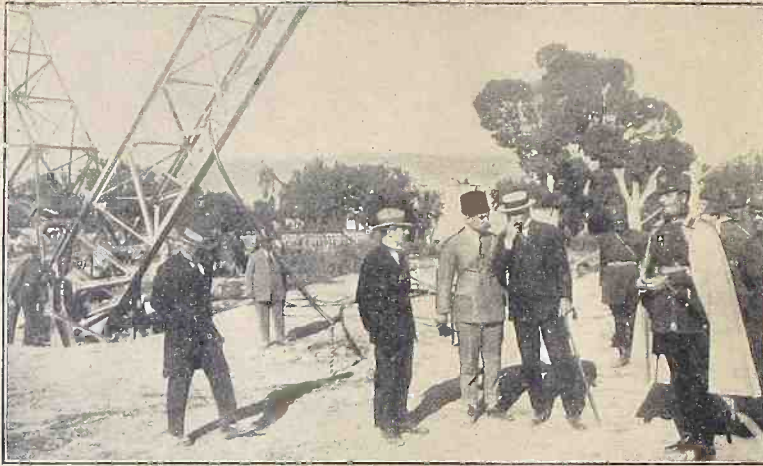
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Name

Street

City and State

New Shah Rushes Station Project



(Ewing Galloway)

NEW RADIO stations are now being built throughout Persia as a result of the reforms instituted by the new Shah. The latest city to have a station is Tabriz, which has large rug manufacturing plants. One of the huge aerial towers used in this station is shown above.

WGY to Be Silent On Mondays for DX

Every Monday evening, beginning August 2, will be observed as silent night by WGY, the Schenectady station of the General Electric Company. Exception to this rule will occur only when outstanding programs are possible, such as an address by the President of the United States, or the Governor of the State.

WGY, like most stations, has received a great many letters from listeners within a fifty mile radius of the station, requesting that transmission be suspended one night in seven, that they might dial distant stations. While owners of selective sets have experienced no difficulty in tuning out the high powered WGY at will, others have complained that the signal of WGY could not be entirely eliminated. It is to meet the requests of ambi-

tious distance dialers that WGY is voluntarily leaving the air Monday nights.

Since the opening of WHAZ, of the Rensselaer Polytechnic Institute of Troy, WGY has shared Monday evening with that station, leaving the air at 9 o'clock. On several occasions the management of the Troy station has cooperated with WGY and consented to give part of its time to the G-E station when feature events have run beyond the usual sign-off period.

With the new schedule WGY will complete its Monday broadcasting at 6:30 p. m. eastern standard time. The farm program, heretofore a feature every Monday night, will be put on the air at 6:45 p. m. Tuesday and continue for three-quarters of an hour.

Brides-to-Be Ask March Be Sent Out

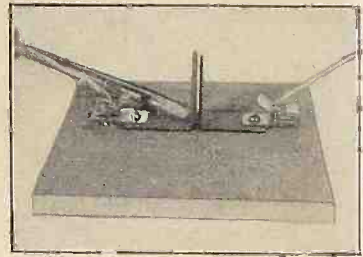
Getting married to music by the Waldorf-Astoria Orchestra, and by radio at that, has begun to assume the proportions of a vogue since the first bride-to-be referred her request last winter that the next evening the orchestra play Mendelssohn's Wedding March at a certain hour through WEAF. This was established recently when Harry Salter, leader of the Waldorf-Astoria Orchestra, and H. K. Martin, the radio manager of the hotel, received no fewer than four requests that at 6:30 that evening the orchestra play that historical air. In no case would the person who made the request by telephone give any information except that she was the "bride-to-be."

Therefore, when early the next afternoon Mr. Salter heard over the telephone

another request from another "bride-to-be" that at 6:30 sharp on Saturday night he begin to broadcast Mendelssohn's Wedding March, he determined to do more and give everybody who wished to get married at that hour and who could "listen in" on WEAF, not only a wedding march, but other music of a more or less appropriate character.

Beginning at 6 o'clock on Saturday evening, June 19, the orchestra played a program which carried radio fans from cradle to cradle. There was no funeral march, but the program began with a cradle song, and at 6:30 sharp Mendelssohn's Wedding March was put on the air. Some of the numbers were "The First Love," a serenade or two, "Always," and another cradle song.

Brackets Neutralize



(Hayden)

TWO BRASS angle irons, mounted as above on either a board or in the set proper, constitute a variable neutralizing condenser. By varying the space between the upright portions it is possible to adjust the capacity.

Keystoners Are Added to Program of WGY

To the weekly features of WGY have been added the program of the Pennsylvania Keystoners every Tuesday night at 8 o'clock Eastern Standard Time. The Keystoners appear at the studio of WJ and it is through arrangement with the New York station that WGY is enabled to give this wider circulation.

In the group is the Shannon Quartet well known for its record and microphone performances. Ed Smalle is assisting, and from week to week special vocal and instrumental soloists will be heard. Such headliners as Andy Sanella, saxophonist; Lew Raderman, jazz violinist; Lew Green and Sammy Herman, xylophonists, and Frank Banta, pianist, will be announced.

WITH THE

CAROLINA, P. R.

Amateur radio as a business asset has just been demonstrated with the conclusion of a year and a half of consistent schedule work between United States amateur station 3JW, operated by W. Ebersperger, of Gloucester City, N. J., and Porto Rican Amateur station 4K, owned and operated by Senor B. Piner of this city.

During the eighteen months in which the schedule between the two stations has been in effect, Senor Piner, who operates a large dairy farm near San Juan, has found his private radio station of incalculable benefit in transmitting and receiving orders, stock quotations, etc., when cable and mail services were inadequate. Cattle were ordered from New York markets, shipments of cigars were direct from the Porto Rican wholesalers, daily bulletins from doctors in New York City to relatives of the patients in far-off Porto Rico were transmitted, and a great deal of other important traffic handled.

In a number of cases the Porto Rican station would "stand by" for a few minutes while the United States amateur telephoned the message to its destination and secured an immediate answer for transmittal back to the island.

HARTFORD.

New radio regulations making adequate provision for the operation of private owned amateur stations have just been put into effect in Denmark, according to a bulletin just issued by the International Amateur Radio Union, with headquarters in this city.

Litmus Polarity Test



(Hayden)

RED LITMUS paper may be used to find the polarity of a battery or DC source. For a few seconds soak a few strips of this paper in water diluted with a tablespoon of salt. Allow the paper to dry. When dry, slightly wet the strip with plain water. Place the ends of the wires coming from the source to be tested on the paper about 1" apart. A blue spot will appear at the minus end of the wire and a red spot at the plus end.

Canary Bird Program Promised By Musician

A chorus of sixty canary birds soon will be broadcast over one of the leading New York radio stations by Louis Katzman, director of Whithall's Anglo Perisians. Katzman is a canary fancier and has selected birds whose voices harmonize. He is training them for the concert.

A feature of the canary bird program will be a trio of these birds who are already trained for the purpose and have three different and distinct vocal ranges. One of them has a voice of the depth of a parrot which, Katzman says, corresponds to a canary bird bass. It will have a special part.

"Uncle Joe" Smokes Less, Listens More



(Underwood & Underwood)

ALWAYS keeping step with the trend of the times, "Uncle Joe" Cannon, former Representative from Illinois, has become a fervid radio fan at his home in Danville, Ill. Where is the inevitable cigar? Well, "Uncle Joe" smokes less and listens-in more.

AMATEURS

The new regulations, which have been anticipated for many years, place the Danish amateur on an equal footing with his brother amateurs in most of the other countries of the world, and already a number of stations have started operation.

Under the new laws operation of amateur stations is permitted on 15 meters, from 43 to 47 meters, from 70 to 75 meters, and from 95 to 115 meters. Powers up to 100 watts are authorized, and licenses will be issued with two-letter calls preceded by the figure "7," as for instance, 7EC. The license fee of 20 kronen (\$5) has purposely been put at a low figure to encourage amateur short-wave development.

A list of the countries of the world whose amateurs are now actively engaged in effecting two-way international private communications sounds like an index to the atlas. The present list, which is being added to daily, is as follows: Australia, Austria, Argentine, Alaska, Algeria, Belgium, Bermuda, Brazil, British Guiana, Bolivia, Canada, Chile, Canal Zone, Costa Rica, Colombia, China, Cuba, Czecho-slovakia, Denmark, Dominican Republic, England, Egypt, France, Finland, Indo-China, Germany, Greenland, Holland, Hawaii, Italy, India, Ireland, Japan, Luxembourg, Mexico, Morocco, Mesopotamia, Madeira Islands, New Zealand, Norway, Newfoundland, Portugal, Porto Rico, Philippine Island, Russia, Spain, Scotland, Sweden, Switzerland, Samoa, Tasmania, Uruguay, Union of South Africa, and the United States.

Graded Music Course Radiated by WOR

A summer course in piano study graded for students of various degrees of proficiency was inaugurated at WOR Thursday and will be continued each Thursday for ten consecutive weeks.

The course is conducted by Edward S. Breck, concert pianist and president of The Musicians Club of New Jersey. Mr. Breck has composed in the fields of song literature, chamber music and modern oratorio.

The course will include studies by the standard composers of teaching material and will lead from the earliest practice pieces for beginners up to the etudes of Chopin.

The composers represented, in addition to favorite composers of the very elementary studies, will be: Czerny, Heller, Clementi, Cramer, Moscheles, Kessler, Novakowsky and Gade. Each set of studies will be supplemented by one or two pieces from the works of the great classical masters such as Bach, Beethoven, Handel, Haydn, Mozart, Schubert, Schumann, Mendelssohn, etc.

