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# RADIO

Reg. U. S. Pat Off.

# WORLD

America's First and Only National Radio Weekly

Vol. 10 No. 13

347

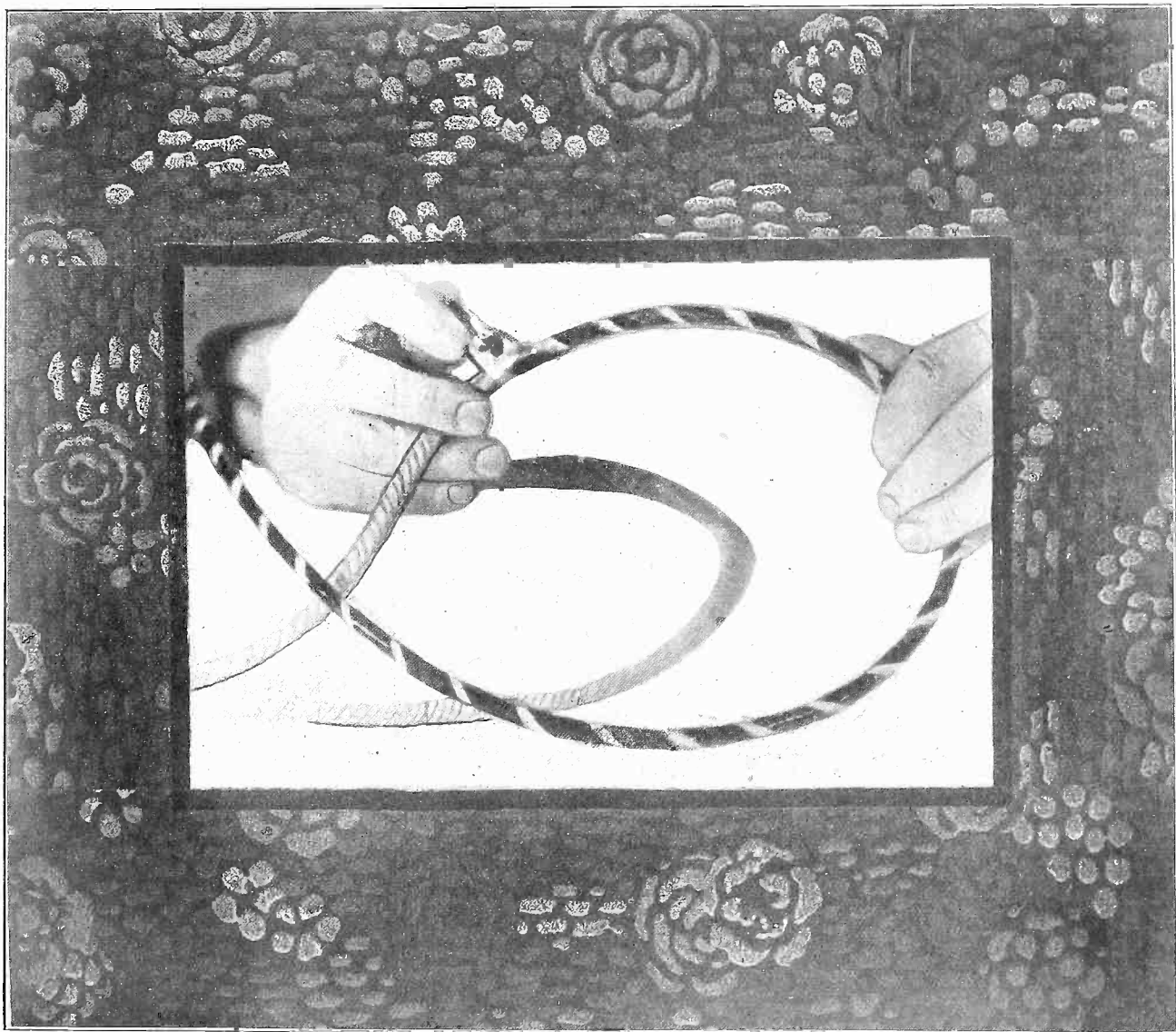
Illustrated

A Selective 1-Tube Set  
(Also in 3-Tube Form for AF)

How to Stop Interference

A Raytheon A, B, C  
Eliminator

Adventures of a Hostess



(Hayden Photo)

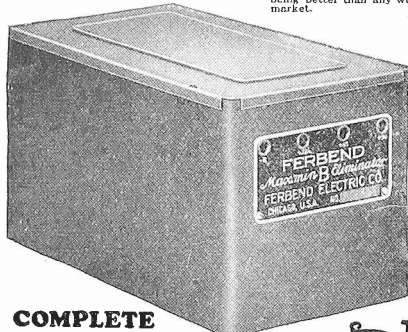
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 Floyd B. Ferwell, WIRE CHIEF, Sig. Det.  
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 F. L. McGRAW.  
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 Ralph J. Rorden.  
 Dryden, Ont. I am more than pleased with your "B" Eliminator and there is no doubt about it being better than any wet battery on the market.  
 D. M. Kentner.  
 New Orleans, La. The "B" Eliminator purchased from you some time ago is very satisfactory and I am much pleased with it.  
 W. M. Kline.  
 Amersterdam, N. Y. The Eliminator is great. Have received all my friends to get for I know none could work any better or give more satisfaction.  
 Reg. Firth.  
 Montreal, Quebec, Canada I have sold all six of your "B" Eliminators and every one is pleased with it. It is one of the best on the market regardless of price.  
 Alfred A. Michaud.  
 Yankton, So. Dak. Our Eliminator has served its purpose wonderfully and we enjoy our radio very much since we received it.  
 Gust. Rundquist.  
 Mt. Morris, N. Y. The "B" Eliminator purchased months ago has given more than best result. Would not part with it for anything.  
 Frank A. Haver.  
 Brooklyn, N. Y. I highly recommend your Eliminator to anyone regardless of the kind they expect to buy. Have had mine for over a year.  
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## Good Back Numbers of RADIO WORLD

The following illustrated articles have appeared in recent issues of RADIO WORLD:

- 1926:
- Mar. 27—An Economical 4-Tube Set, by Edgar T. Collins. A Practical B Battery, by Capt. P. V. O'Rourke. Teetron Trouble Shooting, by Lewis Winner.
  - April 3—How to Get DX, by Capt. P. V. O'Rourke. A Compact B Supply, by Lewis Winner.
  - April 17—The New 1-Dial Powertone, by Capt. P. V. O'Rourke. The Action of Transformers, by Lewis Winner.
  - May 8—To Wind a Loop on a Cardboard Frame. How to Reflex Resistance AF, by Theo. Kerr.
  - May 15—Super-Heterodyne Results Brought Up to Maximum, by Herman Bernard. The Truth About Coll Fields, by J. E. Anderson.
  - May 22—A Built-in Speaker Set, by Herbert E. Hayden. The Powertone in Operation, by Capt. P. V. O'Rourke.
  - June 5—Five-Tube Compact Receiver, by J. E. Anderson. A Tester for Tube Circuits, by Spencer Hood. Problems of Portables, by Hugo Gernsback.
  - June 19—Selectivity's Amazing Toll, by J. E. Anderson. The Light 5-Tube Portable Set, by Herman Bernard.
  - July 3—Set with a 1-Turn Primary, by Herman Bernard. Part 2 of the Victoreon Portable, by H. Bernard. Trouble Shooting Article for The Light 5-Tube Portable.
  - July 10—A Rub in Single Control, by Herman Bernard. A DX Double Regenerator, by Capt. P. V. O'Rourke. A 5-Tube Dry Cell Receiver, by Samuel Schmalz.
  - July 17—A Double Duty Loop Aerial, by J. E. Anderson. How to Measure Coupling, by John Rider. A 1-Control Crystal Set, by Smedley Lyons.
  - July 24—Why the Super-Heterodyne Is the Best Set, by Herman Bernard. A 1-Tube Reflex Receiver, by H. A. Reed.
  - July 31—What's Best in an AF Amplifier, by Herman Bernard. A 6-Tube Reversed Feedback Set, by K. B. Humphrey.
  - Aug. 7—The 5-Tube Tabletop, by A. Irving Witz. The Wiring of Double Jack, by Samuel LeGer.
  - Aug. 14—The Improved Browning-Drake, by Herman Bernard (Part 1). Storage Batteries, by John A. White.
  - Aug. 21—A New Stabilized Circuit, by E. H. Loftin and S. Y. White (Part 1). The Browning-Drake, by Herman Bernard (Part 2).
  - Aug. 28—The Constant Coupling, by E. H. Loftin and S. Y. White (Part 2). The Browning-Drake, by Herman Bernard (Part 3).
  - Sept. 4—The Four Rectifier Types, by K. B. Humphrey. A Simple Battery Charger, by J. E. Anderson.
  - Sept. 11—The Beacon (3-tubes), by James H. Carroll. The 1927 Model Victoreon, by Herman Bernard.
  - Sept. 18—The 1927 Victoreon, by Arthur H. Lynch. Eliminator in a Cash Box, by Paul R. Fernald.
  - Sept. 25—The Lynch Lamp Socket Amplifier, by Arthur H. Lynch. Wiring up the Victoreon, by Herman Bernard.
  - Oct. 2—The Victoreon (Continued), by Herman Bernard. New Equamatic System, by Capt. P. V. O'Rourke.
  - Oct. 9—A Practical "A" Eliminator, by Arthur H. Lynch. Building the Equamatic, by Capt. P. V. O'Rourke.
  - Oct. 16—The Bernard, by Herman Bernard. How to Box an "A" Supply, by Herbert E. Hayden.
  - Oct. 23—The 5-tube P. C. Samson, by Capt. P. V. O'Rourke. Getting DX on the Bernard, by Lewis Winner.
  - Oct. 30—The Singletrol Receiver, by Herbert E. Hayden. How to Get Rid of Squeals, by Herman Bernard.
  - Nov. 6—Reduction of Interference, by A. N. Goldsmith. Variations of Impedances, by J. E. Anderson.
  - Nov. 13—The 4-tube Hi-Power Set, by Herbert E. Hayden. A Study of Eliminators, by Herman Bernard.
  - Nov. 20—Vital Pointers About Tubes, by Capt. P. V. O'Rourke. The 4-tube Diamond of the Air, by Herman Bernard.
  - Nov. 27—The Antennales Receiver, by Dr. Louis B. Blan (Part 1). Short Waves Yield Secrets, by M. L. Prescott.
  - Dec. 4—The Regenerative 3-Tube Set, by Capt. P. V. O'Rourke. The 8-Tube Lincoln Super, by Sidney Stack. The Antennales Receiver, by Dr. Louis B. Blan (Part 2). Winner's DC Eliminator, by Lewis Winner.
  - Dec. 11—The Universal Victoreon, by Ralph G. Hurd. Some Common Fallacies, by J. E. Anderson.

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## Selectivity on One Tube Obtained With Aid of Equamatic Coil

Single Bulb Receiver Uses the Hartley Method of Feedback in Conjunction with a Primary in the Antenna Circuit That Makes Selectivity High Even at Shorter Waves

By Edgar Speare

THE energy transfer in a radio frequency transformer is directly proportional to the frequency of the current. This fact underlies some of the most serious troubles in radio frequency amplifiers. For instance, if the coupling between the primary and the secondary in the transformer is fixed to give a good energy transfer for the longer waves in the broadcast band, the energy transfer for the shorter waves will be excessive. This results in overloading of the tubes on the short waves and also in blocking of the grids. Growls, shrieks and whistles result. The receiver becomes useless on the short waves. The closer the coupling between the secondary and the primary is the lower will be the frequency (higher the wavelength) at which the noise will begin in the set. In many sets it begins in the middle of the broadcast band.

If the coupling between the two windings on the transformer is made so loose that the shortest waves in the band may be received without overloading the tubes, the set will not be sensitive enough to the longer and usually more desirable waves.

One excellent method of overcoming this difficulty is to vary the coupling in inverse proportion as the frequency, as is done in the Equamatic system. In this the primary of the transformer is coupled directly to the rotor of the condenser with which the circuit is tuned and the two windings are so placed that as the condenser shaft is rotated the coupling is decreased as the frequency is increased. Thus when the condenser is set at maximum and the circuit is tuned to the longest waves, the coupling is the closest, and when the condenser is set at minimum and the circuit is tuned to the shortest waves, the coupling is very loose. At no setting of the condenser is the coupling great enough to cause excessive energy transfer from one winding to the other, and consequently there is no frequency in the entire band at which the circuit will self-oscillate.

The degree of coupling at any given frequency may be adjusted to any desired value within limits. Thus the coupling may be so adjusted that the energy transfer is the greatest possible consistent with the carrying capacity of the

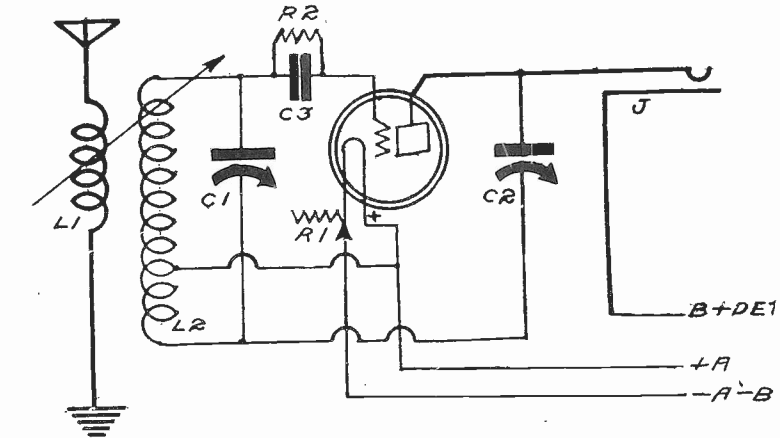


FIG. 1

THE 1-TUBE regenerative set, using the Hartley system in conjunction with a Karas Equamatic coil. The plate coil is wound by the constructor.

tubes in the receiver. But tubes and associated circuits vary greatly in characteristics, and there are cases in which it is not possible to maintain the optimum adjustment throughout the entire range. It is then desirable to have some means of making a final adjustment to obtain the utmost of which the circuit is capable at every frequency.

The best method for a one-tube design is regeneration. There are numerous ways of obtaining regeneration in a circuit, but the most suitable for the circuit under discussion is the Hartley parallel feed method. This is shown in Fig. 1. One terminal of the secondary or tuning coil is connected to the grid of the tube and the other end to A plus. An extra winding is connected to the plate through the condenser C2. Regeneration is then controlled with the condenser C2. This is a very effective method of control and the circuit may always be operated as near the oscillating point as is desired, or as near the overloading point as is permissible.

This scheme of controlling the volume is particularly useful when there is only one radio frequency tube in the circuit and when the primary of the transformer is connected in the antenna circuit.

If the coupling between the antenna and the tuning coil is too close, the selectivity is very poor, and the losses introduced into the tuning coil by the antenna are very great. The circuit will not regenerate and only moderate sensitivity and volume are possible. This trouble is greater, the greater the frequency. If the coupling is automatically varied, making it loose for high frequencies and close for the low, the optimum adjustment may be maintained for the entire band. The set will be selective and sensitive throughout the tuning range of the circuit.

### LIST OF PARTS

(For One Tube Set)

- L1, L2—One Karas Equamatic RF transformer.
- One special plate coil, wound as per text.
- C1, C2—Two Karas Orthometric extending shaft, .000375 mfd. variable condensers.
- R1—One Yaxley 20-ohm rheostat.
- R2—One Durham metallized 2 megohm grid leak.
- C3—One Electrad .00025 mfd. fixed condenser.
- J—One Yaxley No. 1 open circuit phone jack.
- One 7x14" panel.
- Two Karas Micrometric vernier dials.
- One Benjamin push type cushion socket.
- Two Karas Equamatic sub-panel brackets.
- One sub-panel.
- One battery cable, three binding posts, screws, nuts, soldering lugs, etc.