It is supposed that only extremely precocious students will be able to progress with the radio recitals, but there will be many in each audience who will find that the studies being broadcast are the ones they are taking up or are about to study.

Broadcast Locates Man Gone 26 Years

SAN FRANCISCO.

Mrs. Lydia G. Nelson, a widow, who lived for ten years at 1135 McAllister Street, sailed from New York recently, her friends have learned here. She went to England to take the Union Castle liner Windsor Castle for South Africa. There she expects to meet her brother, Siegfried Jensen, a Danish construction en-

gineer. The last time she saw him was twenty-six years ago, just before he set out into the Belgian Congo on a mission for King Leopold II.

"During the last twenty years I often prayed that I would meet him, but little realized that I ever would," she said. "My prayers were answered by the modern miracle of radio."

Wave Confusion Increases

6 STATIONS MOVE UP ON TUNING BAND

Seventh Reconsiders, After Brief Trial and Returns to Old Channel, Due to Causing Interference—WBNY, WMSG, WRNY, WBBR, WHAP and WTAG Hold Their Higher Position.

FOUR NEW LICENSES

Three Broadcasters Added to Chicago List and One to New York Group—Hoover Refuses to Call Conference, But Broadcasters May Do So.

Four stations in the Metropolitan district followed the lead of WBNY and moved up on the wavelength scale, as a result of Secretary of Commerce Hoover's admission that he had no authority to assign or refuse wavelengths to stations. WRNY, the "Radio News" station at the Hotel Roosevelt, went from 250 to 375 meters; WMSG, the New Madison Square Garden station, moved up from 213 to 302, and WNJ, Newark, N. J., changed from 252 to 349. However, WNJ quickly returned to its original wave, as it was interfering badly with WMCA and was being as badly interfered with by that station.

WHAP is using 431, instead of 240, and WBBR, People's Pulpit Association, is on 416, having quit 273.

WBNY, managed by Dr. Sidney N. Baruch, is using 322 meters, instead of its former wavelength of 210. It went on the higher wave for two days, returned to its old one until the antenna could be accommodated to the better position and the wavelength calibration properly made, and then broadcast regularly on 322.

All Channels Occupied

The Telegraph Publishing Co., publisher of the "Telegram-Gazette," Worcester, Mass., shifted the wavelength of its station WTAG, from 268 to 545, the wave used by KSD, St. Louis. In fact, every new station, and every change of wavelength, means that more broadcasting is being done on a wave already occupied.

WAMD, owned by the Radisson Co., Minneapolis, went from 244 meters to 297, thus occupying the wave assigned to KPRC, the "Post-Dispatch" station of Houston, Texas.

The chief reason for the changes is the

commercial advantage, since stations on low wavelengths have difficulty in selling time on the air, due to the inability of quite a percentage of receivers to reach down that low. These receivers include models purchased at department store sales and which sets, in other respects as well, are considerably out of date.

Care was exercised by some of the stations in picking their new waves, due mainly to the possibility of having to defend an injunction suit brought by an aggrieved station that deemed its property right to a certain wavelength infringed.

Legal Difficulties

Occupancy of the same wave, or even one near enough to it to cause interference, was considered by offended stations as being ground for equitable redress, including an injunction and, perhaps later on, when the case reaches trial, heavy damages.

However, stations theoretically or actually hurt were slow to invoke legal process, and after the Secretary's admission of lack of power was more than a week old no suit had been started.

While some confusion resulted from the wavelength changes that the few stations saw fit to make at their own risk, no chaos, or anything like it, was experienced. The worst sufferers were owners of non-selective receivers, including "bargain sets" bought at dumping sales.

Four New Stations

In line with his statement that he had no power to withhold licenses to station applicants, Secretary Hoover licensed four stations. Three of these were in Chicago and one in New York. However, the transmitting station actually was erected and inspected before the license was granted, in each case, and this is a rule by which the Department is abiding, as a check upon the avalanche of station license applicants. So expensive is it to erect a station that this rule serves as an effective deterrent.

The question of wavelength permission is agitating the Department of Commerce, due to circulation of statements that it authorized some specific wavelength or a change from a previously used wave to some other. However, the Department has no control over this and has issued no "authorization."

How Plan Works

The station license applicant selects his own "normal wave" and this is the one that appears on the license, without comment, the Department having nothing to do with it, except to see that it is not between 600 and 1,600 meters, or isn't 200 or 300 meters. The use of the "normal wave" or selection of some other, not within the prohibited limits is the concern of the station itself.

As a side issue in the wavelength tangle, WOR, with its transmitter in Newark but its studio in New York, began daily broadcasting, instead of thrice-a-week programs.

Super-Power Defense

It is making use of the time occupied

by WJY, R. C. A.'s weak sister station in New York City, which hasn't been doing any broadcasting for a few moons. WOR, which uses 405 meters, the same wave WJY had, considered WJY had done the forfeit act.

It is expected that if any new sources of trouble develop, the R. C. A., the Westinghouse Electric and Manufacturing Co. and the General Electric Company will combat interlopers by introducing at their stations super-power of an enormous order, say around 500,000 watts. WJZ, the R. C. A. station at Bound Brook, N. J., is equipped for 50,000 watts, which is one reason no one has appropriated a wave at or near 455 meters.

4 New Stations Get Their License

WASHINGTON.

For the first time in many months licenses were granted to four new stations, two of which are in Chicago and of sufficient power to upset already crowded conditions in that city. Although the licenses specified the "normal" wavelengths of these stations, they are at liberty to change to others at will.

The four new stations licenses follow. WCFL, Chicago Federation of Labor, Chicago, 491.5 meters, 1,000 watts. This wavelength already is in use by WFAF, New York.

WJBT, J. S. Boyd, Chicago, 238 meters, 500 watts. This wavelength already is in use by five stations.

KGAR, Citizen Publishing Company, Tucson, Arizona, 243.8 meters, 100 watts.

WMRJ, P. J. Prinz, Jamaica, N. Y., 227.1 meters, 5 watts.

Lucky Stations Quick To Promise to Stick

Assurances have been received by the Department of Commerce from around a dozen broadcasters that they will stick to the wavelengths assigned them and otherwise cooperate in any way possible to prevent interference. These assurances, however, came from class B broadcasters who are perfectly satisfied with the wavelengths assigned them by the Department of Commerce, since they are well up on the band.

Up Again, Down Again, WNJ's Meteoric Career

WNJ, Newark, N. J., assigned to 252 meters, moved up to 348 meters, but returned to 252.

Herman Lubinski, owner of the station and a member of Secretary Hoover's committee for allocation of wavelengths, said the return was made in response to many complaints from fans, who reported that WMCA in New York interfered with the higher wave.

Conference Call Refused By Hoover

WASHINGTON.

Secretary Hoover refused to discuss the wavelength situation. He said he could not add anything to his previous statements. He appeared interested in the New York situation.

Mr. Hoover scouted the idea of calling a conference to work out a plan for the elimination of interference. He said the only thing a conference could do would be to make a lot of regulations which could not be enforced.

STATIONS ON TRIAL, RICE DECLARES

Policing of Air Comes to An End

"Accustomed to Self-Government," Asserts General Electric Company Director—Fears Temporary Destruction of Broadcasting if Wave Seizure Becomes Extensive.

By *Martin P. Rice*

Director of Broadcasting, General Electric Co.

Broadcasters are somewhat accustomed to self-government, as the radio conferences called by Mr. Hoover have been conducted on that plan.

It is not surprising that laws enacted in 1912, when radio consisted of dot and dash communication from ship to ship and ship to shore, should not provide suitable regulation for the great system of radiophone broadcasting which has since developed.

It is surprising that more than 500 stations with various interests should agree on essential regulations which have advanced broadcasting to its present standard and saved it from utter chaos.

Knew Limitations

Broadcasters have known for some time that they were not really bound by all the regulations which they observed, and it has been so stated at the radio conferences, but broadcasters have also known that harmony and progress could only be maintained by mutual agreement.

The decision of the Department of Justice puts broadcasters on their mettle more than ever.

Probably a few here and there will grasp the opportunity to seize privileges which have heretofore seemed impossible to give them.

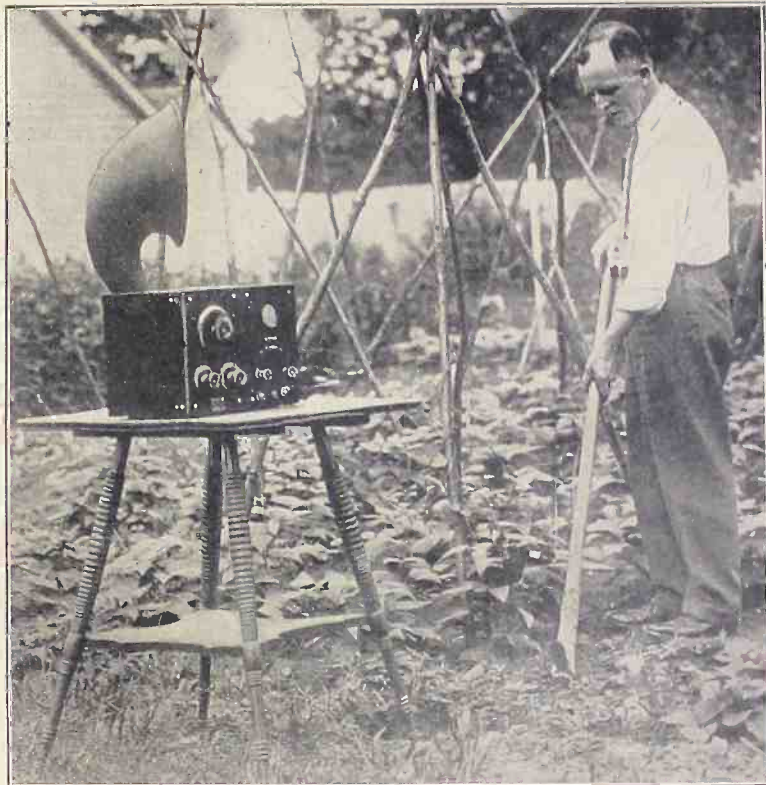
Range of Interference

If this movement becomes at all general, broadcasting will be utterly destroyed until new legislation is enacted. It is hoped that a realization of this fact will induce all to be patient until the problem is worked out.