The condenser C2 serves not only as a regeneration or volume control but also as a by-pass for the radio frequency in the plate circuit of the detector, and none other is necessary or practical.

If the set is to operate a loud speaker it is necessary to add a couple of stages of audio frequency amplification. If good transformers are used for coupling these stages, greatest volume may be obtained with the least number of tubes, and the quality of the output will be good enough to satisfy most of those who judge by sound alone, which is the best practical test of a receiver.

For good quality 5-volt tubes should be employed, as well as adequate plate vol-

# High Efficiency Gained On All the Broadcast Wavelengths

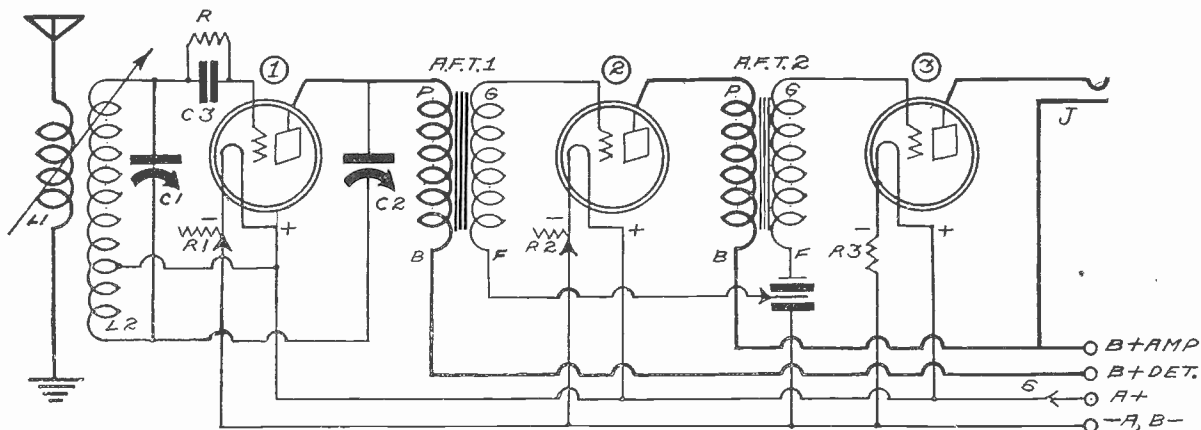


FIG. 2

THE THREE-TUBE SET, showing the same receiver diagram as in Fig. 1, but with two audio stages added for speaker operation.

tage on these tubes. The second audio tube should be a power tube, e. g., a 112. The plate voltage on the audio tubes may be 135 or more, unless extreme volume is desired, when the voltage should be higher. The grid voltage on these tubes must also be adjusted carefully for optimum results. This may best be determined by experiment. In adjusting this one should not judge by the greatest volume but by the purest tone on loud volume.

A rheostat R1 is used to control the filament current in the detector tube. This may be used also for controlling the volume and sensitivity in the rare cases condenser C2 does not suffice for this purpose. A separate rheostat R2 is employed to limit the filament current in the first audio amplifier.

#### Volume Control Caution

This rheostat should not be used for controlling volume, as this cannot be done without adversely affecting the quality of the set. It should be adjusted so that the filament current is normal, that is, one-fourth ampere. In the filament circuit of the last tube a fixed ballast resistor is used. This should be selected to match the particular tube used as the output tube. For a 112 or 171 use Amperite 112.

#### The Plate Coil

The Hartley method of producing regeneration in a circuit demands that the secondary coil be tapped for the filament

#### LIST OF PARTS (For Three-Tube Set)

L1, L2—One Karas Equamatic RF transformer.

One special plate coil, to be wound as per text.

C1, C2—Two Karas Orthometric extended shaft .000375 mfd. variable condenser.

R1, R2—Two 20-ohm Yaxley rheostats.  
R—One Durham metallized 2 megohm grid leak.

C3—One Electrad .00025 mfd. fixed condenser.

J—One Yaxley No. 1 open circuit phone jack.

AFT1, AFT2—Two Silver-Marshall No. 220 audio frequency transformers.

R3—One mounted Amperite, either 1A or 112.

S—One Yaxley filament switch.

One 7x21" panel.

Three Benjamin push type cushion sockets.

Two Karas Micrometric vernier dials.

One subpanel.

Three Karas Equamatic subpanel brackets.

One battery cable, four binding posts, screws, nuts, soldering lugs, etc.

connection. But on the Equamatic coil there is no tap and it is not desirable to

make one. Hence to provide a plate coil another winding should be made and connected in series with the grid or main coil. This winding may consist of about 7 turns of wire on a short piece of bakelite tubing three inches in diameter. Any size wire may be used, but No. 28 double cotton covered is suggested. The small plate coil should not only be connected in series with the grid coil but it should also be placed in inductive relation with it. The grid coil is placed on top of the sub-panel with its axis vertical. The plate coil should be mounted directly under it on the opposite side of the sub-panel, also with its axis vertical. The leads should be joined so that the connection is in series aiding. To determine whether it is connected in series aiding or in series opposing both connections should be tried and the correct one used. For each connection tuned in some strong station with the condenser and note the setting at which it comes in. The lower setting corresponds to the correct connection.

Now it may be that stations tune in too low on the condenser. This indicates that the inductance of the two windings is too high. It may be remedied by removing a turn or two from the plate coil. If the stations tune in too high on the condenser with the particular capacity used, it indicates that the inductance is too low. This may be remedied by adding a few more turns to the plate coil.

(Photos Next Week)

## There's Money In It for British Stations

Broadcasting in England is a very profitable institution, for the government and for the radio service.

An unlimited amount of money may be received by the new British Broadcasting Corporation, under the new government license which sets up that organization for a period of ten years.

Nearly \$3,750,000 is available for broadcasting in 1927, on the basis of 2,097,000 listeners, each paying a fee of ten shillings annually. For every new license, six shillings one and a half pence go for programs and general expenses.

The government—in this, the Post Office—will receive about \$1,125,000. It costs about \$500,000, to issue the licenses, leaving a fine net profit. The Post Office receives one shilling three pence on each

license. Of the remaining eight shilling nine pence, the new British Broadcasting Corporation will receive:

90 per cent, or seven shilling ten and a half pence, out of each of the first million license fees;

80 per cent, or seven shilling, out of each of the second million license fees;

70 per cent, or six shilling one and a half pence out of each of the third million license fees;

60 per cent, or five shilling three pence, out of every license fee after the three million limit has been reached.

Hitherto not more than £500,000 might go to the British Broadcasting Corporation in any one year, irrespective of the number of licenses issued, but this was changed.

## Blue Law Offset

PORTLAND, Ore.

The blue law problem in many sections of the country has caused the public to turn to radio as a medium of providing entertainment and dance music on the days that these laws are effective.

The director of a central station has recently announced through the microphone that each program on a given night would be composed entirely of request numbers mailed in by listeners in the sections where the blue laws forbid dancing.

Some clergymen and others have criticized stations that purposely put on jazz programs, saying that a station in one state, receivable in another, works only mischief by putting on jazz programs to contravene blue laws.

# Solder Well and Be Happy

## Make Proper Joints and They Stay Put

By James Montana

**S**OLDERING is a fine art, but it is an art that anybody can learn by diligently following the rules. The rules are: have a scrupulously clean joint, insure mechanical firmness, use a clean and hot soldering iron, a moderate amount of solder, and a good flux.

Very important is a clean joint. It is impossible to get the solder to stick to any kind of metal unless the surface of that metal is clean. In some cases it is necessary to file, sandpaper or scrape the metal to be soldered, in addition to using a good flux. The object of using a flux in soldering is not to clean the surfaces to be soldered, but to keep them clean after they have been cleaned by other means. The dirt on a joint which is particularly inimical to good soldering is oil and oxide or other chemical compounds of the metal. Such compounds are very readily formed on the surface of the metal when it is heated, particularly the oxide, since there is always free oxygen around. The purpose of the flux is to keep the oxygen away from the cleaned surfaces and thus to prevent oxidation. In the interest of a clean joint the fingers should be kept away because they are always oily. Fingerprints do not make a good flux!

### Tin the Iron

The soldering iron should also be kept very clean and well tinned. The objects of tinning the copper are to prevent the formation of copper oxide on the surface of the soldering tool, and thus protect the iron, to cause a more ready transfer of heat from the tool to the work, and to make the tin flow more readily.

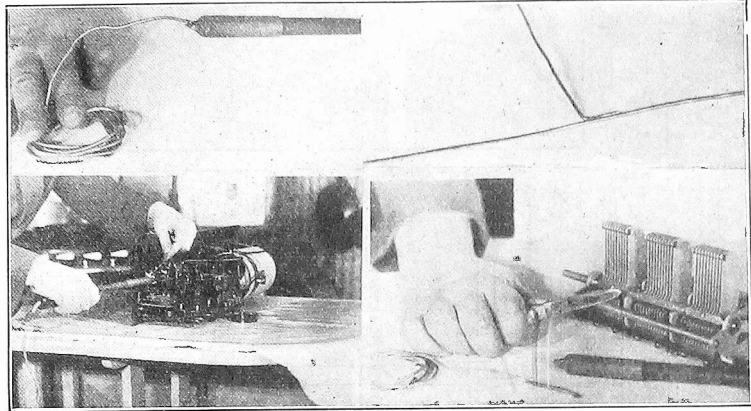
The iron should be hot for good soldering, but it must not be too hot. If the iron is not hot enough it is impossible adequately to heat the work to be soldered and the solder will not flow. If the tool is too hot it oxidizes the solder as well as the copper, and it is then impossible to maintain the work free of oxide.

Solder should also be used very sparingly. No more than will make a fast and neat looking joint should be applied. Excess of solder will make an ugly joint or will form globules which might cause short circuits.

A good flux suitable for the particular work at hand is also a necessity for good soldering. There are a great many fluxes which are very effective in keeping the joints clean, or even in removing some of the dirt, but they are corrosive and will attack the copper in the conductors to be soldered. If these conductors are very fine it will require only a little while for the flux to eat away the wires. Such flux will also attack the soldering iron and eat deep pits into the copper. After a little while of use the copper point must be replaced as it can no longer be shaped up. Muriatic acid is one of these corrosive fluxes, and there are many others. They are wholly unsuitable for soldering in a radio set, although useful in other lines of work.

### Rosin Is Excellent

Perhaps the best flux for soldering is rosin. It keeps the working surfaces clean and it is not at all corrosive. It may be used for even the finest wires without any danger. When this is used, however, the solder does not flow as readily as when other fluxes are used, and more care has to be used to get the wires clean before applying the flux and solder. One thing that must be guarded



(Hayden)

**SOLDER** should not be melted on the iron and then carried to the joint, as this baking oxides the solder, just as happens when the iron is too hot. Apply the solder and iron directly to the joint. (Photos at left.) Nor should a bus be bent in L fashion for soldering, as this contributes no mechanical strength. To solder to a nicked surface, scrape off the plating. (Photos at right.)

against is what is called a rosin joint. This simply means that the two wires have been joined by rosin instead of by solder, and consequently there is no metallic joint at all. To prevent this the joint should be thoroughly heated so that all the rosin is melted out or burned out. There is very little danger of getting a rosin joint if only a small amount of solder is applied to the joint.

Some workers put a little solder on the heated copper and then apply it to the joint to be soldered. This is not good practice. The joint should be heated first and the solder should be applied directly to the joint. The solder flows around the joint much better if the joint is well heated first.

### What Solder Is

Solder is a soft metallic alloy. It has not much mechanical strength. Hence solder should not be depended on for holding two conductors together mechanically. If there is stress on the joint it will break, and there will be an open circuit. This is a trouble of very frequent occurrence in radio sets, both home made and factory made. To make a firm joint the two wires should be twisted together or mechanically joined in some other manner so that there will be no twisting or bending or stretching of the solder itself. For example, when one bus bar wire is to be joined to another at right angles the end of one wire should not be put up against the other, either pointedly or in L fashion, and the solder applied. The end of one of the wires should be bent around the other in the form of a loop, and the loop should be forced together with a pair of large pliers. Then the solder should be applied to make the electrical joint permanent.

Again, when two bus bar wires are crossed and joined electrically, it is good practice to twist a finer wire around the joint and then apply the solder, particularly if there will be any stresses on the joint.

### Soldering Aluminum

Some amateur mechanics have undoubtedly tried to solder other metals besides copper or brass. Perhaps they have tried to solder aluminum surfaces. No doubt they have had a difficult time making the solder stick. Aluminum simply cannot be

soldered by ordinary methods. The reason for this is that an aluminum surface cannot be cleaned and kept clean. An aluminum oxide forms on the surface of the metal almost instantly, and the solder will not stick to an oxide. If aluminum is used as conductor and a joint is to be made, much time will be saved by making a firm mechanical contact and let it go at that.

Iron may be soldered, but it is not so easy as copper. Here again it is a question of keeping the surface clean and free from oxide. Clean the surface well, heat thoroughly and apply the solder to the heated joint. If it is practicable to copper plate the iron surfaces before applying the solder it is just as easy to solder iron as copper. This really amounts to soldering copper.

Resistance wire is very difficult to solder, if not almost impossible. To make a good joint when resistance wire, such as nichrome, forms one or both of the conductors to be connected, it is best to be satisfied with a firm mechanical contact. The wires may be twisted together or they may be clamped between to soft metal surfaces. When nickel plated conductors are to be joined the same remark applies. If, however, the nickel plating is over copper or brass, the nickel may be removed with a file or with sandpaper, and then ordinary soldering will work.

### BIGGEST RADIO CARGO REACHES LOS ANGELES

The largest cargo of radio equipment ever received at this port recently arrived on the steamship Lewis Luckenback from Philadelphia.

The cargo consisted of complete sets and speakers, cabinets and accessories.

The Lewis Luckenback is 473 feet long and carries 14,000 deadweight tons.

The moment the vessel docked, 250 men went to work unloading her and deliveries were begun to the waiting dealers.

### Y. M. H. A. PLANS RADIO CLUB

The Washington Heights Y. M. H. A., in New York City recently held a meeting for the purpose of organizing a radio club. An elaborate receiving station is being built.

# Eliminating Interference

## Taxes the Ingenuity of Experts

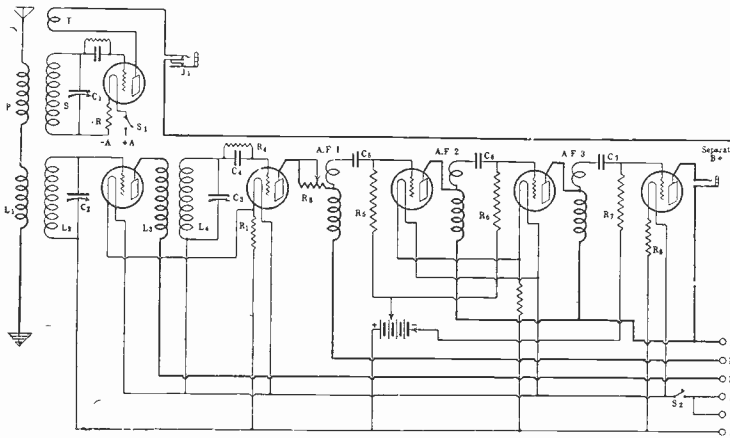


FIG. 1

A wave trap, regenerative or otherwise, helps cut out interference. The diagram shows a 5-tube receiver to which another tuned tube circuit has been added for trapping. It is simply a 1-tube regenerative set used as an interference eliminator. Commercially made interference eliminators, like the Steinite are on the market and serve their purpose well, but require no extra tube.

### Balancing of Outdoor Antenna and Loop Pickup One of Novel Means Suggested—Peanut Whistles Reduced Below the Point of Annoyance—Secondary Interference Has Wide Ramifications

By J. E. Anderson

INTERFERENCE is a subject very much to the fore these days. And no wonder, because it is thrust upon us whenever we turn the dials. Two stations may insist on performing in the loud speaker at once. Selectivity of the receiver is of little avail unless it is so high as to exclude the greater part of the undesired signals. It is of course possible with a very selective Super-Heterodyne or a highly regenerative set to eliminate the greater part of interference from other broadcasting stations, but what is left after the exclusion is not always worth having, because it is little more than the boom boom of a bass drum. That is, if the amplifier and the loud speaker are capable of reproducing such low tones. If it is not, even less comes through.

What remains to be done to eliminate interference after the selectivity of the set has been chosen at a reasonable value—a value which will give the higher frequencies a chance to register in the loud speaker? Directional selectivity is about the most interesting remedy to apply. A loop may be employed for picking up the signals from the desired station. The reason why this eliminates some of the interference is that it possesses directional properties. It picks up signals better in some directions than in others. If the loop is turned so that its plane is perpendicular to the direction of a given station, then that station will not be picked up by the loop.

#### Greatest Volume

If the loop is turned so that its plane is parallel with the line joining the station and the receiver, then that station

will come in loudest. If the loop is turned so that its plane makes an intermediate angle with the line joining the station and the receiver, the received signal will be of intermediate strength. The position of no reception is very critical, so that it is necessary to adjust the loop very carefully if this method is to be effective in eliminating interference from a station. The method of operation is to tune in the desired station with the loop, then if there is any interference the loop should be turned until this is minimum, or until it disappears. But turning the loop may reduce the strength of the desired station, which can only be compensated for by increasing the amplification. If the desired and the interfering stations both lie on the same line with the receiver, this method cannot be used because both stations will disappear at the same setting of the loop.

If the desired and the interfering stations not only lie on the same line but also in the same direction nothing can be done about it except to try for some other station which is not interfered with. But if the stations lie on the same line but in opposite directions one of them may be excluded by means of a balancing arrangement between a loop and an open circuit antenna.

#### Needs Careful Adjustment

This is very effective but it requires considerable care to adjust the loop and the antenna. The adjustment is made so that the signal picked up by the loop is exactly equal to the signal picked up by the antenna. This may easily be done by having a variable coupling between the primary and the secondary of the loop pick-up. When these two pick-ups have once been equalized both the loop

and the antenna should be tuned to the desired signal. If the interference remains, the loop should be turned through an angle of 180 degrees. The interference should then be completely eliminated, leaving the desired signal in full strength as obtained by the sum of the loop and the antenna pick-ups.

Unfortunately, the method just described is not generally suitable for eliminating interference because of the accurate adjustments necessary. Many persons object to manipulations. But for radio fans who are by nature experimenters it is an excellent method.

The great majority of radio fans prefer to have the elimination of interference done for them. They expect the radio engineers to do it. But the engineers have just about reached the limit from a technical point of view, unless the entire scheme of broadcasting be reorganized. The radio public is not yet ready for any far-reaching changes, as completely new receiving equipment would have to be obtained.

#### Legislation Is Needed

The only immediate relief is legislation. Congress is the only agency that can do this effectively. A large number of small stations which has no definite purpose for being and which does not contribute much to the entertainment or instruction of the radio public should be removed from the air, leaving the space thus vacated to such stations that do something worth while.

Already a proposal has been made to Congress that no more stations be licensed until such a time that adequate legislation on the subject shall have been enacted. But a mere proposal is not sufficient to stop the last minute rush for licenses when the Department of Commerce is bound by existing laws to grant licenses to all who comply with the law. Neither will such a proposal, if made into a law, relieve the interference situation as it already is. Apparently it is required to reshuffle the available broadcast channels and hand out a new deal, and many must of necessity stay out of the game.

#### Use of Higher Frequencies

It is, of course, possible to open up more broadcast channels and thus make room for another game. There is much room in the higher frequency regions. But which of the broadcasters will be willing to accept the shorter waves? All want to be as near the higher class stations as possible—to use waves which these stations have popularized. That is the reason why they jumped from the high frequencies assigned to them to the lower bands, and which is directly responsible for interference.

One way to stop some of the interference is for some of the better class stations to start up on much shorter waves. The scramble of the satellites will then be in the direction of high frequencies, because they must be in the limelight of popularity of stations of first magnitude to receive any notice at all. It is up to Congress to make it impossible for them to trespass. There will be no trouble to get the radio fans to get equipment which will tune in these short waves provided there is something worth while on the waves.

One of the pioneer broadcasting concerns is now engaged in developing a

# Reception Made Clearer

## By Trapping Out the Crosstalk

short wave broadcast transmitter. The most suitable wavelength has not yet been decided, but whatever wave is selected it will be in a region of the spectrum where there is plenty of room. When one high quality station has been established in this region, other stations will find it more desirable, and there will probably be a rush for licenses to use adjoining waves.

### The Peanut Whistle

One of the most persistent interferences to broadcast reception is what is often referred to as the peanut whistle. This term is self-explanatory and refers to the high pitched whistle heard in a radio set when two stations are operating on waves with insufficient separation. The manner in which this noise is produced is evident when one looks at the detection characteristic of a vacuum tube. When two waves of nearly the same frequency are impressed on the grid circuit of a tube, a current having a frequency equal to the difference between the two is produced in the plate circuit of that tube. If the frequency separation between the two interfering stations is less than about 15,000 cycles, the difference frequency may be heard in the loud speaker. It does not, however, become serious interference until the frequency difference is less than 10,000 cycles. Quite frequently the separation is much less than this and the resulting interference is correspondingly greater.

The intensity of the interfering whistle depends on the intensity of the two separate high frequencies which produce the beat, being directly proportional to either. Therefore the interference is quite intense if either of the two is strong and the other is weak, so that a station located a long distance away is capable of interference with a local station in direct proportion to the intensity of the local station. Hence even stations in foreign countries set up beats with strong locals.

### Secondary Interference

Not only may a high pitched whistle be produced by direct interference between two carriers, but also by the interference between a carrier frequency and beat frequency produced between any two other stations, or between two beat frequencies produced by the beating of any two high frequency stations.

This might be called secondary interference, and it is practically impossible to avoid interference of this sort, but fortunately it is usually very weak. In Super-Heterodynes, however, it is sometimes very strong because the situation is complicated by the wave generated locally and by its harmonics.

### Computation of Beat

The production of a beat frequency may be illustrated by means of a diagram. Referring to Fig. 4 let  $f-1$  be the lower of two frequencies and  $f-2$  the higher. Suppose that they differ by less than 10,000 cycles, so that the beat between the two is audible. Then  $(f-2)-(f-1)$  represents this audible beat frequency. It only represents the frequency, not the current which produces the audible response in the loud speaker. The audible current is produced when the two high frequencies are impressed simultaneously on the grid circuit of a detector tube, and there is not a tube in the receiver which does not

detect sufficiently to produce the beat current.

The production of a beat current may be illustrated with actual figures. Suppose there are two broadcasting stations operating on 660 and 650 kilocycles, and suppose further that the 650 kc station is off frequency by 2,000 cycles in the direction of the 660 kc station. Their actual separation is then 8,000 cycles, which falls well within the audible band. In fact, it would appear as a very annoying whistle in the loud speaker. It is not necessary that both of these stations be local and of high intensity. The noise will appear if one is strong and the other weak. Tuning does very little good in this case, because if the circuit is tuned to the 660 kc station it is also very nearly tuned to the 652 kc station.

Let us take an example of secondary interference. For the purpose metropolitan district local stations may be taken. WNYC is operating on a frequency of 570 kc. and WJZ on a frequency of 660 kc. If these two stations are operating simultaneously they produce a beat current in a receiver of 90 kilocycles. Again WMCA is operating on 880 and WLWL on 780 kilocycles. The beat current produced by these two stations has a frequency of 100 kc. This current will beat with beat current produced between the 570-660 stations and will produce a secondary beat current of 100-90 kc., or 10,000 cycles. It is thus

capable of producing a high pitch whistle in the receiver. If any one of the four stations should deviate ever so little from its nominal frequency, the percentage of variation in the secondary beat current would be quite considerable. The absolute variation would be the same in the carrier as in the secondary beat. Thus if WLWL should increase its frequency to 782 kc., the first beat between WLWL and WMCA would change to 98 kc., and the secondary beat current would change to 8,000 cycles. Since the secondary beat will change in pitch with a change in any one, one would expect that the pitch of this whistle would be variable, which is the case.

### Steinite Stops Trouble

One way of eliminating interference from other broadcasting stations is to employ a wave trap. There are several types of these and may be used in several ways. In some connections the trap rejects one station only, and if the trap be set for that station no interference will be encountered from that station. In other connections the trap will by-pass all stations except the one to which it is accurately set. This is not so simple as to use as the trap that rejects a single one.

One effective trap for projecting interfering stations is called the regenerative trap. This requires another tube and is not easy to operate. However, those who care to take the time and trouble

(Concluded on page 26)

## How Twin Antennas Serve As Fine Trap

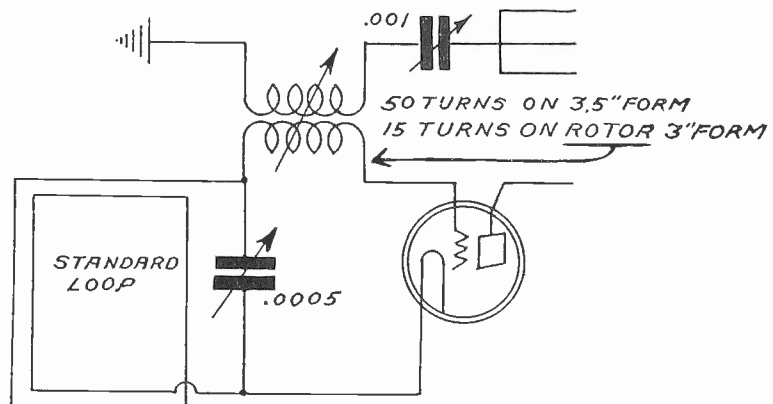


FIG. 2

A standard loop with a tuning condenser across it is used for obtaining the two-directional pick-up, and this tuned circuit is connected in the grid circuit in the usual way. To obtain the circular pick-up an ordinary antenna is employed. This is coupled to the grid circuit by means of a small coupling coil which is in inductive relation with the antenna inductance. This may be a variocoupler with the rotor, or smaller coil, in the grid circuit of the tube. The antenna is tuned by means of a .001 mfd.

variable condenser. The coupling is adjusted in the variocoupler until the loop pick-up is equal to the antenna pick-up. To obtain this equality the loop should be pointed to a certain station and the circuit tuned. Then the antenna should also be tuned to that station. Then the loop should be turned until the signal is minimum. Then vary the coupling until the signal disappears, or until it is at minimum. The station to be used in finding the proper point of balance may be the interfering station.

# A Humless Power Plant

## Affords All Necessary A, B, C Voltages

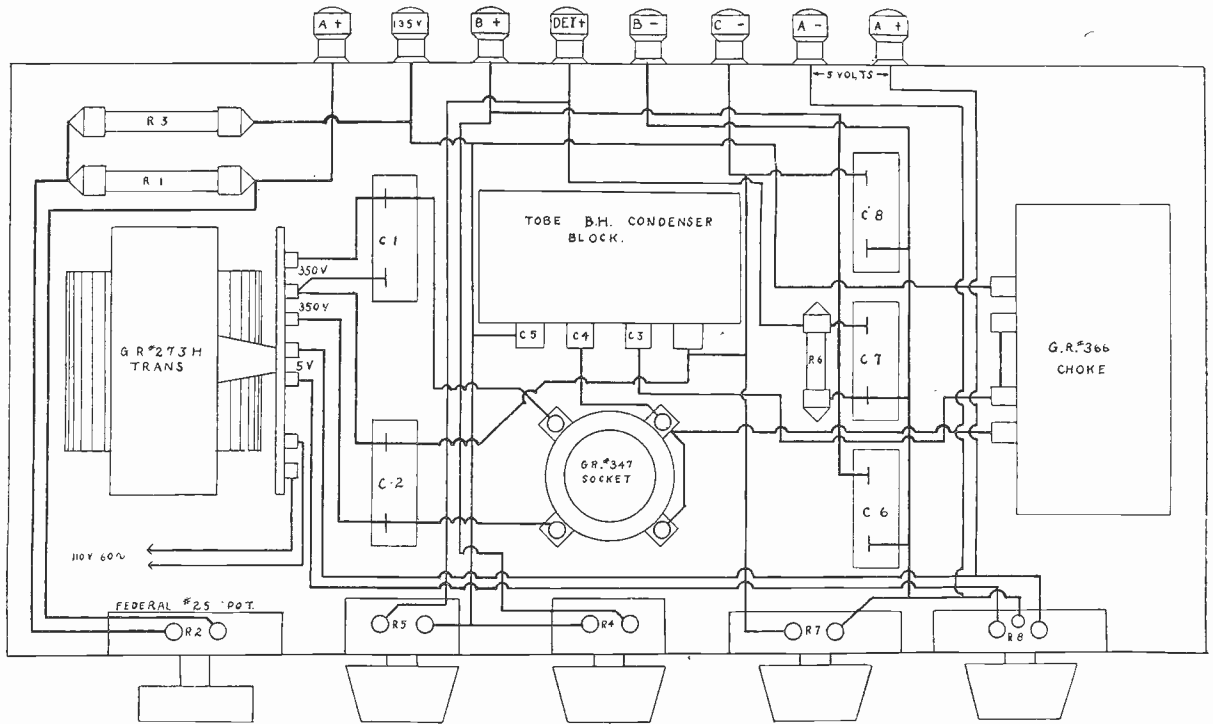


FIG. 1

The A, B, C power plant, shown in picture diagram. The schematic diagram is Fig. 2.

**Outfit is Applicable to Any Set, But All Tubes, Except Last One, Must Be Connected With Filaments in Series To Keep Down the Drain**

*By Perry S. Graffam*

**D**UE to the many improvements which have been made by manufacturers of battery eliminator parts, a hum-free A, B and C current supply unit capable of operating any type of receiver now in use with small tubes can easily be made.

In designing the new power plant, as it will be called, the primary consideration was availability of apparatus, simplicity of assembly and constancy of voltage output even with a considerable fluctuation of line supply voltage.

The matter of designing and building the B battery eliminator is a very simple one, as compared to producing a device which will supplant the A or storage battery. In either type of eliminator, the power used is about the same, considering an average five-tube set. In a set of this kind the filament wattage does not greatly exceed the wattage of the plate circuit. This is due to the fact that in one instance a high voltage and low current combination is employed,

while in the other it is a combination, relatively, of high current and low voltage.

#### Theoretical Considerations

Alternating current to be made available for filament and plate supply must be rectified, that is to say, it must be so changed as to have the characteristics of direct current. In order to give the current this characteristic, it is necessary to pass it through a type of vacuum tube or other agent endowed with rectifying properties. With vacuum tubes of this class, it is necessary to raise the house lighting voltage of 110 volts to a voltage of several hundred through the medium of a transformer before leading it to the tube to be rectified. While the voltage drop through the rectifying tube is appreciable (varying with the load), it is not great enough to prevent its use with the proper transformer for supplying plate voltages from a few to several hundred volts. But the output current of the tube is relatively small, in most cases usually not exceeding 100 milliamperes.

#### Conditions Are Met

So from this it can be seen that one solution to the A battery eliminator problem lies in a method of adapting the receiver and its tubes to meet the conditions of the rectifier. In other words, we may take a receiver, for example, which employs 199-type tubes whose filaments when connected in parallel draw an appreciable current at a low voltage, and by changing the filaments to a series connection reduce the total filament drain while increasing the total filament voltage. Then with this procedure,

**Theoretical Considerations of a Total Eliminator Explained—How the Limited Current From the Rectifier Is Used to Satisfy All Demands**

it will be evident that we are taking advantage of the characteristics of the rectifier.