Interference may be caused by relatively low power stations, in view of the fact that the carrier wave extends far beyond the range of modulated transmission. If a low power transmitter attempts operation on the same frequency or wavelength used by a distant higher powered station, reception difficulties will develop.

Strike By Big Stations Expected by Unionist

Fans have been busy speculating what might happen if smaller stations move up in a body into the Class B division, where the large stations disport themselves. One member of a union suggested that large stations would go on strike, leaving only the small ones on the air, whereupon the best programs would be denied to the fans, and protests soon would send the wave jumpers back home. Jumping is ended, some think.



(Wide World)

ABSENCE of authority to regulate broadcasting or police the air leaves Department of Commerce bureaus with less to do. So W. D. Terrell (above), chief radio supervisor, works in his garden a little longer and listens to interference. He believes the only way the broadcasters can prevent interference is to get together and agree to stick to the wavelength assigned them. He believes broadcasters will call a conference for this purpose.

WASHINGTON.

Commissioner Carson, of the Bureau of Navigation, instructed all radio supervisors to limit their activities in accordance with the interpretation placed upon the radio law by the Department of Justice. In his letter to the supervisors, Mr. Carson said:

"In the enforcement of the Act to Regulate Radio Communication, approved August 13, 1912, the Department will be guided by the opinion of the Attorney General, dated July 8, 1926, a copy of which has been sent you.

"Under this Act, and in accordance with the decision, licenses for the operation of radio transmitting stations will be issued to all applicants. A copy of the new license is enclosed herewith.

"When a formal application for license is filed with you an inspection must be made to determine if the station exists and is ready for operation prior to recommending the issuance of the license. The applicant must designate a certain definite wavelength below 600 meters or above 1600 meters as the normal wavelength of the station.

"The wavelength recited will be included in the license. The Department is not assigning wavelengths and under the opinion of the Attorney General stations are free to use wavelengths other than the one designated as the normal wavelength.

"The license will not contain any restrictions on the power to be used by the station or the hours of its operation, or

any other limitation now shown on the license form.

"Should applicants for station licenses designate a wavelength used by Canadian stations, attention should be called to the Department's view as expressed in the statement accompanying the Attorney General's opinion.

"Under existing conditions and in view of the opinion of the Attorney General you will confine yourself to the above instructions as they apply to transmitting stations only and the operators thereof. The Department has no jurisdiction over receiving stations and correspondence in regard to such stations therefore is outside the Department's authority and should be reduced to the minimum."

Most of Navigating Was Done On Shore

Because radio, at the time the present law was enacted in 1912, consisted largely of ship-to-ship communication, then called wireless, the traffic was placed under the jurisdiction of the Department of Commerce, and assigned to the Bureau of Navigation thereof. However, the work of the bureau has concerned broadcasting to a preponderating extent in the last few years. The bureau has made investigations of interference caused by power lines and other man-made sources and has helped to quell it by cooperation with the source.

WRIT STOPS TIME GRAB IN MIDWEST

**W O S Enjoined From
Going On Air at Same
Time KLDS Is Broad-
casting—Both Use 441-
Meter Wave**

HOOVER IS UPHELD

**Federal Judge Finds Sec-
retary Has Power to
Regulate Broadcasting**

KANSAS CITY, MO.

WOS, the Missouri State Marketing Bureau, Jefferson City, was enjoined in Federal District Court from using time allotted to KLDS. Following the Secretary of Commerce's admission of lack of authority to define hours on the air and assign wavelengths, WOS took unto itself time allotted to KLDS. Both are on the 441-meter wave. KLDS is owned by the Reorganized Church of Jesus Christ of Latter Day Saints, Independence, Mo.

The opinion and decision were made by Judge A. L. Reeves, who held that the Secretary of Commerce has power to regulate broadcasting stations. In the Zenith case in Chicago a Federal Judge held otherwise, while a previous District of Columbia decision, also in Federal Court, was in line with Judge Reeves' finding.

HOOVER ON SEIZED WAVE

An address by Secretary Hoover, before a Building and Loan League, in Minneapolis, was broadcast by WADM on 297 meters, instead of the assigned 244 meter wave.

WOR Appropriates WJY's Unused Time

A detailed statement was issued by Alfred J. McCosker, of L. Bamberger & Company's station, WOR, concerning the extension of that station's schedule to include late afternoon and evening programs on the 405 meter wavelength, formerly occupied by WJY, on Tuesday, Thursday, Friday and Sunday of each week. This schedule is in addition to WOR's regular Monday, Wednesday and Saturday afternoon and evening schedule. "A desire to better serve public interest is responsible for the decision," said McCosker. "The loss to radio listeners occasioned by failure of the sponsors of WJY to provide programs regularly on the 405 meter wavelength for the past five months was pointed out to us by many radio listeners.

"During April, 1926, we applied to the management of WJY for the time on the 405 meter wavelength used by them up to February 6 of the present year and the

Behavior Promises Sought From Stations

The National Association of Broadcasters, 1265 Broadway, New York City, is circulating a blank "certificate of promise" among stations, soliciting a pledge not to change from the assigned wave or hours on the air. The pledge blank follows:

CERTIFICATE OF PROMISE

Believing that the operation on any wave length or hours other than those assigned by the Department of Commerce places in jeopardy,

1. The trust and confidence which the public has in the radio industry.

2. The speedy enactment of adequate and remedial legislation,

3. The welfare and stability of the entire industry,

and in consideration of the annual open meeting of the National Association of Broadcasters to be held in New York City, New York, on Wednesday, September 15, 1926, which will be open to all broadcasters for a full and frank discussion of the problem with a view to effecting a satisfactory working agreement,

Station hereby promises the Officers and Board of Directors of the National Association of Broadcasters that it will operate only upon its assigned wavelength and hours, and in accordance with the rules and regulations prescribed by the Department of Commerce prior to the rendering of the Attorney General's opinion, until such time as Congress shall enact adequate laws controlling the industry.

Our assigned wave is meters.
Station Owner
By
(Title)

The following was sent "to every station owner" by Paul B. Klugh, executive chairman of the association:

"Broadcasters who have changed or are contemplating changing either the wavelength assigned to them by the Department of Commerce or their hours of operation are making a grave mistake. Such stations are bettering their own position very little, if any, jeopardizing the entire

industry, undermining the costly and ceaseless effort of this association for three years in furthering adequate legislation to meet the problem, and last, but not least, belittling the confidence and trust the entire public has in radio.

"It is true that there are a few points in the wave band which may be availed of, and the Department of Commerce could have made reallocations in these few instances. However, the Department has stood on the action of the Fourth Radio Conference, which, by voluntary gentleman's agreement among the broadcasters, recommend that the Department grant no more licenses until adequate legislation was enacted.

"During the summer months the industry is preparing for its new season. Manufacturers, jobbers and dealers are investing huge sums of money in bringing out their new lines and preparing for the return of the public to their sets. If broadcasters are wilfully going to keep changing their wavelengths, a shadow of doubt is cast over the whole future by the action of a few.

"We are assured from Washington that the Conference Committees on the Dill and White bills, which have passed their respective houses, will convene in Washington about November 15 for the sole purpose of reconciling the two bills and obtaining enactment of an adequate compromise measure as soon as Congress convenes in December. If broadcasters persist in recent practices there is little doubt that Congress will enact drastic laws to cope with the serious situation which may well exist at that time.

"On the floor of the Senate it was said:

"There is no finer example of the co-operative spirit in a great and developing industry to be found anywhere in the world than the radio broadcasters of the United States have shown." This compliment to the industry was well deserved, and expresses in an eloquent manner the faith which the entire public has in the industry. Every station owner should pause to consider this. If each will focus his vision upon the entire industry, rather than upon his immediate problem, he will see the wisdom of remaining upon his assigned wave and hours of operation until Congress acts.

"The annual open meeting for all broadcasters of this association will be held here in New York September 15. This problem of paramount importance will be the first question for discussion at this time."

WBAL Will Increase Announcing Staff

As part of the plans connected with the enlarging of that station's activities, the directors of WBAL at Baltimore are to add several more announcers to the staff. Says Frederick R. Huber, director:

"It stands to reason that hearing a fresh voice when a new program comes on the air is bound to have an invigorating and stimulating effect on the listener-in and will do a great deal toward maintaining interest and pleasure in the programs."

At present WBAL has three regular announcers, and under Mr. Huber's new plan these three will be supplemented by three others, the idea being that no one voice will be heard in more than one program.

reply received indicated an early resumption of broadcasting by that station.

"However, in the ten weeks that have since elapsed WJY has remained totally silent and it was decided that the best interests of radio listeners demanded a continuous program on the above wave band.