To accompany the power plant certain changes are necessary in the present receiving set to operate without batteries. If the receiver to be converted is not already equipped with a power tube, this will be the time to improve the audio end of the receiver by the addition of a power tube.

#### The Series Connection

To employ the power plant, the filament circuit of the receiver with which it is to be used must be altered so that all the filaments are connected in series, except the filaments of the last tube, which should be run to two additional posts or leads not heretofore present in the receiver, for the filament current which will be supplied by the power plant. Then 199 or other 3 volt tubes replace the tubes formerly used. In the last stage a power tube such as the 171 may be employed, which is a 5-volt, not a 3-volt, tube.

The present rheostat and fixed resistor if any, of the set will not be further



# Potentiometer Is Vital Across the Filament Secondary Coil

**Grid Return of the AC Heated Power Tube Is Brought to the Center Arm and Nice Adjustment Is Absolutely Requisite to Balance Out the Hum**

required and may be removed or disconnected. Any circuit may be changed over simply by connecting the filaments in series, except for the last tube.

By connecting the filaments in series we may now use higher voltages, making it possible to use condensers to advantage, and the current consumed is so small that the filter choke coils are of reasonable proportion.

Figs. 1 and 2 show the wiring of the power plant pictorially and schematically. This unit will supply voltages and currents as follows:

A current, 60 milliamperes (6 to 30 volts).

B current, up to 30 milliamperes (240 volts maximum; 90-165 variable int.; 20-80 detector).

C bias, 0 to 50 volts.

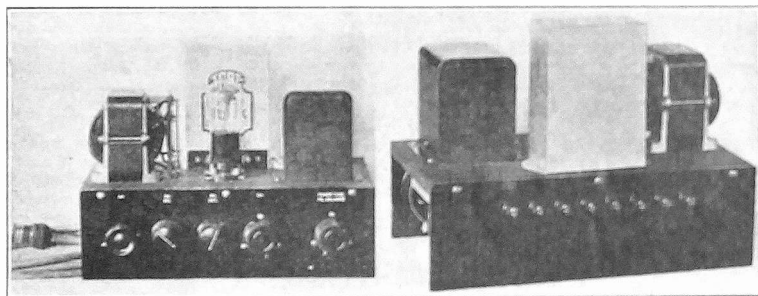
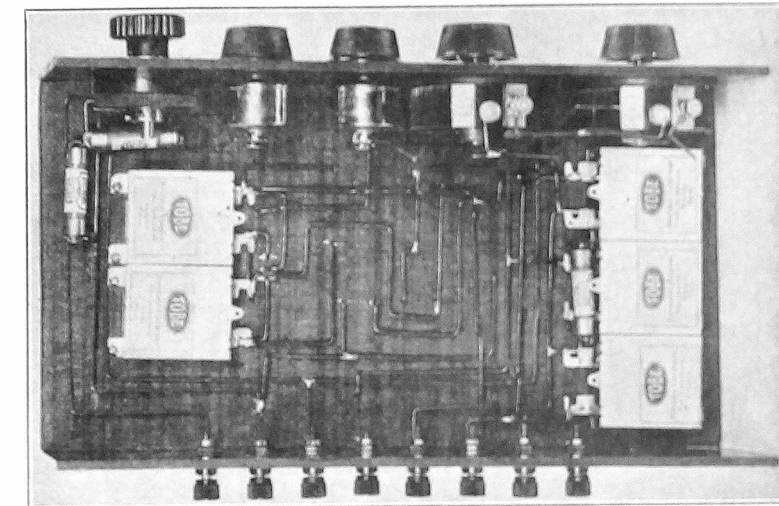
AC for power tube filaments, such as 112 or 171.

A General Radio No. 273 H Transformer provides the various voltages required. The outer ends of the high voltage are connected to the filament terminals of a standard UX type socket into which is plugged the new type BH Raytheon rectifier. The plate terminal of the socket, corresponding to the cathode of the Raytheon tube, is connected to the plus side of the filter circuit.

**Coils Pass 85 Milliamperes**

The filter circuit of this power supply includes choke coils (L) capable of passing 85 milliamperes direct current without heating and having a residual inductance of at least 25 henrys per choke at this value of direct current. The General Radio type No. 366 standard B substitute choke is admirably suitable for this purpose. Other makes of choke coils which meet the above requirements may be used.

Further to improve the filter the Tobe BH Condenser block C3C4C5, is used. This condenser block is designed to be used with the new Raytheon BH Tube. C6, C7 and C8 are separate Tobe Condensers of 1.0 mfd. each, connected from the B plus posts to the B minus terminal



FIGS. 3 AND 4 Views showing the top, front and back of the power plant.

to by-pass any rheostat noises. These condensers have been tested for an operating voltage of 350 volts. R1, R3 and R6 are fixed Tobe Veritas resistances of 5,000 ohms, 3,000 ohms and 10,000 ohms respectively. R2 is a Federal No 25 potentiometer for the purpose of stabilizing the control of the filament supply to the receiver. R4 and R5 are Clarostats for controlling the intermediate B plus battery used for the RF tube and Detector B plus plate supply. R7 and R8 are Yaxley air cooled 400 ohm potentiometers, No. 400. R7 supplies C battery up to 34 volts without excessive heating. R8 is connected across the 5 volt filament AC supply and the center tap is returned to the B minus terminal of the power plant.

The adjustment of the potentiometer is very critical and must be carefully made to balance out any AC hum.

**Market Obstacle Overcome**

To supply the A plus filament voltage R1 is shunted across R2 to obtain the (Continued on page 28)

**LIST OF PARTS**

- One General Radio No. 273 H transformer.
- One General Radio No. 366 choke coil.
- Two Precise 400 ohm potentiometers.
- One General Radio UX socket.
- One Raytheon BH tube.
- One Tobe-Deutschmann BH condenser block.
- Three Tobe-Deutschmann 1.0 mfd. filter condensers.
- One Tobe-Deutschmann Veritas 3,000 ohm resistor.
- One Tobe-Deutschmann Veritas 5,000 ohm resistor.
- One Tobe-Deutschmann Veritas 10,000 ohm resistor.
- One Federal No. 25 potentiometer (1,850 ohms).
- Two Clarostats.
- Eight Eby Binding posts.
- Two Celeron panels, 13x4".
- One wooden base, 7x13".
- One milliammeter, 0-75 scale (Hoyt, Jewel or Weston).
- Miscellaneous screws, wire, spaghetti, etc.

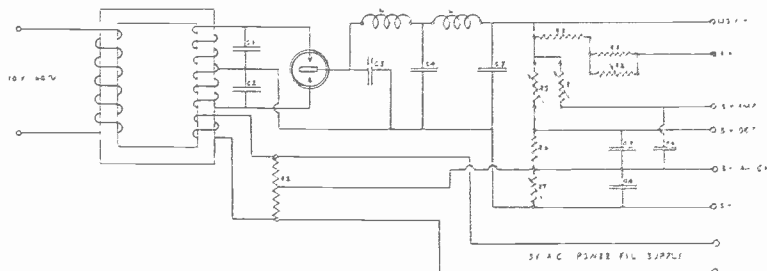


FIG. 2 The schematic diagram of the A, B, C eliminator

# Volume Control Is Versatile in The Victoreen Universal

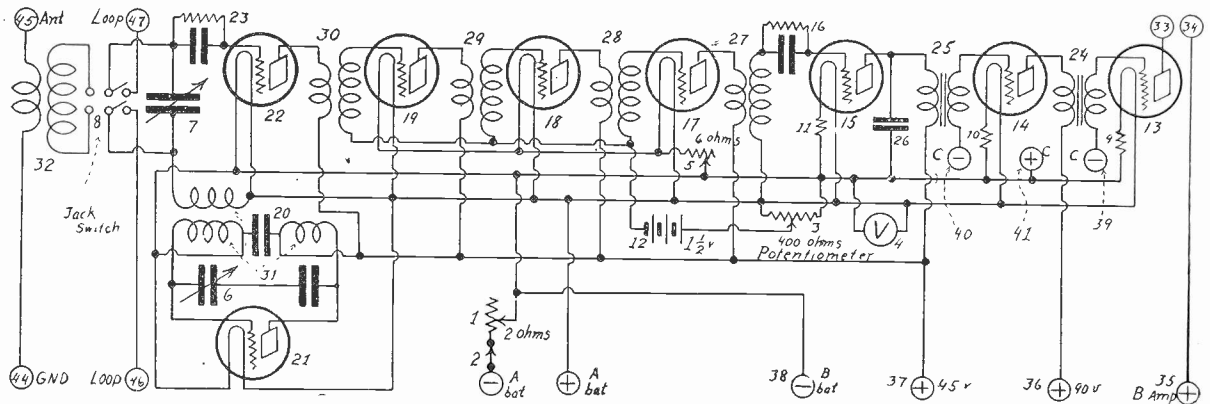


FIG. 3

The schematic wiring diagram of the Victoreen Universal.

[Part I of the article on "How to Build the Victoreen Universal" was published in last week's issue, dated December 11. Next week's issue will contain the next week's constructional data which will be published.]

By Ralph G. Hurd

## PART II

WHEN using a Super-Heterodyne like the Victoreen it is desirable to be able to use a loop or antenna according to one's preference. For instance when receiving local stations all the volume desired may be obtained with a small loop. But when receiving stations are at great distances away from the receiver much better results often may be obtained by a good open circuit antenna.

It is a prevalent opinion that reception with an open circuit antenna in connection with a Super-Heterodyne is not satisfactory because of the excessive noise that accompanies the signal. This idea arose from the fact that the first Super-Heterodynes brought out lacked adequate volume control, and the amplifiers, both intermediate and audio frequency, were overloaded. Noise was the inevitable result. There is no danger of overloading the amplifiers when receiving distant stations, and consequently an outdoor antenna may be used.

If a receiver is to be provided for both loop and antenna there must be a ready means of switching over from one to the other. The simplest method to employ is a double pole, double throw switch, which may be of the jack type. This switch is symbolically shown in the circuit diagram herewith.

### How Connections Are Made

The condenser leads are permanently connected to the middle springs of this switch, the loop terminals to the two on one side and the antenna tuning coil to the other two. Turning the switch in one direction connects the condenser to the loop and turning it in the other connects the antenna and disconnects the loop. Of course the loop is permanently connected to binding posts provided for it, as is also the antenna to its posts.

The first detector in the circuit operates

on the grid detector and leak principle. It should be pointed out that improved results may often be obtained by deviating from the usual combination of values used here. The usual values are .00025 mfd. for the condenser and one to two megohms for the leak resistance. These values have been found to be about the best when detecting from radio frequency to audio frequency; but in this case the detection is from radio to intermediate frequency, which requires somewhat different constants. Hence values other than those indicated should be tried, and those used which give the best results. Usually, it is not necessary to vary both the capacity of the condenser and the resistance of the leak. It is sufficient to vary the leak only.

In a sensitive Super-Heterodyne volume control is of great importance. In the present set there are several methods of controlling the volume without impairing the quality of reproduction. The first of these is the interchange of loop and antenna, already referred to. In case a loop is employed the volume may also be varied by turning it about its vertical axis, thereby turning it in or out of the direction of maximum signal strength.

### Other Volume Control

A second method is by varying the filament current in the high and intermediate frequency tubes by means of the rheostat controlling them. None of the audio frequency tubes is on this rheostat and therefore the volume may be varied in this manner without in the least affecting the quality of the output.

A third way of controlling the volume is by means of the 400 ohm potentiometer. Altering the setting of this instrument changes the grid bias on the intermediate frequency tubes, and therefore the volume may be changed to a certain extent. However, this method should not be abused. The main bias on these amplifier tubes is obtained by means of the grid battery, and this should be adjusted so that amplification is maximum when the potentiometer is set near the positive end of the filament. Then by turning it toward the negative end the grid bias may be increased up to about five volts maximum.

In the filament circuits of the detector and the two audio frequency amplifiers is a ballast resistor of such value that the voltage drop in each of them is slightly less than one volt when normal current is flowing in the filaments. To insure normal current shall flow for all stages of charge of the storage battery, a master rheostat is employed. Its value is two ohms and its only purpose is to compensate for variations in the voltage of the supply. For instance, when the storage battery is nearly exhausted all of the resistance of the master rheostat is cut out; and when the battery is fully charged enough resistance is cut in to reduce the voltage across the line to the proper value.

### The Use of a Voltmeter

For the purpose of checking up on the voltage across the line a filament voltmeter V is employed. This is connected between the positive side of the battery and the high voltage side of the two ohm rheostat, which should be adjusted so that the reading on the voltmeter is always the same regardless of the charge of the battery. When this fixed value can no longer be maintained by reducing the resistance in the rheostat, the battery should be put on charge.

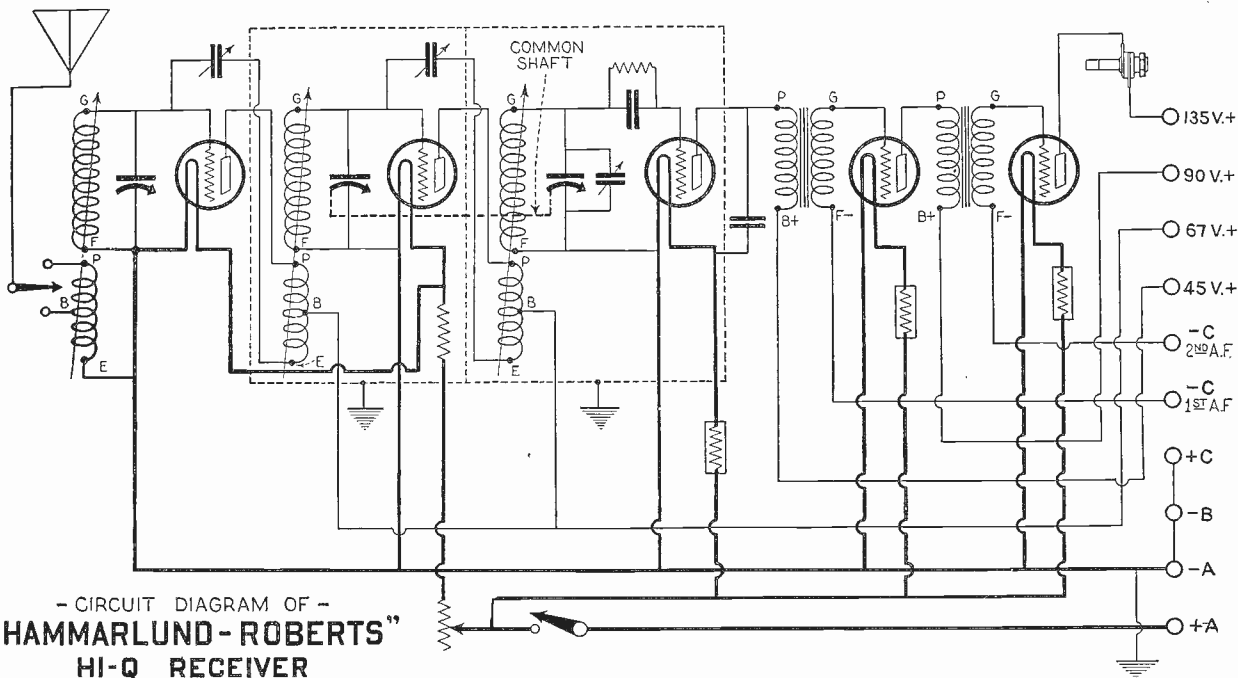
An important feature in constructing a good Super-Heterodyne is to place the various tuning coils and intermediate transformers in such a way that there is a minimum of coupling between them. This means that they should be placed at right angles electrically. The antenna coil and the oscillator coil are placed so that their axes lie on the same plane and then the two coils are placed so that the axes are also at right angles. There is no difficulty in obtaining this condition when there are only two coils to place. If four coils were to be placed so that there is a minimum coupling the problem would not be so simple, but may be solved by placing them in a manner made familiar by the Neutrodyne.

All the intermediate coils are placed in a similar manner in a straight line, and then their axes are inclined a certain angle with respect to this line.

The exact angle cannot be stated but must be found experimentally. It depends

(Concluded on page 27)

# Final Constructional Touches in The Hammarlund-Roberts



[The following is the third consecutive installment on how to build this receiver.]

By Leslie G. Biles

**PUSH** the shaft through condenser No. 2 and thread on one of the coil cams with the knob of the cam toward the front panel. Continue the shaft through condenser No. 3 until  $\frac{3}{8}$ " of the shaft projects beyond the rear bearing of the condenser. Then turn the movable plates of the two condensers until a position is reached where the set screws in the rotors of the condensers can be reached with a screw driver. Tighten one screw in each rotor slightly and then by means of the shaft turn the plates entirely out of mesh and gently force the rotor sections of the two condensers into line by pressing them up against their respective stops. Then by means of the shaft turn the rotors so that the set screws may again be reached and all screws tightened securely, making sure that the rotors of the condensers have not shifted out of line.

If the condenser shaft turns very stiffly this can be remedied by lining up the condensers properly. One method of doing this is to loosen the screws holding the shields to the shield strips and turn the condenser shaft back and forth several times, at the same time moving back and forth the shield sections supporting condenser No. 3 until a spot is found where the condenser turns most freely. Hold the shield firmly in this position and retighten all screws in the shield mounting strips.

The cams for coils No. 2 and No. 3 should then be adjusted to their proper positions.

Shield section No. 2C may now be

erected and work started on the audio amplifier unit.

Mount the ten binding posts on the side of the sub panel having two counter-sunk holes. Between the A Batt. plus binding post and the panel place a soldering lug.

Next the three Amperites are mounted, first removing the screws and nuts from the Amperite mounting strips and substituting the six 5-8 x 4-36 round head screws provided in the Foundation Unit. These screws should be passed through the Amperite clip and the Amperite base strip and secured under the sub-panel by a nut under which is placed a soldering lug.

Sockets No. 4 and 5 (without bases) are now to be mounted. To mount them it is necessary to take them apart by removing the screw in the bottom part of the socket and pulling the two halves apart. The half with the springs is pushed up through the large hole in the sub panel and then the top half replaced so that the pin in the top section fits in the slot in the bottom section. The screw holding the halves together should then be replaced.

A soldering lug should be placed under the heads of the P terminal and the minus terminal screws of socket No. 5.

Next secure a soldering lug on the top side of the sub panel directly in front of Amperite No. 3. A soldering lug is also placed on the under side of the panel and held in place by the nut.

Then similarly attach soldering lugs to the hole on the edge of the panel near socket No. 4.

Now remove the screws from the .001 mfd. fixed condenser and fasten it to the under side of the sub panel. Soldering lugs should then be attached to each terminal of the condenser.

The transformers are then mounted with their terminals in the positions shown in the diagram.

All of the wiring now to be done takes place on the under side of the sub panel. These connections are clearly indicated on the picture diagram by broken lines. The connections represented by solid lines are not to be made until after the audio amplifier unit has been mounted in place.

When these connections have been made the audio unit which is ready to be mounted on the baseboard, and then the radio frequency and audio frequency ends of the receiver are to be hooked up.

End of wire from P of socket No. 3 to P of transformer No. 1.

End of wire from "plus" of socket No. 3 to "B" of Amperite No. 1.

Free end of wire from "B" of coil No. 3 to lug "B" on sub-panel.

Free end of wire from terminal B of coil No. 2 to soldering lug B on sub-panel.

The soldering lug on shield section No. 1 D to the soldering lug on the minus terminal of socket No. 5.

The soldering lug on the P terminal of socket No. 5 to the P terminal of the jack.

Terminal B of jack to 135 V plus Binding post.

Soldering lug on A plus binding post to terminal B of switch (the outer terminal).

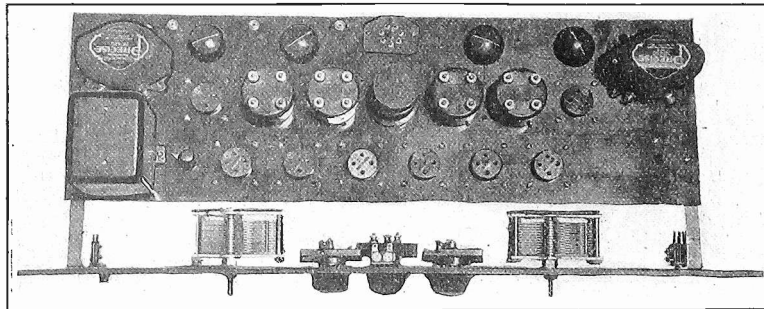
Terminal C of switch (near front panel) to soldering lug A on sub-panel.

Now that the assembly and wiring are completed the builder will do well to follow a systematic course of testing for even the most careful workman sometimes makes mistakes and a slight error in wiring may cause considerable damage. The following procedure is therefore recommended.

[Testing Data Next Week]

# The Eight Tube Lincoln

## Puts Regeneration Ahead of Super



HOW TO place parts for the Lincoln, is clearly viewed in the above photo. The large output choke is at the extreme left hand corner of the subpanel. The two AFT are at the extreme left and right hand corners of this panel.

*By Sidney Stack*  
Consulting Engineer

THERE are many features in a Super-Heterodyne such as the Lincoln which the uninitiated do not fully appreciate. A review of some of these will not be amiss. Let us first focus our attention on the oscillator. There are many types of oscillator circuits generally employed in Super-Heterodynes and one of the most successful is illustrated in this circuit. It is a modification of the Hartley oscillator so adapted that this circuit can be used on a common B battery.

In the first place there are two windings on the oscillator coil, one in the grid circuit and one in the plate. These two windings are bridged by condensers at both ends so as to form a single oscillator circuit. One of these condensers is a large by-pass condenser used to shunt the oscillating current around the batteries and thus remove the high resistance of these from the tuned circuit. This enables the tube to oscillate much more readily and localizes the oscillating current. The value of this condenser in the present circuit is .5 mfd., a value sufficiently high to accomplish the object.

The second condenser is in reality two condensers joined in series between the

grid and the plate of the tube. One of these condensers is the tuning or frequency determining condenser. Its value is .0005 mfd. The second condenser, the value of which is .006 mfd., is purely a protective device. It prevents a short circuit of the B battery in the event that the tuning condenser should become shorted as it us turned.

It will be observed that there is a 7½ volt grid bias battery in the grid circuit of the detector tube. This is used instead of the customary grid leak and blocking condenser to obtain the required grid bias on the detector. Some prefer to use one method of detection, others the second method. The present writer prefers to use the battery method of detecting or of modulating in the first detector in a Super-Heterodyne, for theoretical reasons.

Adequate volume control is of utmost importance in any receiver and particularly in a Super-Heterodyne. Therefore several methods have been incorporated in the Lincoln Super. The first is the small variable condenser C3 in the plate circuit of the first detector tube. That condenser feeds some of the radio frequency output of that tube back to the input side. In other words it is a regeneration control. Great variation in the sensitivity of the receiver is possible by

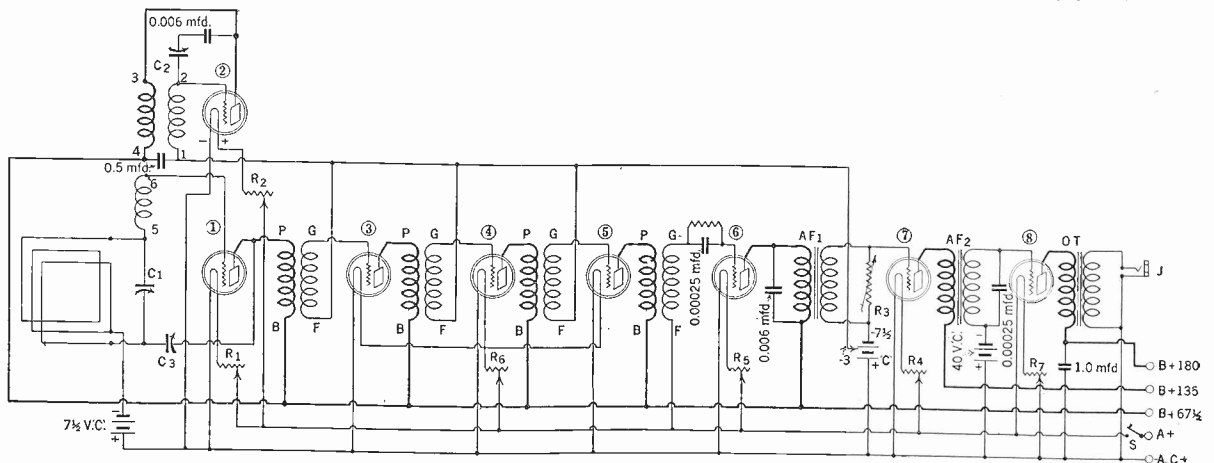
### LIST OF PARTS

- One Lincoln fixed Inductance.
- Four Lincoln long wave transformers.
- Two Precise audio frequency transformers (2½-to-1).
- One 221 Silver Marshall output transformer condenser.
- C1, C2, Two Precise variable condensers, .0005 mfd. capacity.
- C3, one Chelten midget variable condenser, No. 850.
- Two. 006 mfd. Tobe fixed condensers.
- One .00025 mfd. Tobe fixed mica condenser.
- One Tobe grid condenser, .00025 mfd.
- One Tobe .5 mfd. by-pass condenser.
- One Tobe 1 mfd. by-pass condenser.
- R1, R2, R4, R5, R7, five 20-ohm Yaxley rheostats.
- R3, one Centralab 200,000 ohm variable resistance.
- R6, a 6-ohm Yaxley rheostat.
- One Tobe Tipon grid leak, 2 meg.
- Two No. 801 National Velvet Vernier Type C dials.
- Eight No. 510 UX sockets, SM.
- One No. 660 Yaxley battery plug and cable.
- One No. 701 Yaxley single circuit jack.
- Three Yaxley pup jacks.
- One Yaxley filament switch.
- One Silver Marshall loop, with center tap.
- One 7x24" front panel.
- One 8x23" baseboard.

means of this midget condenser. And in addition to regeneration control there is a filament rheostat R1 in the first detector tube by means of which the detecting efficiency of the tube may be varied over wide limits.

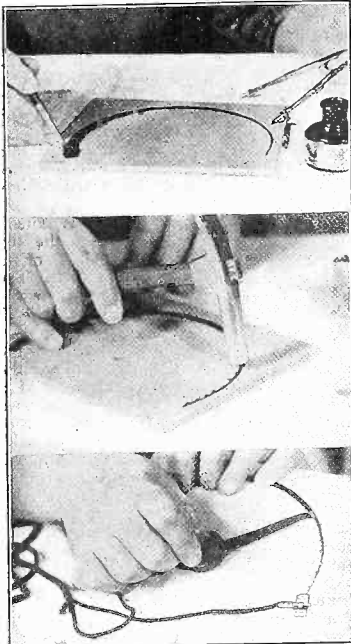
If the preceding two methods do not suffice for controlling the volume, there is in addition a rheostat R6 in the filament circuits of the intermediate frequency amplifier tubes, and yet another in the filament circuit of the second detector tube. These two rheostats may be employed for limiting the volume.

A fourth method of limiting the volume is provided in the variable resistance R3 which is connected across the secondary (Concluded on page 25)



THE SCHEMATIC wiring diagram of the Lincoln Super-Heterodyne.

## AUDIBILITY TEST



(Hayden)

**HOW to make a simple audibility meter is illustrated above and explained below.**

Draw circle 8" wide. The line should be drawn so that one end is about 3/8" wide, tapering down at the other end to a single line. This is shown in the photograph. Fill this in with several coats of India ink. Do not use ordinary ink, as the carbon in the India ink is necessary to the success of the device.

Hammer very small tacks in this line so as to make contact with the India ink line. Also connect a spring Binding Post to each end of the line for connection purposes.

A switch handle, secured to a thin piece of phosphor bronze strip, slides over these contacts in the manner of the old time inductance switches, to function in rheostat fashion. This switch blade is also connected to the India ink line at the right-hand terminal, as shown. The device is connected across the phones, and the switch arm adjusted until the signals are barely audible. In this condition removing tubes in use and inserting new ones gives idea of the sensitiveness of tubes, or in comparing speakers, or phones the same facility is afforded. If desired, the contacts can be numbered.

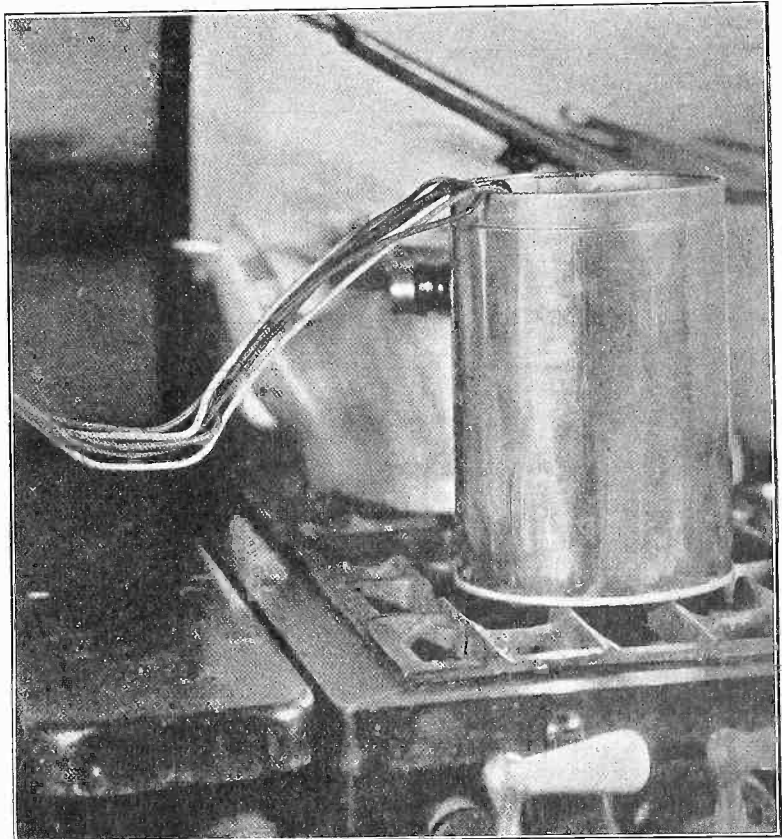
## BYPASS METER



(Hayden)

**WHEN USING a DC milliammeter to measure the drain of tubes, place a .001 mfd. fixed condenser across the meter posts, to bypass the RF current.**

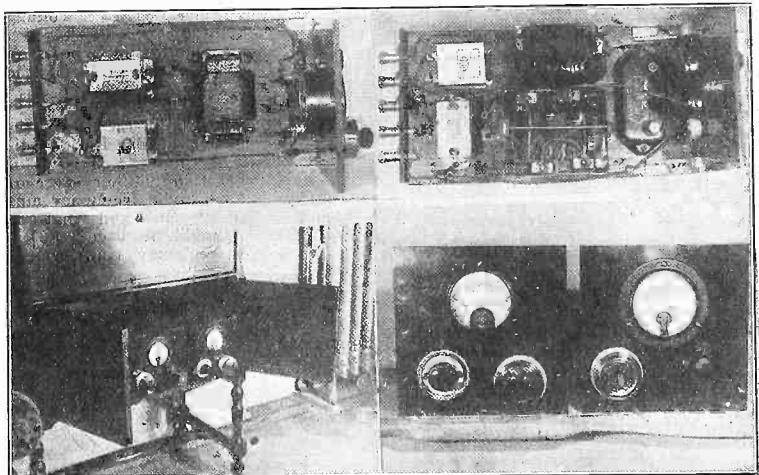
## REINFORCE THE BATTERY LEADS



(Hayden)

**THE INSULATION on the cable leads, which pass over the storage battery posts, may become corroded, due to the sprays emitted from the cells, during charging. This can be prevented by placing the cable leads in a can of molten paraffine. The paraffine will then reinforce the insulation.**

## BUILDING DC ELIMINATORS



(Hayden)

**HOW TO place the parts used in a DC A eliminator is shown in the photo in the upper left. How to place the parts for use in a DC B eliminator is shown in the upper right photo. A large current choke is used for the A filtering side while a regulation B eliminator choke is used in the B filtering side (both in series with the B plus line). Across the B plus and B minus leads, before and after the choke connections, three 2 mfd. fixed condensers are shunted. Variable and fixed resistances are used to obtain the B and A voltage. Voltmeters are shunted across the A and B output lines. The panel views of both eliminators is shown in the lower right photo. The combination eliminator being mounted in a console is shown in the lower left. Note the B batteries in the B eliminator, they being used to obtain a higher voltage for amplifier tubes, that is possible with the output itself. Larger voltages may be obtained with larger batteries, more space being allowed on the baseboard. For DC construction data see Dec. 4 issue.**

# Radio University

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When writing for information give your Radio University subscription number.