"WOR is rated a pioneer broadcaster, having supplied programs of highly cultural and better-class entertainment to an ever-increasing audience, since February 21, 1921, and the present extension of its activities to include a daily and Sunday program, will offer additional opportunity to present a practically uninterrupted broadcast. Many standard features were originated by the management of WOR, including the early morning exercise feature, dinner music, bed-time story broadcast, and the station has brought to radio listeners outstanding personages in industrial, social and professional activity."

Coast Guard Fires On Atwater Kent Yacht

A report was filed at Coast Guard headquarters in New York charging that patrol boats had fired on the private yacht of A. Atwater Kent, radio inventor, while it was en route from Philadelphia to Bar Harbor, Me. The report stated that Kent, his wife and son, were on board when the shots were fired. No one was injured.

The boat was searched by the Coast Guard, it was charged.

According to the report, an airplane detected Kent's yacht proceeding at about thirty knots.

A patrol boat chased and opened fire. As soon as the shooting began, the Kent boat stopped and permitted the guardsmen to search. Nothing was found.

It was said at headquarters that Kent had been told the firing was due to a misunderstanding.

Newspaper Awards Announced by WBZ

BOSTON.

Alice C. Kendall of Holden, R. F. Thomas of Cambridge and John K. Winner, of Arlington, Mass., were awarded the prizes for the best papers submitted by students in the journalism course broadcast from Westinghouse Station WBZ by Edward E. Whiting, well-known newspaper columnist, under the auspices of the Massachusetts Department of Education.

A large number of radio listeners from all parts of New England enrolled in this course which was presented in a series of eight weekly lectures. Nearly all of

the students enrolled submitted "papers." The three papers selected as the best were chosen because the authors showed particular talent for the new style of writing.

Honorable mention was merited by W. P. Smith of Wells River, Vt.; Mrs. Ralph Copeland, Brewer, Me.; M. B. Henneberger, Boonsboro, Md.; John F. Morse of Pittsfield, Maude M. Luke, Quincy; Margaret Shields, Brighton; Mary F. Dower, Easthampton; Ethel Fernald, Melrose; T. D. Hill, Cambridge, and B. A. Cassidy, Medford, Mass.

The test roused much interest.

Stunt On New Wave



(Photograms)

BY JUST crossing the gangplank at the pier where the S.S. Hamburg was anchored in New York City, James W. Gerard, U. S. Ambassador to Germany when war was declared, stepped on German soil, for the first time, since he left Germany in 1914. He made an address on the ship, which was broadcast over WMSG on its new wavelength of 302 meters.

Two Deaf Mutes Hear Music on Earphones

WEAF recently received a letter from a Western listener who receives most of his programs through WWJ at Detroit. The letter beside commenting on the programs told about two deaf mutes who are guests at this particular home frequently and up to a year ago had never heard a sound. One evening they were persuaded to put on head phones and their surprise can hardly be imagined when they heard music. They have now developed their hearing to the point that they can distinguish a man's and woman's voice, piano, banjo and violin and are "dyed-in-the-wool" radio fans.

Crosley Thinks Courts Will Stop Interlopers

By POWEL CROSLY, JR.

There is no real cause for alarm in the present situation. The solution is in the hands of the listening public, because hostile public opinion will be set up when ever a station causes interference by changing its wavelength.

No broadcaster by destroying the goodwill of another station by interfering with the reception will be able to build goodwill for himself. It seems to me that the common law will protect the pioneer broadcasters who have established stations.

It is not improbable that the courts will not only grant injunctions against pirate stations invading the waves of others, but will possibly grant damages to the stations interfered with by covering the injury the interlopers will possibly do.

Old Favorite Songs Most Often Requested

Jazz songs are not generally popular with the radio listeners, according to the hundreds of requests received by Allen McQuhae, the Irish tenor, who sings in concert over the radio each Sunday night in the Atwater Kent hour.

Old favorites of years gone by are most in demand and, Mr. McQuhae said, indicate that the radio programs reach the listener when he is thoroughly relaxed at home and in a more contemplative, reminiscent mood.

"But jazz is very useful," said Mr. McQuhae. "It is an outlet for the pent-up emotions. The American is naturally self-contained about his emotions but let

a good band play some of the old works made into jazz form and it makes him light and happy in heart and mind and he wants to dance. Jazz has its place, although many of the tunes are taken from the old masters and revamped."

In classifying the requests with a view to singing first the songs most in demand, it is found that there are very few songs on the list of a hundred or more that have not been asked for many times, while there is a large group polling a very general demand.

IMPORTANT PRECAUTION
Regularly charge your A battery.

Batcheller Finds Some Interference

By Arthur Batcheller

Federal Supervisor of Radio in New York Area.

After a few New York stations had changed their wavelengths I listened in and noticed that several announcers endeavored to create the impression that we had selected their new waves and approved their action.

This is not true.

They have merely chosen their own waves and, without any permission from the Department of Commerce, have tuned their transmitters to higher wavelengths.

If we had authority we would not permit any wave changes or increases in power in the New York district.

I have observed the interference caused by the stations adopting new channels, and in one or two instances broad carrier waves have blurred reception. However, we have no authority to act.

A THOUGHT FOR THE WEEK

A PULPIT association's station quit a wavelength to take a higher one. A church station enjoined another broadcaster from monopolizing the wave they shared. This religion is on both sides of the tangled ether problem.

RADIO WORLD

REG. U.S. PAT. OFF.

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

TELEPHONE BRYANT 0558, 0559

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(Dated Saturday of same week)

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SUBSCRIPTION RATES

Fifteen cents a copy. \$6.00 a year. \$3.00 for six months. \$1.50 for three months. Add \$1.00 a year extra for foreign postage. Canada, 50 cents. Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order is automatic acknowledgment of their subscription order. Changes of address should be received at this office two weeks before date of publication. Always give old address; also state whether subscription is new or a renewal.

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General Advertising

1 Page, 7 1/2" x 11"	462 lines	\$300.00
1/2 Page, 7 1/2" x 5 1/2"	231 lines	150.00
1/4 Page, 8 1/2" D. C.	231 lines	150.00
1/4 Page, 4 1/2" D. C.	115 lines	75.00
1 Column, 2 1/2" x 11"	154 lines	100.00
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JULY 31, 1926

Why Hoover Did It

THE reason for Secretary Hoover's sudden admission that he had no power to control broadcasting stations has never been officially stated by him. He made his now famous announcement shortly after the adjournment of Congress. Surely there is much significance in this.

It is hard to imagine that the Secretary really felt secure in the armor with which the Law of 1912 provided him, although he had maintained in published statements and in official conduct that he was properly equipped legally to exercise control. Then came the decision in the Zenith case, denying he had such power. Having been on a trip at the time the decision was handed down, the Secretary hastened back to Washington and was quick enough in prophesying that great confusion would ensue if it was a legal fact he did not possess the authority he had been exercising. Chaos would result, he said, and his remarks were intended for Congress, or rather for the Senate, for the House of Representatives, a few weeks prior, had been good enough to pass the White bill, confirming the Secretary in his authority over radio.

The Secretary dealt very kindly to-

ward Congress, all things considered, for the Senate in particular behaved in a manner such as to arouse any one's ire. It amended the White Bill unto death, the substitute being known as the Dill Bill, which the Senate gladly passed, because it stripped the Secretary of all power over radio and conferred it instead on a new and special commission of five, to be appointed by the President, "with the advice and consent of the Senate." Failure on the part of both Houses to agree in time resulted in adjournment before there was any radio legislation.

The natural questions that would come to the mind of any man so circumstanced are: How long shall I permit this farce to endure? If I have no authority and Congress will give me none, nor confer any on any other agency, new or old, what course should I take?

President Coolidge obviously had no desire to stir up Congressional wrath over the radio situation. Both he and Secretary Hoover favored the White bill. When the success of this seemed virtually impossible in the Senate the President agreed to accept a bill creating a board which was to be appointed exclusively by him and be responsible to him, the so-called executive board. But the Senate declared itself in on the proposition by the "advice and consent" clause, so that in reality the Senate would have a great deal to say about radio, because of being able to withhold approval of nominations by the President for appointment to the commission.

But Secretary Hoover never publicly favored this plan, so that it is fair to assume that the President was the more inclined to be conciliatory.

The Secretary certainly did not come to his decision to hold as aloof as possible from radio control without having consulted the President. That the Secretary has dealt so gently with Congress is proof enough that the desire of the President to be soothing to Congress ran very high. The Senate in particular had been playing fast and loose with the Secretary, ignoring completely the recommendations of his Fourth National Radio Conference, as previous Conferences had been ignored by Congress, and leaving him, as the Senators thought, with a great industry in his lap.

But the Secretary had made up his mind he was not going through another summer and winter in anomalous fashion. He certainly knew, long before he made the announcement, that he had no power over broadcasting, for the Zenith decision preceded the announcement by about three months. The solicited opinion of the Acting Attorney General, which corroborated the court decision, was merely a timely peg upon which to hang his announcement.

The object of the Secretary's determined move, therefore, was to show up Congress and to excite public opinion, so that Congress will be forced to enact legislation. Some stations changed their wavelengths, following the announcement, but one can hardly say truthfully that chaos, or anything like it, resulted. The Secretary is trying to serve the public by forcing Congress into action. If anybody has a better plan, what is it?

Straight Line What?

OUT of more than 5330 broadcasting stations in the United States, six moved upward on the wavelength spectrum in consequence of the free-for-all conditions ensuing on Secretary Hoover's announcement.

But what do you suppose would have happened had there been a great exodus upward?

Not only would chaos have held sway, but the fan who took especial pains to buy straightline frequency condensers would be in a pickle indeed.