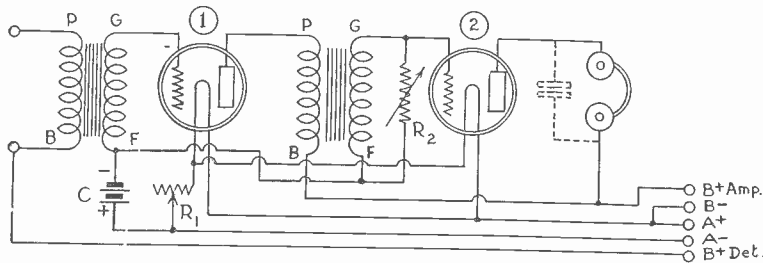


FIG. 480

THE CIRCUIT of a transformer coupled AF amplifier with a resistance across the secondary winding of the second AFT.

I HAVE an "Electrad" Audiohm, which I would like to connect in the audio amplifying circuit enclosed for controlling volume. Two -01A tubes are used. On the plates of both these tubes, 135 volts are applied, with a 9-volt C bias. A 10 ohm rheostat controls the filament temperatures of both AF tubes. Across the phones, I sometimes connect a .001 mfd. fixed condenser, as shown by the dotted lines.—Grayson Morton, Boston, Mass.

Fig. 480 shows the circuit diagram of your amplifier with the resistance installed across the secondary winding. It is indicated at R2.

\* \* \*

CAN TWO stages of resistance coupled audio frequency amplification be used after the first stage of transformer coupling, in the 4-tube receiver described on page 10 in the July 3 issue of Radio World, instead of the two stages of transformer coupling? (2) I have a unit, containing .1 megohm resistors in the plate circuits, a .5 megohm resistor in the first grid circuit and a .25 megohm resistor in the last grid circuit, with 25 mfd. fixed coupling condensers. Is this all right to use? (3) Is one terminal of a .1 megohm resistor connected to the plate post of the second tube socket, and the other terminal of the resistor connected to the B plus Amp. post? (4) Both filaments of a 10 ohm rheostat is connected in the unit. Is this for use with -01A tubes?—James Warren, N. Y.

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

\* \* \*

PLEASE SHOW how to place the parts for the Alden-Somerbridge set on the baseboard, shown in diagrammatic form in the Nov. 6 issue of Radio World.—William Mariet, Poughkeepsie, N. Y.

Fig. 481 shows how to place the various parts.

\* \* \*

IN THE Sept. 25 issue of Radio World, on page 13 there appeared a circuit diagram of a 7-tube receiver. I have two single .00035 mfd. variable condensers and a double .00035 mfd. variable condenser. Could I use these in this set, winding my own coils on 3" diameter tubing with No. 22 dcc wire? (2) What change will be necessary? (3) Could I use two stages of transformer coupled audio frequency amplification, instead of the resistance coupled audio? (4) How should I connect a double circuit jack at the detector output? (5) How should C batteries be connected to both grid return terminals of both AF tubes?—Paul Rothstein, L. I. City, N. Y.

(1) Yes. The primary of the antenna coupler contains 8 turns. The primaries of the other radio frequency transformers contain 16 turns. All the secondaries contain 59 turns. Each primary and secondary winding is made on a single tubing.

with a  $\frac{1}{4}$ " spacing between them. (2) Instead of connecting the grid returns of the three radio frequency transformers to the common rotor, run the grid return of the second RFT to the rotor section of the single condenser and the stationary plate section to the grid post and coil connection. You will then have single condensers in the antenna and the first and second RF stages. The double condenser will tune the third and detector stages. The rotary section of the double condenser is brought to the grid returns of the second and third radio frequency transformers. The first coil is referred to as an antenna coupler and not a radio frequency coil. The grid leak and condenser connections remain the same. (3) Yes, very satisfactorily. (4) The upper spring terminal is connected to the plate post of the detector tube socket. The bottom terminal is connected to the B plus detector voltage post. The top inner spring is connected to the P post on the audio frequency transformer. The third spring from the top spring is connected to the B plus post on the audio frequency transformer. (5) The C minus posts are connected to the F posts on the audio frequency transformers. The C voltage then flows through the secondary winding of the transformer to the G posts on the sockets and into the grids of the tubes.

\* \* \*

I WOULD like to build the 4-tube regenerative set shown in the Radio University columns of the Oct. 23 issue of Radio World. (1) Can another stage of transformer coupled audio frequency amplification be added? How and what ratio transformer should be used? (2) I have two radio frequency transformers

and 3-circuit tuner, which have 10 turn primaries and 44 turn secondaries wound on 3" diameter tubings; the tickler containing 40 turns, is wound on a  $1\frac{1}{4}$ " diameter tubing. The primary and secondary windings are wound with No. 22 double cotton covered wire. The tickler is wound with No. 30 single silk covered wire. Can these be used? (3) Will -01A type tubes work best throughout? (4) Can a single 10 ohm rheostat be used to control the filaments of the radio frequency amplifier tubes?—Howard Smithson, Atlanta, Ga.

(1) Yes. Use a 3 to 1 ratio AFT. The P on the AFT post is brought to the top terminal of the single circuit jack or to the P post of the last tube socket. The B post on the AFT is brought to the bottom terminal of the jack or to the B plus 3 post, alone. The G post on this AFT is brought to the G post on the fifth socket. The F minus terminal of the socket is brought to one terminal of a ballast resistor. The type of resistor used here is dependent upon the exact type of tube used, e. g., using a -01A tube, a 1A Amperite is used; using a 112 or 171, 112 Amperite is used, etc. The other terminal of this resistor is connected to the A minus post. The F plus post on this socket is brought to one terminal of the filament switch. The F post on the AFT is brought to C minus post. The plate post on this last socket is brought to the top terminal of a single circuit jack. The bottom terminal of this jack is brought to another B post. The voltage applied here, if a power tube is used, should be higher than for the other tubes. (2) Yes. The wiring of the antenna circuit is a bit different. That is, you have a coil, which has a separate primary and secondary winding, while the circuit diagram shows a single winding. Therefore this wiring data should be followed. The beginning of the primary winding should be brought to the antenna post. The end of this winding should be brought to the ground post. The beginning of the secondary winding should be brought to the A minus post. The end of this winding is brought to the G post on the socket. The rotary plate post of C1 is brought to the A minus, while the stationary plate post is brought to the G post of the socket. (3) Yes, except that you may use a power tube in the last stage. See the first answer. (4) Yes.

\* \* \*

MY FRIEND constructed the 6-tube receiver described by Lewis Winner in the Oct. 10 and 17 issues of Radio World and received such good results that I decided to build one myself. However I would like to use a power tube in the last stage so as to get louder signals. How could this be done? (2) I noticed that very often when listening to my friend's set the reception would stop and then

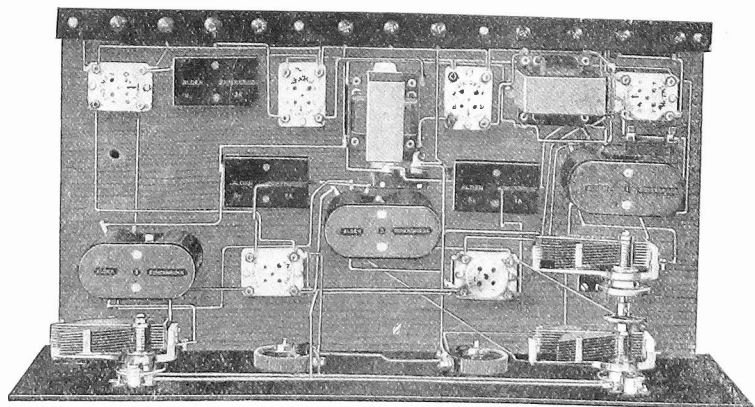


FIG. 481

The photo showing how to place the parts for the Alden-Somerbridge set.

come on again. It sounded like a choking effect. How can this be cured?—Bob Makley, Los Angeles, Cal.

(1) Break the B plus 3 lead so that one B voltage is applied to the plates of the first and second AF tubes only, while a separate B voltage is applied to the plate of the last tube. Instead of bringing the grid return of the last tube to the same C voltage bring it to a variable C portion or to a new battery entirely. Otherwise the circuit remains the same. (2) This can be cured by installing a Centralab 500,000 ohm variable high resistance in place of R8, which is shunted across the grid and filament circuits of the 5th tube. The resistance terminals are connected to C4 and C minus respectively, while the grid post of the 5th tube is brought to the arm of the high resistance. In other words the connection between the grid post and the resistance is broken, and brought to an arm of a variable control.

\* \* \*

**WHAT DIFFERENCE** is there between the receiver shown under Fig. 383, Radio University columns, July 24 issue of Radio World and the receiver shown under Fig. 459, Radio University columns, Nov. 13 issue of Radio World?—James Frunt, Monticello, N. Y.

In the Fig. 459 circuit, only one stage of tuned radio frequency amplification is used. Also a tube is used as a detector. In the Fig. 383 circuit diagram, two stages of tuned radio frequency amplification and a crystal detector is used. The similarity lies in the resistance coupled form of audio frequency amplification. The form of antenna input in both circuits is different, also. That is, in the Fig. 383 diagram, a continuous winding is used, while in the other, a separate primary and secondary winding is used. The results from the Fig. 383 receiver will be a bit better as to volume and DX.

\* \* \*

**CAN RESISTANCE** audio frequency coupling be used in the 5-tube receiver shown on page 9 of the July 17 issue of Radio World. (2) Can a ballast resistor of the 1/2 ampere type be used to control the filaments of the first two AF tubes of the high-mu type and another 1/2 ampere ballast resistor be used to control the filament of the last AF tube which will be a low-mu type?—Harry Streng, Roanoke, W. Va.

(1) Yes. (2) Yes.

\* \* \*

**HAS WFCI**, the Frank Crook, Inc., station located in Pawtucket, R. I., changed its wavelength? I don't hear them any more when I turn the dials to the point I formerly did.—Leslie Coles, Pawtucket, R. I.

Yes, they have changed their wavelength from 229 meters to 258.5 meters.

\* \* \*

**I HAVE** three variometers, all wound in this manner—72 turns on a 3" diameter stator and 56 turns on a 2 1/2" diameter rotor, No. 24 single silk covered wire being used in both cases. I would like to use these variometers in a 5-tube RF receiver. Please give the circuit diagram of such a receiver, showing the RF and Det. portion only, since I wish to add my own audio coupling. State the other constants.—Martin Merrill, N. Y.

Fig. 482 shows the circuit diagram of such a set. L2, L4 and L6 represent the variometers. They are used to tune the grid circuits. C1, C2 and C3 are .0005 mfd. fixed condensers, used for coupling. C4 is the .00025 mfd. grid condenser. R4 is a 3 megohm grid leak. C5 is a .001 mfd. fixed condenser. R5 is a 2000 ohm variable resistance, used for controlling B voltage. R1 and R2 are 10 ohm rheostats. R3 is a ballast resistance, of the 1/2 ampere (Amperite 1A). The detector plate voltage is obtained via the 6-volt storage battery, instead of the B battery. This prevents feedback through the batteries and uncontrollable oscillations. L1,

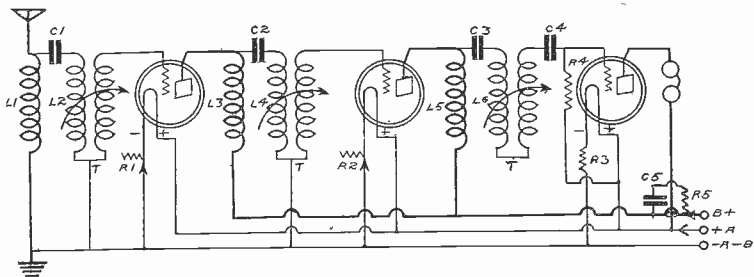


FIG. 482

The circuit diagram of the radio frequency and detector portion of the receiver requested by Martin Merrill.

L3 and L5 are 15 turn coils wound on 3" diameter tubings, with No. 22 double cotton covered wire. They are placed in magnetic relationship to variometers in the succeeding circuits. Use the -01A tubes throughout. A filament switch is inserted in series with the A plus lead, for cutting the battery in and out.

\* \* \*

**I HAVE** constructed the DC Eliminator described by Lewis Winner in the Dec. 4 issue of Radio World. When using the loud speaker, the results are great. However, when I hookup the phones, a slight hum is heard. It does not interfere with the reception, but it is annoying at times. Is there any way that it can be eliminated?—Richard Garrity, Sacramento, Cal.

The fixed condensers across the B plus and B minus lines should be tested. These condensers are very important, and a leaky or open one will cause the output to be irregular. Also the choke coil (30 henry type) may have a lower inductance than required. Another 30 or even 20 henry choke coil connected in series with the other choke (L1) and a 2 mfd. fixed condenser shunted across the B minus and B plus leads at this point should cure this trouble. In other words, instead of having one small choke, you use two small chokes and another large condenser.

\* \* \*

**CAN I** use Clarostats connected in series with the B plus line, in Winner's DC Eliminator, for variable B voltages instead of the fixed resistors?—Leonard Buck, Indianapolis, Ind.

Yes. Connect the resistance terminals to the main or maximum B plus line, running the posts connecting to the arms, to the output posts. Do not connect the variable resistance posts to the output posts of each preceding post. In this way, you will only be able to get a voltage no higher than that used by the preceding tube. Also, don't forget the bypass condensers across the B plus and minus line.

\* \* \*

**I HAVE** purchased a rotary snap switch, which has two input and two output lead connections. Do the output connections go to the line and the input connections to the fuses, the proper polarities being watched, of course in Winner's DC Eliminator?—Harry Wright, Bronx, N. Y. City.

Yes.

\* \* \*

**WHAT HAS** happened to WEBZ, the Savannah Radio Corp., of Savannah, Ga., broadcasting station?—Isaac Morton, Plainfield, N. J.

They have discontinued operation.

\* \* \*

**THE CIRCUIT** diagram, appearing under Fig. 1, in K. B. Humphrey's article in the Dec. 11 issue of Radio World, has attracted my attention and I would like to build the set. Now I have two tuned RFT, having 10 turn primaries and 44 turn secondaries wound on 3" diameter tubing, using No. 22 double cotton covered wire; two .0005 mfd. variable condensers; a 20 ohm rheostat; a 6 ohm rheostat and a 3-stage resistance coupled amplifier wired exactly the same as per diagram except that there are two B plus leads, one for the first and second AF tubes and another for the last AF tube. Can I use this apparatus in this set? It seems that I will only need a grid leak and condenser—Harrison Peak, Sawyer, Wis.

Yes, all the material you have can be used. You will need a 2 megohm leak; a .00025 mfd. fixed condenser and a .001 mfd. fixed condenser C4.

\* \* \*

**WHERE IS** station WAAD? (2)—By whom is it owned, on what wavelength in meters and frequency do they operate on and what power do they use? (3)—Is KZRG in the Philippine Islands? (4)—How much power do they use?—Charles Mechane, Dover, Del.

(1)—Cincinnati, O. (2)—It is operated by the Ohio Mechanics Institute, on a wavelength of 258 meters or 1160 kc. 25 watts. (3)—Yes. (4)—500 watts.

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## International Test Unlikely Next Year

WASHINGTON.

Arrangements for conducting a new series of overseas tests in connection with international radio week this winter have been temporarily abandoned. If tests are held at all early in 1927, it is believed likely they will be of the all-American type that marked the final days of the test week last winter.

The expense connected with the undertaking and the protests lodged last January by broadcasters on the Pacific Coast, who asserted their audiences were unable to share in the thrills of listening to European broadcasts because of their geographical location, are understood to be the chief reasons for the lack of enthusiasm over a repetition of the radio stunts.

It is even possible that the tests may be entirely discontinued, due to the growing importance of toll broadcasts and the unwillingness of many stations to cancel contracts with ether advertisers in order to maintain the silent periods necessary to the success of the undertaking. In cities on the Pacific Coast and in the Middle West these hours would fall in the heart of the evening programs.

## Doctor Expects 1929 Will Bring Television

CLEARMONT, Mo.

"I expect to see and hear by electricity the Presidential inauguration in 1929, even though I may be thousands of miles away from Washington," declares Dr. Gerald Wendt, director of the division of industrial research, Pennsylvania State College. He is foreseeing electrical advances that are sure to be made in the next few years by industrial research.

"Single pictures are already being sent across the sea," he points out.

"When a more sensitive photo-electric cell is developed, a picture will be transmitted as rapidly as the movie can flash it on the screen. In Washington during the ceremony, the microphone will have a 'microscope' alongside it and I shall be sitting in my own living room seeing and hearing the entire performance as if I were on the spot. Then we shall have radio movies for every home."

## Most Stations Sell Time On Air Now

Almost 75 per cent of the total amount of stations throughout the country are now selling advertising time on the air.

The recently organized National Broadcasting Company is leading the stations, charging the highest rate and selling the most time. Many stations are employing various members of the staff, including announcers, operators, managers, etc., to solicit accounts.

An owner of a recently built station announced that he intends to make the station pay during the following year, by charging an average fee of \$25 per hour. Setting a 1,000 hour goal, 3 hours a night, he should accumulate \$25,000, which with deductions for operating expenses, should provide him with enough money for a comfortable living. He, as well as others, claim that it will not be difficult to sell time at this rate or even at higher rates.

## New Station for 'Frisco

SAN FRANCISCO.

A broadcasting station of 1,000 watts is to be erected on the Clift Hotel in the near future, according to Vincent I. Kraft, manager of the Northwest Radio Service Company, operators of the Seattle station KJR. The station will be operated by the Pacific Broadcasting Company, an auxiliary organization of the Seattle concern, and will be another unit in a chain of five high-power stations to be erected in Seattle, Portland, Spokane, San Francisco and Los Angeles.

# The Person Of a Charmin

By Anne L. Lawless

WBZ-Boston, Hostess

BOSTON.

"How interesting and fascinating you must find your work, coming into contact with so many charming and talented people!"

Scarcely an evening passes that some artist or guest at the WBZ studio in the Hotel Brunswick does not make this remark to me. Beyond question, the work of the studio hostess is interesting and fascinating.

In my two years at the station I have found it very pleasant work although being a professional hostess is quite another matter from entertaining in my own home. At the studio I meet new people every day; at home, my guests are friends or acquaintances of long standing, with whom I have much in common. It is rarely, however, that a visitor to the station does not bring in a new thought, a new idea, or accomplishment. If one is interested in people and enjoys their company, it is not a task always to be pleasant.

### Need Diplomacy

Diplomacy and tact—veritable watchwords of the radio studio which a hostess must exercise constantly. That I had not realized my guests' identity was brought forcibly to me on one occasion.

A distinguished looking gentleman whom I presumed to be a guest of the hotel entered the studio one evening and asked if he might listen to the program. At the time it was coming from the hotel Kimball studio in Springfield. The artist's voice was soprano, and because of certain peculiarities of radio was unsuited for broadcasting. It is for this reason, you may know, that some prominent vocalists will not broadcast. Radio

does not deal with concert hall to s

One While the art nouncer walked and in the pre-guest, remarked not broadcast to prano had finish concluding one difficult operatic did that quite her previous one said. "I'm glad by my wife."

One evening scheduled to follow chorus was from and was made there were 25 m was necessary to of the studio, p and have them ready to commen brief interval of or other. The fa warmest evening help matters.

Charming peo retain their char 40, as in the cas to appreciate th some of the mos are not the mo and vice versa.

Much

Where there a temperament. Or ing woman who of songs asked broadcast. "It ca I replied with wh er amount of ent surprise when th eyes. "Is that all in an indignant to

## Lessons By Mail

### Supplement KGO

### 'Talks Over Radio

Speech and sound spread over a wide area by a broadcasting station are now to supplement education by correspondence which makes use of letters and printed instructions through the mail.

The first in a series of fifteen lessons to be broadcast by the University of California Extension Division, as a regular supplement of its correspondence work, will be given by Dr. Virgil Dickson, lecturer on education, Tuesday afternoon, January 11, at 5 o'clock, over KGO, General Electric Pacific Coast broadcaster.

The course will be on Mental Measurement. And pupils scattered over the West, in order to keep up with the radio talks, will have to prepare two assignments of the correspondence material each week.

Thirty correspondence assignments make up the course on Mental Measure-

ment by Dickson weekly radio talk two units of u course has been fornia State Boar tributing toward

According to Mental Measurem ther the teacher individual differer discovering them classification, (3) tion to meet ind

Doctor Dickson for his radio cla periments in con land Public Schoo the conditions of essary to properly radio with visual

The University sion Division has KGO microphone but their work, no way coordinat the Extension Di

Leon J. Richar sion work, is a n University Extens in charge of the making use of rad



# Adventures Studio Hostess

# Far North Hears American Programs

PITTSBURGH.

me justice as the  
voices.

**Break**

is singing, the an-  
the reception room  
of the gentlemen  
," "Her voice does  
ill." After the so-  
another selection, the  
er program and a  
I remarked, "She  
much better than  
ereupon my guest  
iked that selection

been told I have the voice of a night-  
ingale." She was so upset that she bluntly  
refused my offer of refreshments.

During the broadcast, the artists are  
as a general rule very composed and digni-  
fied. One exception to this occurred  
which caused considerable amusement in  
the studio, although the listener could  
not have appreciated it. Two of our  
younger artists were about to sing a duet  
from a Verdi opera. Being thoroughly  
acclimated to broadcasting, these young  
men had not the slightest trace of micro-  
phone fright. They felt, however, that to  
give the proper feeling and interpretation  
to this duet they should act it too.

**Spectacular Work**

Much to the astonishment of the guests,  
the announcer and myself, at the intro-  
duction of the number the baritone drop-  
ped to his knees before the microphone  
while the tenor stretched at full length,  
rested his head against his companion  
and began the opening lines, "Sollene in  
quest'ora" from "La Forza Del Destino."  
Whether the listening audience appre-  
ciated the action is problematical, but we  
in the studio have seldom heard anything  
to surpass this dramatic duet.

Even when the impromptu broadcast  
effect is desired, the artists conduct them-  
selves in a very serious and business-like  
manner before the mike. According to  
the fan mail, listeners are under the im-  
pression that the artists have a great  
deal of fun during such programs. In  
reality, however, the entertainers are fol-  
lowing a well defined plan which is re-  
hearsed many times before the perform-  
ers go on the air.

It is only after the "mikes" are shut off  
that the artists relax. They group around  
the piano to discuss the compositions of  
this or that composer, striking chords  
or singing snatches of one song or an-  
other to illustrate their points. It is then  
that one hears the latest song news.

and program was  
thor number. The  
ending Boston church  
s 30 or 40 people;  
is in the band. It  
ie entire choir out  
airs for the band  
ated in the studio  
eir program in the  
ia from something  
it was one of the  
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twos and three  
in groups of 30 or  
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arm. Incidentally,  
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standing in talent

**Program**

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in say?" she asked  
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aim, and will yield  
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owed by the Cali-  
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teacher's credential.  
on, the course in  
designed to fur-  
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and the means of  
best methods of  
agation of instruc-  
needs.

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e is familiar with  
roadcasting nec-  
ordinate sound over  
ads of instruction.  
California Exten-  
speakers to the  
over two years,  
ore, has been in  
the activities of

director of exten-  
of the National  
association, and is  
city's new venture  
increase its range.

The radio program has entered Greenland! The special  
broadcasts transmitted to the Far North every Winter by the  
four Westinghouse stations have penetrated the atmospheric  
veil overhanging the frozen north and have taken to the  
isolated residents a new form of Winter cheer and enter-  
tainment.

Cable and wireless brought the message from Godhaven,  
Greenland, that the program of November 20 from station  
KDKA, Pittsburgh, had been received in entirety and in fine  
condition. No posted word, however, from most of the remote  
points for which the broadcasts were inaugurated will be  
had until next Summer, with the arrival of the few weeks  
of navigation during the short warm season. The four sta-  
tions, KDKA; KYW, Chicago; KFKX, Hastings, Neb., and  
WBZ, Springfield, Mass., have transmitted one program of  
the scheduled four apiece.

**Greet Consuls**

KDKA'S reception was reported by the government agent  
at Godhaven, and by Dr. Morten Porsild, Danish scientist  
stationed there. They sent greetings to the Danish consuls  
general at New York and Montreal, and Dr. Porsild acknowl-  
edged receipt of messages from his two sons, who are in the  
western part of Canadian Northwest Territory, conducting a  
botanical exploration for the Canadian government.

They have kept their father apprised of their movements  
from time to time through the medium of KDKA's trans-  
missions.

It is the first time in radio history that a whole program  
has been received in Greenland. The program included many  
messages of a personal nature, for transmission on voice and  
telegraph waves to isolated traders and trappers in the north  
country, who could not otherwise have communicated with  
the outside world during the long wintry months.

**Trappers Equipped**

A number of settlements, stations of the Royal Canadian  
Mounted Police and trading posts of Revillon Freres and the  
Hudson's Bay Company have receiving equipment of some  
kind. Until KDKA, and finally all of the Westinghouse sta-  
tions, commenced the special Arctic programs, what little  
aerial communication there was had to be conducted on short-  
wave telegraph. The messages sent along with the programs  
were all repeated on short-wave telegraph from KDKA. In  
addition this station transmitted on 63 meter wave simul-  
taneously with the general broadcast on 309 meters.

Station KYW will go on the air next with an Arctic  
program, on December 18. KFKX will follow on Christmas  
eve, and KDKA on the night of Christmas. WBZ, which  
finished the first cycle of programs just one week ago, will  
again be heard on the night of January 1.

**A Great Boon**

The reception of programs from the United States and  
Canada brings such great joy to the listeners in the frozen  
fastnesses that they send long letters of appreciation to  
stations. These letters sometimes arrive six months or more  
after the reception of the program.

Canadian stations received several such letters from mission-  
aries last summer.

## Listeners' Club Holds Meetings Via Microphone

In the interests of the broadcast listen-  
er, from the viewpoint of education and  
advice, The Pittsburgh Post Home Radio  
Club was organized by James W. H.  
Weir, radio editor.

The features are weekly meetings held  
over KDKA, comprised of lectures and  
discussions, non-technical in nature, on  
pertinent radio topics. These talks will  
be supplemented with printed information  
on the various subjects discussed, and  
mailed to each certified club member free  
of charge, upon request.

The Certificate of Membership issued  
to those fulfilling the conditions of mem-  
bership is one of artistic merit, suitable  
for framing and appropriate enough to  
adorn your radio room. The membership  
is open to all and will be international in  
scope. It is a pioneer move to group the  
broadcast listener under one head for the  
betterment of radio reception. Full details  
will be mailed upon request.

## Western New York Listeners Incorporate

BUFFALO, N. Y.

Incorporation of the Radio Listeners' League of Western  
New York was authorized by Justice Noonan recently. It  
creates an association of radio users who will endeavor to  
reduce interference in broadcasting, improve radio programs  
and will work for legislation to forward the betterment of  
radio.

The association was organized informally a short time ago  
when the argument was heated over the Churchill Tabernacle  
broadcasting station interfering with other radio stations.

Directors are: Howard J. Smith, Alan R. Ferguson, William  
J. Clements, Walter P. Wells, John R. Briem, Robert F. Schel-  
ling, Wilmont A. Webb, M. M. Clements, C. R. Ferguson,  
Victor Johnson, Henry R. Ernst, Raymond V. Windrath, D. F.  
Burdick, W. Layland and Charles F. Moore.

**A THOUGHT FOR THE WEEK**

Radio has reached the stage where it is regarded by various people as a science, a business, an entertainment, and by many as a mystery. Let us hope it will not also become a pest—which thought is directed at those who use their sets as if there were no other radioists in the world. Get all you can out of your set, but remember that you are not the only one entitled to the privileges of the air. Liberty does not mean license.

**RADIO WORLD**  
REG. U.S. PAT. OFF.

The First and Only National Radio Weekly

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

TELEPHONE BRYANT 0558, 0559  
PUBLISHED EVERY WEDNESDAY  
(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.

**ADVERTISING RATES**

General Advertising

1/2 Page, 7 1/4"x11"	462 lines.....	\$300.00
1/2 Page, 7 1/2"x7 1/2"	231 lines.....	150.00
1/4 Page, 3 1/2" D. C.	231 lines.....	150.00
1/4 Page, 4 1/2" D. C.	115 lines.....	75.00
1 Column, 2 3/4"x11"	154 lines.....	100.00
1 Inch.....		10.00
Per Agate Line.....		.75
<b>Time Discount</b>		
52 consecutive issues.....		20%
26 times consecutively or E. O. W. one year..		15%
4 consecutive issues.....		10%

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

**CLASSIFIED ADVERTISEMENTS**

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

Entered as second-class matter March 23, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879.

**POWER TROUBLE CURED;  
RECEIVER OWNERS REJOICE  
TOLEDO, O.**

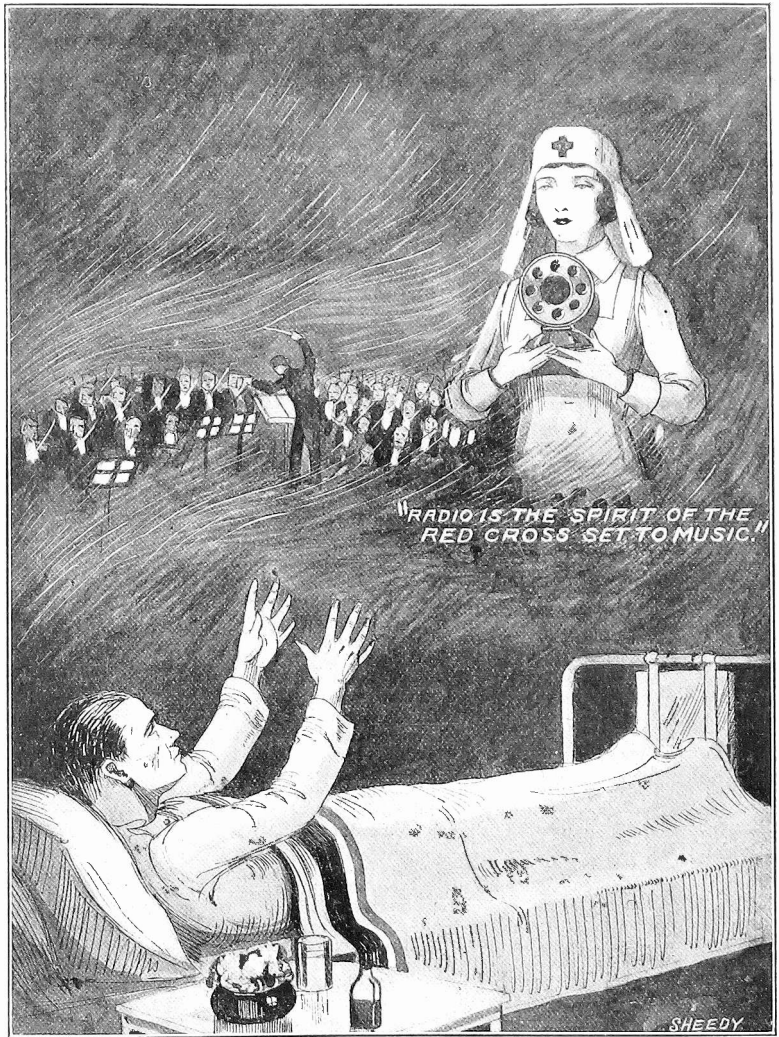
The Service Department of the Aitken Radio Co., is the recipient of a congratulatory letter from the Peoples Hardware Co., Delta, O.