These tuning condensers separate equal

frequency differences by equal differences in dial divisions, resulting in the uncrowding of the dial positions of low wavelength stations, but bringing higher wavelength stations closer together, for that is how the room is gained below.

Imagine, then, the engineering stunts that would have to be devised to make straightline frequency condensers behave in the face of a crowded upper register, along the same line that they behaved as the solvent of a jammed lower register! It is painful to think of the enormity of the task!

TAKING THE AIR

Fickleness of Sets

REACTIONS of a mentally regenerative nature have followed the appropriation of higher wavelengths by stations who felt offended at being placed at or near the bottom of the broadcasting list. One woman thus voices her complaint:

"The way that some set manufacturers make sets is a shame. I bought a factory-made set a few months ago and it gave splendid service until recently, when it got all confused, so that the dials bring in some of the stations at new settings. Manufacturers should take care to produce receivers that do not get excited the moment mid-summer sets in. What good is my log book if the set behaves so as to upset all my careful recordings?"

Obviously the good woman needs a combination wavelength rectifier and interference suppressor, the kind that works right off the vacuum cleaner.

The Industry Impugned

An electric fan rises to ask what is the trouble with all these variable condensers that they have to be sent to the service station so often? He is frightened at all the publicity given to fixed condensers and figures that all of them had to go through the repair shop.

Progress Toward Elimination

Next we will have radio engineers trying to devise some method for eliminating the B eliminator, and then eliminating the eliminator of the B eliminator, and finally eliminating the eliminator of the eliminator of the B eliminator. Radio has made such rapid progress in five years that in 1931 we ought to be able to get some kind of reception from a non-broadcasting station by means of a receiverless installation.

The Crown is Threatened

Congress has successfully completed its fourth consecutive attempt not to enact any radio legislation, but the strain is beginning to show dire effects, and the fifth effort, next December, is likely to be a complete fizzle. A champion can not hold the crown forever. Age will tell, even if women won't.

As the radio situation now stands, Secretary of Commerce Hoover's economy program is necessarily slipping, because he has to spend so much money on rubber stamps to O. K. applications for station licenses that the recipients dare not use.

Too Bad Not to Pass Up

Few radio fiction stories published to delight nobody knows whom are worth ignoring entirely, if one has much time to waste. The pranks of childhood, played upon adult relatives who hold important executive positions in large business concerns, are ample food for whiling away worthless hours in this leisurely age.

No; TICKEE

China is about to establish a new and important broadcasting station. Will the call letters be WASHEE?

THE RADIO TRADE

Western Electric Wins Suit on Cone

The Western Electric Co., Inc., in Federal District Court, New York, won a decision in the suit brought against it by the Lektophone Corp., owners of the Hopkins patents on cone speakers. The infringement charge, which concerned the Western Electric cone speaker, was dismissed.

The decision, handed down by Judge Thomas D. Thacher, had been awaited with especial interest in view of a recent decision by Federal Judge Campbell in Brooklyn, which held the same patents to be valid and to be infringed by a cone made by another concern.

The present decision holds the claims of the so-called tympanum patent, No. 1,271,529, valid, but not infringed, and with respect to the other patent, Judge Thacher says:

"The references to Brown and Lumiere clearly anticipate the claims of Patent No. 1,271,527, which are in suit," and these

claims are held to be invalid. As to the tympanum patent, Judge Thacher is unable to find any infringement in the Western Electric Company's loud speaker. He says in his opinion:

"A patent broader than its claims is a legal absurdity, and in this case involving a mechanical combination the limitations incorporated in the stated claims cannot be ignored or construed contrary to the plain import of their terms.

"That the defendant's structure is unlike the patented structure, not only in its form of construction, but in its mode of operation, was clearly demonstrated by the tests to which reference has been made.

"My conclusion is that claims 1, 2, 3, 4 and 8 of Patent No. 1,271,527 are valid, but not infringed; that claims 29 to 30 of Patent No. 1,271,527 are invalid and that the complaint must accordingly be dismissed with costs."

TRADIOGRAMS

A SPECIAL showing of the 1926-1927 Fada line was held at the Hotel Pennsylvania, New York City, for one whole week. The receivers are manufactured by F. A. D. Andrea, Inc., including the new models and the cone speaker. From July 26 to 30 at the Newark Athletic Club, Newark, N. J., and from August 3-6, inclusive, in Philadelphia exhibits will be held.

* * *

THE DAVIDSON Radio Corporation is in its new quarters at 505 Court Street, Brooklyn, N. Y. This company was formerly located at 222 Fulton Street, New York City.

* * *

CLARK & TILSON, INC., radio wholesalers, are in their new quarters at 122 Chambers Street, New York City. Among the lines carried by this firm are All-American, Bright Star, Thordarson, Silver Marshall, Cardwell, Hammarlund, Carter, Timmons, Schickerling, Crosley, Jewell and Dubilier.

* * *

GEORGE LEWIS is now vice-president and general manager of the Ken-Rad Corporation, at Owensboro, Ky. Mr. Lewis was formerly connected with the Crosley Radio Corporation.

* * *

A SINGLE CONTROL 8-tube set, with drum type dial, is being marketed by Freed-Eisemann as its 1927 Model "300" Neutrodyne. The set incorporates both the Hazeltine and Latour patents. Copper shielding is used for the radio frequency stages of amplification and the detector, and a steel compartment for the audio frequency stages—all supported on a heavy angle-iron chassis.

* * *

HERBERT E. MILLS has been appointed production manager at the new plant of the Amplion Corporation of America, manufacturers of the Amplion loud speaker. Up to this time the Amplion Corporation has been an American assembly plant for the parent Amplion concern in England but due to the tremendously increased American demand

the Amplion Corporation has decided to manufacture here as well.

* * *

JOS. KUCERA, president of the Radio Production Machinery Co., announces a new machine which this company has recently perfected and put on the market, a by-pass condenser winding machine. It winds layers of paper .0005, and tinfoil .00025 of an inch thick which represent about one-tenth the thickness of the average human hair. The condensers are in extensive use in B Eliminators and power sets.

Trade School Lauded By Kiley After Visit

The Radio Trade School conducted by the Federal Radio Trade Associations is doing a great deal of good for the radio industry, according to Geo. H. Kiley, vice president and sales manager of the Farand Manufacturing Company of Long Island City, Mr. Kiley has just returned from a tour of the Central States.

This school, which is a development of the radio trade course sponsored by the Detroit Radio Trade Association last year, is conducting a special summer short course begun July 19. Among the subjects to be discussed will be the construction of testing instruments for checking up radio sets, and their application and use with practically every kind of radio receiving set present in the laboratory of the school.

At the completing of the course certificates as first, second or third grade radio technicians will be granted the students who qualify. An enrollment of the entire capacity of the school is expected for the summer course, according to Mr. Kiley who discussed the problems of the school with officials of the Federation in Detroit recently.

DID YOU GET A COPY OF RADIO WORLD'S VACATION NUMBER DATED JUNE 12? This issue is full of information for summer vacationists. Some of the features are: The Light 5-tube Portable, by Herman Bernard, The Freshman Masterpiece, by Albert W. Franklin, The Importance of C Batteries, by John F. Rider, etc. 15c per copy, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

Literature Wanted

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

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

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His Address

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- Frank Gossett, 524 South Main, Independence, Mo.
- William R. Rowcroft, 121-10 114th Ave., Ozone Park, N. Y.
- A. F. Dittman, Brownsville, Tex.
- W. J. McNamee, 29 Manning St., Medford, Mass. (Dealer).
- Lorin D. Raines, Columbus, Ga.
- F. Leonard Reiter, 413 Oak St., S. E., Minneapolis, Minn.
- S. Peterson, 335 Sumpter St., Brooklyn, N. Y.

NEW CORPORATIONS

- Lugom Electrical Company, N. Y. City, \$10,000; C and L and P. Mogul. (Filed by Karasick & Reznikoff, 104 West 42d St., N. Y. City).
- Harmony Radio Company, N. Y. City, \$20,000; R. and P. M. Mollica, S. Fradel. (Filed by Kramer & Binder, 51 Chambers St., N. Y. City).

NAME CHANGES

- Banner Radio Products, N. Y. City to Triumph Radio Products, N. Y. City.

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MANAGER: LARGE JOBBER, handling several standard makes of Radio wishes to engage services of Manager of Radio Department. Write giving full details, salary expected, etc. Box 100, Radio World.

BROADCASTING STATION, SUPERPOWER, 5,000 watt, licensed A. T. and T., and department includes Western Electric amplifiers and tubes, for sale, lease or hire; offers wanted immediately. Address Box 927, San Antonio, Texas. Business address 101 West Pecan St.

BROADCAST RADIO STATION in New York City, now operating, prominently located and affiliated, requires additional capital, or will lease to national advertiser for loan; large earning possibilities. Box 1, RADIO WORLD.

ELECTRICAL, MECHANICAL ENGINEER. Europe bound, will represent manufacturing concerns. Box G, RADIO WORLD.

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

GETTING DX by Capt. P. V. O'Rourke, appeared in RADIO WORLD dated April 3, 1926 per copy or start sub. with that issue. RADIO WORLD, 145 West 45th St., N. Y. C.

De Forest Co. Owes Namesake \$20,000

Arthur D. Lord of Summit, N. J., was appointed ancillary receiver under \$5,000 bond by Judge Knox upon the petition of Walter A. Darby, a creditor for \$6,975, and upon the consent of the DeForest corporation, which was incorporated under the laws of Delaware in 1924 to take over the business of the DeForest Radio, Telephone & Telegraph Company, which previously succeeded the Radio Telephone & Telegraph Company, which was organized in 1913.

No estimate of the liabilities or assets is contained in the papers, which merely set forth that the principal asset of the debtor corporation is a large factory located in New Jersey.

However, the complaint recites that the main asset of the corporation in this jurisdiction consists of accounts receivable aggregating \$30,000.

On June 24 last Mr. Lord was appointed receiver for the debtor company by Chancellor Walker in New Jersey and has been in charge of the business of the company in New Jersey since that time.

According to the complaint the DeForest Radio, Telephone & Telegraph Company, the predecessor of the debtor corporation, filed a suit in 1923 in the Supreme Court of New York County against the Triangle Radio Supply Company and the latter company interposed a counterclaim and obtained a warrant of attachment upon which a levy was issued on July 14 last.

The appointment of the ancillary receiver was said to be necessary to conserve the assets and protect the interests of the general creditors. Lee DeForest, who states that he holds 9,400 shares of the common stock of the debtor corporation and is a creditor for upward of \$20,000, joined in the petition for the appointment of an ancillary receiver on the ground that there is "grave danger that the assets of the company may be wasted unless an ancillary receiver is appointed."

The authorized capitalization of the

company is 250,000 shares of no par value, of which 208,208 have been issued.

In 1922 the debtor corporation acquired the capital stock of the Radio Craft Company, which holds a license to manufacture regenerative receivers and transmitters. The stock issued by the company is held in a voting trust and the voting trustees are listed in the complaint as T. Luce, A. C. Allyn, William Buchsbaum, E. H. Jewett and F. W. Blair. Mr. Lord was also named as ancillary receiver in \$5,000 bond by Judge Inch in the Eastern District (Brooklyn).

Greater Music Program, WBZ's Summer Policy

BOSTON.

Summer radio has received a tremendous boost as a result of a new policy inaugurated by the Near East Relief in its regular Sunday evening Golden Rule Hour of music programs broadcast from Westinghouse Station WBZ. Instead of economizing in time and quality, it is embarking upon an even more ambitious series of Sunday entertainments than those which have delighted its listeners since the first of the year.

Concert artists of international reputation will be heard on the Golden Rule Hour each Sunday afternoon. In all cases, these vocalists and instrumentalists will donate their services as their individual contribution to the effort of International Golden Rule Committee in stimulating interest in the general observance of Golden Rule Sunday which occurs December 5.

Golden Rule Sunday, which has been observed for three years on the first Sunday of December, is intended as a day of self-sacrifice and consideration for the suffering and needy. The orphan children of the Near East and other unfortunate children are the special objects of consideration on that day.

The Golden Rule programs from WBZ

are under the supervision of the National Golden Rule Committee on Radio Cooperation, comprising Gen. James G. Harbord, the Rev. S. Parkes Cadman, William B. Millar, Frederick H. Toye and A. C. McCrea. Active direction of the programs, and announcing of numbers will be in charge of Frederick H. Toye of Boston.

Among the first of the guest artists on the summer series are Frederick Millar, British basso; Jeanne Laval, contralto; Weyland Echols, tenor; Esther Dale, soprano; Ely Nev, pianist; Rozsi Varady, cellist; Jerome Swinford, baritone; John Campbell, tenor; Katherine Gorin, pianist; Geza de Kresz, Hungarian violinist, and Vera Curtis, soprano of the Metropolitan Opera Company.

Hans Ebell, Russian pianist and Ary Dulfer, Dutch violinist who have been featured players in many previous Golden Rule concerts, will be heard on each of the summer programs, in addition to one of the great artists listed.

Artists Answer Mail By Broadcast Lyrics

CHICAGO.

"Opening the Mail" is a unique method of acknowledging letters to radio fans. Eddie and Fannie Cavanaugh, "The Gaelic Twins," are the originators of this bit of radio novelty.

The idea is to answer their mail over the radio. This is done by writing one stanza of lyrics as a response to each letter, which is then sung over the radio from the Congress Studio of Westinghouse KYW, each Tuesday and Thursday evening.

Of course, it is almost impossible to answer all letters, although each letter that warrants a reply, does receive a radio acknowledgment.

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A BUILT-IN SPEAKER SET, by Herbert E. Hayden, **POWERTONE IN OPERATION**, by Capt. P. V. O'Rourke, **THE NOVICE'S NOOK**, by James B. Scully, appeared in **RADIO WORLD** dated May 22. Sent on receipt of 15c, or start sub. with that number. **RADIO WORLD**, 145 W. 45th St., N. Y. C.

THE BRETWOOD GRID LEAK will aid you to get DX even in the summer. Sent on receipt of \$1.50. North American Bretwood Co., 145 W. 45th St., N. Y. C.

A DISCUSSION ON SELECTIVITY, by J. E. Anderson, appeared in **RADIO WORLD**, dated June 19. Sent on receipt of 15c, or start sub. with that number. **RADIO WORLD**, 145 W. 45th St., N. Y. C.

GETTING MAXIMUM RESULTS with Super-Heterodynes by Herman Bernard appeared in **RADIO WORLD** dated May 15th. 15c per copy, or start your subscription with that issue. **RADIO WORLD**, 145 West 45th St., N. Y. City.

HOW TO USE AERIALS IN GROUND AND WATER, by Lewis Winner, appeared in **RADIO WORLD**, dated May 29. Sent on receipt of 15c, or start subscription with that number. **RADIO WORLD**, 145 W. 45th St., N. Y. C.

BLUE PRINT FOR 1926 DIAMOND OF THE AIR sent on receipt of 50c. Guaranty Radio Goods Co., 145 West 45th Street, New York City.

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THE BERNARD PORTABLE SUPER-HETERODYNE appeared in **RADIO WORLD** dated April 3, 10, 17 and 24. Sent on receipt of 60c, or start your subscription with April 3 issue. **RADIO WORLD**, 145 West 45th St., N. Y. City.

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

HERMAN BERNARD, managing editor of **RADIO WORLD** broadcasts every Friday at 7 p. m. from WGBS, Gimbel Bros., N. Y. City. 315-6 meters. He discusses "What's Your Radio Problem?" Listen in!

CONFESSIONS OF A SUPER BUG, by James H. Carroll, appeared in **RADIO WORLD** dated May 22. 15c per copy, or start sub. with that number. **RADIO WORLD**, 145 W. 45th St., N. Y. C.

SELL AND INSTALL RADIO SETS. With a \$25 capital we can put you in the radio business and show you how to earn a hundred or two a week. For full details write Guaranty Radio Goods Co., 145 West 45th Street, New York City.

THE VACATION NUMBER OF RADIO WORLD DATED JUNE 12 contained many great features. The light 5-tube Portable, by Herman Bernard, The Freshman Masterpiece, by Albert W. Franklin, The Importance of C Batteries, by John F. Rider, etc. Sent on receipt of 15c, or start sub. with that number. **RADIO WORLD**, 145 W. 45th St., N. Y. C.

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

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

Nine Safety Laws For Makers of Sets

By **Charles C. Henry**
 Radio Engineer, Sonora Phonograph Co., Inc.

It is not difficult to add enough extras, such as "compensators" and "modulators" and "verniers" to make most any radio contrivance operate. But, products must stand shipment. They must be quickly and simply repaired if on rare occasions that becomes necessary. There must be a *minimum possibility of trouble.*
 Here are some of the secrets of success. It took our engineering force years of experience to learn some very simple rules. But they learned them, and, what is more, these laws for minimum-trouble were not forgotten.

Law No. 1. There is no connection so good as a soldered one—with a big IF—if the soldering is well done.

Law No. 2. Riveted joints, generally speaking, are too unreliable to be discussed.

Law No. 3. Connections depend upon the compression of a screw and nuts should be used guardedly. At some points, they cannot be used. A lock washer is always a requisite.

Law No. 4. Stiff busbar and stiff wire cannot be used in a set which must be shipped. Rigid wire breaks, especially, at the soldered joints due to vibrations and jars during transportation. There is none in our model C.

Law No. 5. Carefully tinned flexible copper wire will stay soldered, will not break, and is thoroughly reliable in shipment, if used properly and if of the correct size and lengths and properly supported.

Law No. 6. Every screw and nut must be protected against turning by a lock washer on a lock nut.

Law No. 7. Each radio set should be doubly tested and inspected by men work-

ing entirely independent of one another.

Law No. 8. Each by-pass condenser is subjected to a rigid separate leakage and voltage break-down test. There are three such in each set. The .006 mfd. by-pass condenser is commonly tested at 200 volts direct current. But, we test at 400 volts alternating current from the start. But, to make certain that an absolute minimum of trouble due to dirt and moisture might be encountered this test voltage was raised to 1000 volts A. C. In other words, peak voltages of 1400 were impressed upon the condenser insulation.

Law No. 9. For electrical stability and uniformity of operation at every installation, it is vital that the batteries and as much of the metal within the set as possible be carried at earth potential. If that is not done, the point of location of batteries and even the proximity of water and heating pipes and other conducting bodies will influence the squealing, howling and criticalness of the set.

WEAF Opera Companies Take Vacations in Bulk

With the coming of the month of August, marking as it does the mid-summer, the thought of vacations is brought prominently to the fore, and for this reason the members of the WEAF Grand Opera Company and WEAF Light Opera Company will "sign off" during the first week of the month. It is believed that this arrangement, which will necessitate the cancelling of the usual grand opera production scheduled for Monday evening, August 2, and the light opera scheduled for Wednesday, August 4, will best meet the desires of the radio audience. Rather than have the vacation period of these popular artists spread over a considerable period of time, thereby restricting the scope of the presentations to be sent out on the air, it was decided by WEAF to allow the artists vacations at the same time in order to dispense with only one production of each of these popular weekly features.

Fans in Fight Arena Hear Broadcast Report

Norman-Bel Geddes, designer of "The Miracle," saw the Delaney-Berlenbach fight in New York and heard it, too, under novel circumstances. In company of Eric H. Palmer, of the Freed-Eisemann Radio Corporation, and Paul C. Gayne, of Georgetown, Conn., he sat in section Y in the upper tier, at Ebbetts Field, and the party listened to the broadcast description as they actually watched proceedings.

Palmer brought a portable radio receiver with him, the same as he used last year in touring the United States and Canada with the Brooklyn Chamber of Commerce and on which he also listened in while in England, France and Switzerland last winter.

This is probably the first time broadcasting was received by fans actually at a fight.

DETAILS OF WIRING THE DC B ELIMINATOR, Part II, by Lewis Winner, appeared in RADIO WORLD dated April 24. Sent on receipt of 15c, or start sub. with that issue. RADIO WORLD, 145 W. 45th St., N. Y. C.

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

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Tips on Producing Storage Batteries

By H. B. Taylor

Eagle Pitcher Lead Co.

In the manufacture of a storage battery of the starting and lighting type there are probably more possible differences in the methods of making the plate itself than in all the other steps in the process of assembly and preparation of the finished battery.

The choice of the type of grid to use is dependent upon many factors. Some of these are more important to one manufacturer than to another. The thickness must be so proportioned with the area that the proper amount of active material is available for reaction, keeping also in mind the resistance to buckling or warping, and the necessary rigidity.

The amount and distribution of grid metal relative to the amount of active material has to be determined, both to attain optimum electrical performance commensurate with prevailing costs of metal and oxides, and in keeping with the selling price of the plate or battery.

Cross Bar Size is Factor

The available space for oxide paste is, of course, influenced by the number and size of cross bars in the grid. The cross section of these little cross bars in practice is sometimes round, triangular, diamond shaped and wedge shaped.

Nearly all grids are reinforced by a wider border strip near the lug, and those grids with light weight cross bars or ribs must necessarily have a wider border all around for strength. The ribs cannot be too thin, it being essential to have proper conductivity throughout the grid, since in the forming process the formation of the active material begins around the grid bars.

There are some grids in use today which have, in addition to the usual horizontal and vertical grid bars, several additional diagonal ribs; still others with additional ribs radiating out from the upper corner nearest the lug.

Staggered Type Popular

Considering the so-called surface type grid and the staggered interlocked type, the latter is in much more general use today.

Furthermore, the grid must be strong enough to permit and withstand the normal volume changes within the plate when in use. In the design of a grid the position, number, and cross sectional

shape of the grid bars should be such that perfect castings can be made speedily, and such that mold expense is not abnormal.

Next consider the all-important item of the oxide paste. Not so many years ago there was a feeling of great secrecy about formulas, but this is fast disappearing. Some formulas were closely guarded by superintendents, and occasionally the individual is still to be found who thinks his formula and process are the only ones that will make good plates.

As a matter of fact there are many, many formulas some, of course, better or more economical than others, but all similar in the sense that the final result is a peroxide positive and sponge lead negative.

Depends On Factory

The choice of a certain formula today is, in general, caused more by existing factory requirements or limitations rather than because it is a magic formula or thought to be the one and only successful method to make a good plate. The percentage of red lead used in various plants ranges all the way from 0 to 100 in positives and from 0 to possibly 80 in negatives, litharge being present in corresponding amounts to equal a full 100 per cent. Sulphuric acid of 110 gravity for

(Concluded on page 27)

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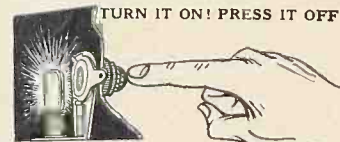
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THE 5-TUBE SUPER HETERODYNE SET, by Jasper Jellicoe, appeared in RADIO WORLD dated April 17. Sent on receipt of 15c. RADIO WORLD, 145 W. 45th St., N. Y. C.

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 How to build this 8-tube Super-Heterodyne described in February 20, 27, March 6 and 13 issues of RADIO WORLD. Send 60c for all four copies. Send \$6 for year's subscription and get these four copies FREE!
RADIO WORLD
 145 W. 45th St. New York City

No Two Battery Formulas Alike

(Concluded from page 26)
 mixing is probably in most general use, though it ranges from straight water up to 1250 gravity in different amounts and at different rates of addition to the mixer. Two manufacturers may be using like proportions of the same oxides but there are almost innumerable steps in the method of handling those like percentages, any one of which might have sufficient effect to change the characteristics of the resulting plates.
Paste Factors Listed
 Some of the factors which have a distinct bearing upon the type of paste or mud to be prepared are as follows:
 (a) Many types of oxides are available on the market. Even one manufacturer may have a wide variety to suit an equal variety of requirements. There may exist such differences as chemical activity, fineness, coarseness, absorptive

qualities, bulking, particle shape and texture.
 (b) As mentioned previously, the gravity of acid and the method of adding it to mixer will influence the character of paste prepared; likewise the temperature of the acid and of the oxides.
 (c) Duration of mixing time and efficiency of mixer.
 (d) Since red lead usually costs about \$10 per ton more than litharge, this cannot be overlooked.
 (e) Stiff paste has less tendency to cause cracking when air drying plates, but likewise cuts down on number of plates obtained per hundred pounds of oxides.
 (f) Wet paste causes more cracking upon drying, but naturally produces more plates.
 (g) The recent competition in plate and battery prices has caused, in some cases, a harmful tendency to make a paste that will have unlimited bulk in number of plates. There are various ways of accomplishing this. Extremely high bulking simply means less and less active material in each plate, which, if too small, means that the later performance of that plate will not be up to normal. The important point of caution in this regard is that the bulking figure can with safety only be increased to that point where the electrical performance of the finished plate is still satisfactory.
 (h) The consistency of paste is frequently influenced by the requirements of the method and equipment for pasting the plates, such as with metal paddles, wood paddles, trowels, pasting machines, different qualities of absorbent paper, thickness of grids, temperature of drier; and if drying in open air, the geographical location in dry or humid sections of the country must be considered as one controlling angle.
 (i) Thought must also be given to choice of high, medium or low forming rate, which, however, is frequently limited by available electrical equipment.
 (j) The formula, the oxide, and the method of mixing are all affected by the preference to make a dense or a porous plate.
 As so many things enter into the preparation of the paste and therefore into the art of plate making, it is obvious that there are probably no two formulas and processes in use commercially which are identical.

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

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 DX Means the Reception of Programs from Distant Stations, and that in Turn Means Pure Joy for Many Thousands of Fans. Better Distant Reception is Being Accomplished Right Now Than Was Possible Last Winter!
THE TRICK LIES IN KNOWING WHAT TO DO TO GET DX!
ALL THE INSIDE FACTS AT YOUR COMMAND FOR 50c!
CAN YOU ANSWER THESE TEN QUESTIONS?
 (1) How does the tuning in of DX stations differ from the tuning in of locals? (2) How can you make your antenna pick up more energy without adding any wire to it or making any change in your set? (3) If low wavelength stations are too loud and high wavelength stations not loud enough, how can you make them all as loud as desired? (4) What is the easiest way to improve selectivity? (5) How can you reduce the antenna resistance to get highest voltage? (6) How should coils be placed to avoid losses? (7) What effect has audio amplification on ability to get DX? (8) Where should by-pass condensers be placed to improve DX? (9) How should tubes be connected and operated for maximum efficiency? (10) Does the grid leak setting affect DX, and if so, how?
 These and many other questions affecting DX are answered in articles by Capt. Peter V. O'Rourke, J. E. Anderson and John F. Rider, published in the April 3, 10 and 24 and May 29 issues of RADIO WORLD. All four copies sent on receipt of 50c., or given free with a year's subscription (52 numbers, \$6.00).
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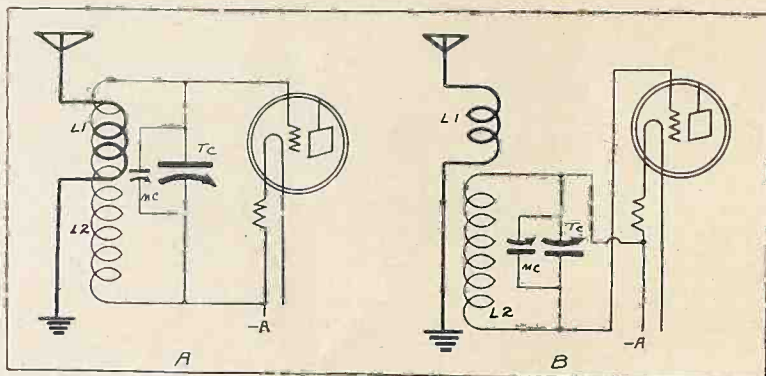
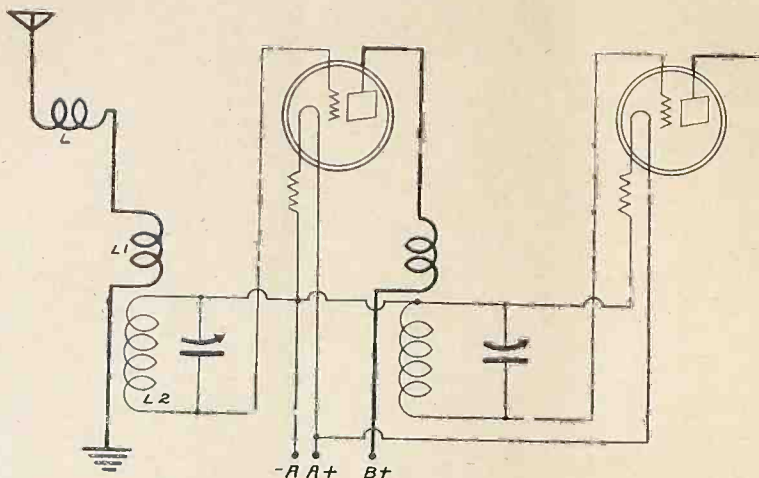
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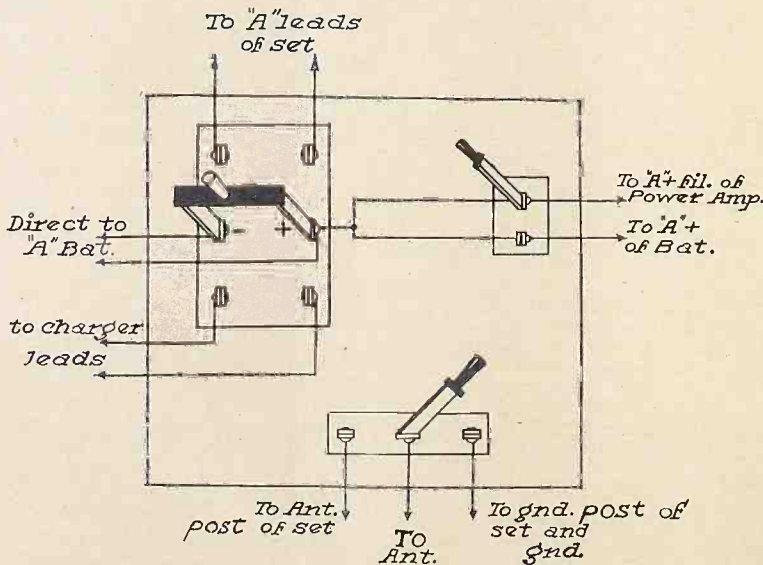
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Simplification Ideas



SYNCHRONIZED TUNING in single control receivers using a multiple condenser is difficult, due largely to the first stage of RF amplification. The antenna-ground system which has a capacity all its own, e.g., about .00025 mfd., and the capacity coupling between the primary and the secondary, are the causes. Methods of compensation are shown above. The location of the primary in respect to the secondary is important. In the top diagram we have a compensating loading coil L. Respective positions of primary are shown in lower hookup.



A PICTURE diagram of a switchboard, adaptable to sets employing a storage A battery and charger, external power amplifier and antenna and ground.

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Sockets and Dials

UX POWER TUBES installed in any set without rewiring by Na-Ald Adapters and ConnectoralDs. For full information write Alden Manufacturing Co., Dept. S-16, Springfield, Mass.

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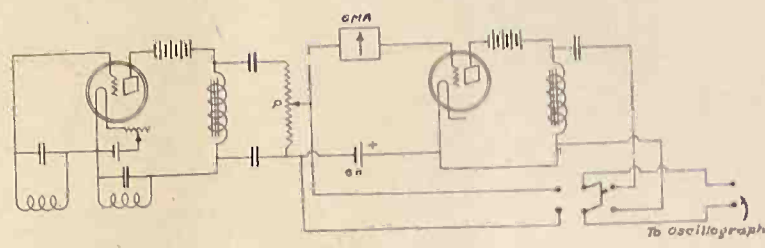
 A combination alkaline element battery and trickle charger all in one. Can be charged while set is operating. Price complete shipped dry with solution, \$16.00. 100-volt with Chemical Charger, \$12.00. 140-volt, \$17.00.
 Write for our illustrated 24-page booklet and Send No Money Pay Expressman.
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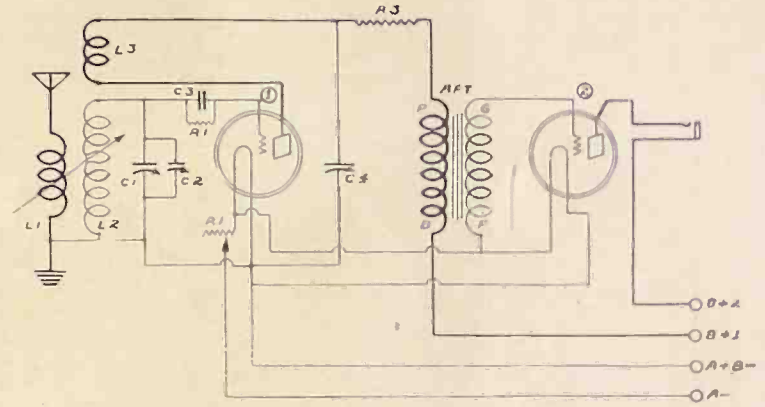
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 Positively given free with each purchase of a WORLD "A" Storage Battery. You must send this ad with your order. WORLD Batteries are famous for their guaranteed quality and service. Backed by years of successful manufacture and thousands of satisfied users. Equipped with Solid Rubber Case, an insurance against acid and leakage. You save 50 per cent and get a **2-Year Guarantee**
Bond in Writing WORLD Battery owners "tell their friends." That's our best proof of performance. Send your order in today.
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 Set your Radio Dials at 210 meters for the new 1600 watt World Storage Battery Station, WSSB, Chicago. Watch for announcements.
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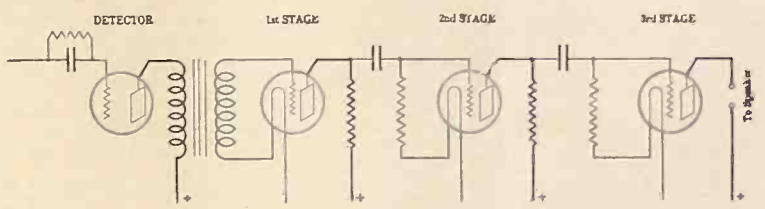
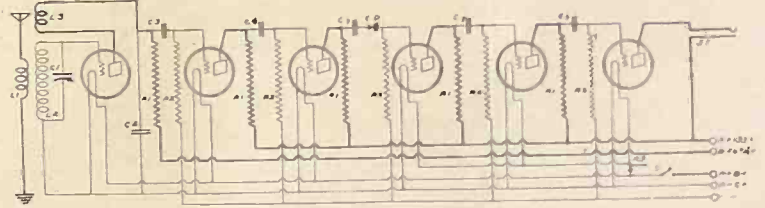
Short and Long Waves



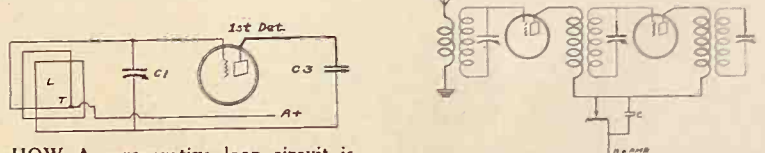
A TEST circuit used for comparing the input and the output of an AF amplifier, both as to wave form and amplitude, when using different C voltages. The wave is seen in the oscillograph tube connected in the input or output of AF tube, via the DPDT switch.



THE ELECTRICAL diagram of the Grebe Short Wave receiver, model CR-18. A complete description of this set was given in the Radio University columns of the May 22 issue of Radio World. This receiver has a wavelength range of from 8.5 to 216 meters, using special plug-in coils.



THE ELECTRICAL DIAGRAM (top) of a 6-tube receiver, employing one stage of regenerative RF and two stages of resistance RF amplification, a crystal detector, and three stages of resistance AF coupling. Bottom diagram shows a tube detector, one stage of transformer AF and two resistance AF stages.



HOW A regenerative loop circuit is hooked up, in the first detector of a super-heterodyne. This is equal to a Hartley oscillator in the first detector.

PLACE BYPASS condenser at C, if series resistance is used as an oscillation control.



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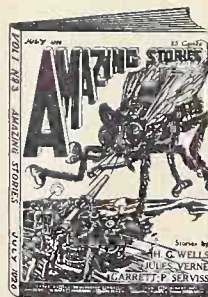
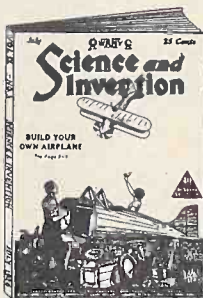
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Special Curkoid Coils; Highly Concentrated Field—
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LOG OF BST-6

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Al. Kraus, 996 Aldus Street, New York City.

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WBBR, Rossville, N. Y. ... 16	WMAK, Lockport, N.Y. ... 14
WEBH, Chicago, Ill. 49	WMSG, New York City. ... 11
WHT, Deerfield, Ill. 55	WOC, Davenport, Ia. 85
WCCO, St. Paul, Minn. ... 61	WFAA, Dallas, Texas. ... 78
WSB, Atlanta, Ga. 66	

SELECTIVITY

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

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- Special Corkoid Coils; Highly Concentrated Field—
- Shore Audio Transformers—
- Caswell-Runyan Two-tone Walnut-Finished Cabinet.
- New Dubilier Grid Condenser.



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

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LOG OF BST-6

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WSBC, Chicago, Ill.	10	WGY, Schenectady, N. Y.	50
WBBR, Rossville, N. Y.	16	WMAK, Lockport, N. Y.	14
WEBH, Chicago, Ill.	49	WMSG, New York City	11
WHT, Deerfield, Ill.	55	WOC, Davenport, Ia.	85
WCCO, St. Paul, Minn.	61	WFAA, Dallas, Texas.	78
WSB, Atlanta, Ga.	66		

SELECTIVITY

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

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