Radio reception was bad in the town and the Aitken company was appealed to. An arrester leak in a 23,000 volt high tension line owned by the Lake Shore Power Co., was discovered. The trouble was corrected to the joy of set owners in and around Delta.

**WAAT ON AIR AGAIN  
BAYONNE, N. J.**

WAAT, located in the Plaza Hotel, Jersey City, recently opened its new station with an elaborate musical program, interspersed with speeches by men prominent in the social and business life of that city. The station is controlled by the Bremer Radio Corporation, named after Frank V. Bremer, who used WAAT early in 1921, but who discontinued it until its re-opening.

**THE ANGEL OF MERCY**



"RADIO enters the sickroom to cheer the suffering patient. It brings the orchestra to the helpless cripple and stirs anew in any invalid the confidence that life is worth the living. Radio is an angel of mercy, the spirit of the Red Cross set to music."

**Coolidge Message  
Asks Legislation**

President Coolidge, in his message to Congress, urged that legislation be enacted to cure the "chaos" on the air. He favored a board with judicial powers, but under administration of the Department of Commerce. The President said:

"Due to decisions of the courts, the authority of the Department under the law of 1912 has broken down; many more stations have been operated than can be accommodated within the limited number of wavelengths available; further stations are in course of construction; many stations have departed from the scheme of allocation set down by the department, and the whole service of this most important function has drifted into such chaos as seems likely, if not remedied, to destroy its great value. I most urgently recommend that this legislation should be speedily enacted.

"I do not believe it is desirable to set up further independent agencies in the Government. Rather, I believe it advis-

able to entrust the important functions of deciding who shall exercise the privilege of radio transmission and under what conditions, the assigning of wavelengths and determination of power, to a board to be assembled whenever action on such questions becomes necessary. There should be right of appeal to the courts from the decisions of such board. The administration of the decisions of the Board and other features of regulation and promotion of radio in the public interest, together with scientific research, should remain in the Department of Commerce. Such an arrangement makes for more expert, more efficient, and more economical administration than an independent agency or board, whose duties, after initial stages, require but little attention, in which administrative functions are confused with semi-judicial functions and from which of necessity there must be greatly increased personnel and expenditure."

# SMALL STATIONS KICK UP A FUSS

## Threaten Bitter Fight on Proposal of Co-ordinating Committee to Curb Broadcasters Pending Legislation

WASHINGTON

A fight of serious proportions is expected to result from the report of the National Radio Coordinating Committee making recommendations as to the form legislation should take. The belief predominates that while most of the large broadcasting stations will support the committee, many of the smaller ones will oppose it. Another ground for dissension will be that the recommendations favor the "ins" and make it difficult for the "outs" to break into the broadcasting field.

The Coordinating Committee conferred in Washington for nearly four days. A report was drawn up which was formally transmitted to members of the House and Senate.

### Signatories of Report

The report was signed by Walter A. Strong, chairman of the radio committee of the American Newspaper Publishers Association; Paul B. Klugh, Executive Secretary of the National Association of Broadcasters; Arthur T. Haugh, President of the Radio Manufacturers' Association; R. W. De Mott, President of the Radio Magazine Publishers' Association; Louis B. F. Raycroft, Chairman, Radio Section, National Electrical Manufacturers' Association; Charles H. Stewart, Vice President American Radio Relay League; Harold J. Wrape, President Federated Radio Trades Association, and Elisha Hanson, Counsel, Newspaper Broadcasters' Committee.

Most important of the conclusions of the Committee was that radio control be placed in the Department of Commerce with a Federal Radio Commission with appellate powers to review appeals. In this and many other provisions, the Committee went on record as favoring the White Bill with some changes.

As a check measure, the Committee recommended the enactment of an emergency measure which would prohibit the issuance of any more broadcasting licenses.

### Injury Impends

Unless immediate steps are taken by Congress to prevent confusion in the air, the radio listening public, together with its large investment in radio, is likely to suffer a tremendous injury, the report says. Fearing that further delay in legislation will jeopardize a national industry involving \$600,000,000 a year, the Committee says that it went to work to co-ordinate the industry on a bill.

The committee recommended that the law should give broadcasters clearly defined rights as against other broadcasters, but that a broadcaster should have no vested rights as against the United States Government. The allocation and use of wavelengths, the use of wavelengths should be determined by: length of time they have been in service, the character of the service they render, and the requirements of their zones and communities.

The Committee recommends that li-

censes be granted for a period of not less than five years.

### Offers Assistance

The reports objects to the clause in the Dill bill which prohibits the sale of a station at a greater price than that paid for it. It is also urged that the law specify that stations shall not be deprived of licenses until actually convicted in the Courts.

The Committee went on record as opposing Government operation of commercial stations except in cases where no other facilities are available to the public.

In making its report to Congress, the Committee says:

"These views are the result of a very careful study of the problems not only confronting the industry, but confronting you as the men who are immediately responsible for the legislation. We submit these views with the knowledge that they express the attitude of the radio industry and the radio public on the vital matters which are before you, and in the hope that they may be of material assistance to you in your consideration of legislation.

"If this Committee, which is truly and wholly representative of radio in America, can be of assistance to the members of the Conference Committee of the Senate and the House, we are at your service."

## White Radio Bill Favored By Tilson

WASHINGTON.

Representative Tilson (Rep.), of New Haven, Conn., majority leader of the House of Representatives, said:

"I feel that it is important to get some action on regulation of radio transmission in this country and the handling of the radio problem along the lines of the bill of Representative White (Rep.), of Augusta, Me., which passed the House at the last session.

"The bill went over to the Senate where it was amended and the whole matter is now in conference between the two houses. I feel that the essential provisions for the solution of the problem, which is of great importance to the country, are in the White bill and I hope that that measure will prevail finally."

### LEGISLATIVE PLAN DELAYED IN CONGRESS

WASHINGTON.

Radio bills will not be taken up in conference between the Senate and House until well after Congress convenes, according to Representative Wallace White, author of the White bill. Meanwhile, Mr. White is holding a series of informal conferences with Senator C. C. Dill, author of the Dill bill, and they hope to be able to place something definite in the way of a compromise before the Conference Committee when it meets.

## Too Many Stations, Carson's View, Too

WASHINGTON.

Although broadcasting may be bad during the coming Winter because of the absence of adequate radio laws, continued growth in the use of and improved radio service to the public are forecast by D. B. Carson, Commissioner of the Bureau of Navigation of the Department of Commerce. Under the 1912 law, the radio enforcement section is in the Bureau of Navigation.

Commissioner Carson points out that there are at present entirely too many stations on the air for satisfactory operation and something must be done before normal reception can be expected. He does not attempt to say how many stations can be operated or how they may be limited. That, he declares, is a function of Congress.

## New Code Needed, Hoover Declares

A new code, designed to determine public interest in broadcasting and reception, will have to be created by whatever agency Congress places in control of radio development, Secretary Hoover announced.

Radio broadcasting stations of today, Mr. Hoover said, virtually constitute commercial businesses, and a standard will have to be established for judging the value to the public interest of radio stations now existing or to be established.

The question of priority rights of broadcasting stations, Mr. Hoover explained, is one that must be determined, not alone by age of service, but also by public interest. Both bills before Congress for regulation of radio provide that public interest should be the determining factor in all decisions.

## Four New Stations Begin to Transmit

WASHINGTON.

Four new stations have been licensed by the Department of Commerce, one of which is of sufficient power to interfere. The station in question is WWPR, Detroit, which will operate on 300 meters with 500 watts. Four stations also reported having changed their wavelengths.

### NEW STATIONS

WWPR—Police Department, Detroit, 300 m., 999.4 kc., 500 watts.

KGDO—Henry Garrett, Dallas, Texas, 285 m., 1052 kc., 100 watts.

KXL Broadcasters, Portland, Ore., 400 m., 749.6 kc., 50 watts.

WLCI—Lutheran Ass'n, Ithaca, N. Y., 266 m., 1127 kc., 50 watts.

### WAVELENGTH CHANGES

WFCl—Pawtucket, R. I. from 229 to 258.5 m.

KWTC—Santa Ana, Calif., from 260.7 to 263 m.

KRLD—Dallas, Texas, from 357.1 to 353 m.

KSBA—Shreveport, La., from 312.6 to 260.7 m.

A fifty watter at Savannah, Ga., is reported as having discontinued operation. The call of the station is WEBZ and it operated on 263 meters.

## THE RADIO TRADE

# CONSOLE TREND GROWS LIVELIER

### Still Good Sale of Table Models—Powered Receivers in Demand, Too, Due to Push-the-Button Pentant

The trend of radio affairs seems to be in the direction of tuned radio-frequency models having two and in some cases three stages of radio-frequency amplification with detector and ordinarily two stages of audio-frequency amplification.

Much development has been made during the past year or two along the lines of improvement in the audio-frequency amplification end of the receiver through the use of power tubes in the output stage or stages. The fact that power tubes are necessary in order to prevent distortion where smaller tubes are over-loaded is now well recognized and the power tubes form an essential part of the modern receiving set.

The trend in cabinet design is decidedly toward the console models although there is still a very large volume of sales in the table types. The indication now is that the public has come to

regard radio as a permanent fixture in the home and therefore feels that the receiving set should be properly housed in its own individual cabinet of the console or furniture type.

#### The Power Idea

Another very definite trend is toward the elimination of batteries through the use of power units which take the current directly from the light socket and make it suitable for use as A, B, and C battery current. Without question the trend in this direction is growing very rapidly wherever power is available. Another year will see the most tremendous development along this line, probably obsoleting many thousands of receivers of the battery type. The advantages of being able to press a button and have an unfailing supply of current available at any time is eliminating the difficulties of

worn out or run down batteries and the necessity for recharging batteries, which is a considerable problem in the hands of the layman.

The ban of wavelengths assigned in the United States to broadcasting ranging from 200 to 545 meters is now definitely inadequate to take care of the large number of stations that have already been established. More than 500 stations, with hundreds more contemplated, are now endeavoring to use some eighty-eight channels separated by ten kilocycles. The result is a chaotic condition only relieved by the fact that in any location it is always possible to receive several of the higher powered stations without severe heterodyning or interference.

#### Too Many Whistles

However, any night now, any place in the United States, the majority of the lines on the dial will bring in nothing but heterodyne whistles. This is a condition that should be corrected but which requires legislation. Many of the broadcasting stations that are now occupying the present band will necessarily have to discontinue or will have to be assigned wave lengths in a new band of frequencies undoubtedly below 200 meters.

It seems only fair that the pioneer broadcasters should be entitled to the use of wavelengths that they have prospected and developed according to Powel Crossley, Jr., and that newcomers should be compelled to develop new wavelengths with the idea that if the broadcasting on the new wavelengths justifies the public in purchasing apparatus to receive their programs, such apparatus will be made available by the manufacturers. With some sets this might entail quite a change.

## Splitdorf Increases Radio Activities

A policy of intensive development of the radio branch of the business was announced by the Splitdorf Electrical Company following a recent meeting of the Board of Directors, at which E. H. Schwab was elected president of the company, succeeding M. W. Bartlett, who has retired from the business.

Mr. Schwab has been chairman of the Splitdorf board since 1924, and will continue in that capacity. He was formerly president of the Bethlehem Spark Plug Company, which united with the Splitdorf interests two years ago, and is a brother of Charles M. Schwab, chairman of the Bethlehem Steel Corporation, who is also a member of the Splitdorf board.

Indicating the company's policy for the future, Mr. Schwab made the following statement at the company's offices in Newark, N. J.:

"As one of the oldest electrical concerns in the country, the Splitdorf Electrical Company was naturally interested in radio from the beginning, and has played an active part in its development. In addition to making our own Splitdorf set, we are today manufacturing parts for several other well-known sets. We believe in the future of radio, and we intend to share in its further development to an increasing extent.

"Being one of the few companies manufacturing complete sets from the raw materials to the finished product, we are fortunately placed with respect to radio, because we can control our inventories, maintain uniformity in production and be independent of outside supply of parts. We have the further important advantage that during the off-season, our complete experimental, manufacturing and distributing facilities in the radio division can be easily diverted to the home electric

and automotive demands of the business. The radio industry has been unfortunately hampered in the past by conflicting patent rights and other difficulties not unusual in a new industry. As one of the larger factors in the industry we were singled out by the Radio Corporation of America for legal proceedings in the matter of patent rights, and we welcomed the suit now in the appeal courts as a means of clarifying that vexing situation. The industry as a whole will be on a sounder basis when this question is finally settled.

"I cannot say more about our plans at the moment, except that we intend to promote the radio end of our business to the fullest extent."

Confirmation of the announcement that radio will take a position of first importance in the affairs of the Splitdorf Company was forthcoming in the appointment of R. W. Porter, former radio sales manager, as General Sales Manager. He will direct the sales and advertising of all branches of the business, including radio.

Mr. Porter is widely known as a sales executive in the field of musical instruments for home entertainment, and was previously associated with the Columbia Phonograph Company, the R. E. Thompson Manufacturing Company, and at one time with the Winchester Repeating Arms Company. In line with the Company's new program of expansion, Mr. Porter will devote much of his time to the co-operative work of retailer merchandising.

### SET NEEDED IN HOME, DUE TO FINE PROGRAMS TOLEDO.

The rapid advances made by the radio manufacturers and the big broadcasting stations in putting on the best of programs have made a truly good radio set a very definite piece of "home equipment" in every modern home, says I. J. Shelley, manager of the King Furniture Co.

## October Showed Drop in Business

Retail trade in October in nearly all lines of business showed a slight diminution in volume as compared with the same month last year, according to a survey just completed by the Federal Reserve Board. The survey revealed there had been a seasonal increase in the volume of retail sales from September, but that the growth was not as great as was the increase from September to October last year.

Department store sales generally were smaller, the Board said, basing its view on reports from all sections of the country. Unfavorable weather conditions, it was suggested, had perhaps worked to reduce the volume of business to some extent. Mail order sales apparently dropped off in about the same proportion as did department store selling, according to the reports.

Radio was not one of the branches included in the report.

## Cabinets Ordered In Brisk Fashion

WARREN, Pa.

Many furniture concerns have been awarded contracts for supplying some of the largest radio concerns in the United States with finished cabinets and material for them. Shipments are now being made daily by the local firms in preparation for the winter rush season. The Warren Furniture Co. is one of them.

Even veneer manufacturing concerns are also kept busy supplying material for radio cabinet construction. Officials state that practically half of their output goes to cabinet manufacturers.

## Four Homes Used For Demonstration of Sets By Dealer

DALLAS.

The traditional method of demonstrating radio sets in the home has been broken by S. H. Lynch manager of the Edison Shop, Dallas radio dealers.

For the convenience of patrons and for the sake of economy, Mr. Lynch conceived and put into operation a plan of radio demonstration that not only is novel but also is said to have proven decidedly effective.

Four "ideal radio homes" have been equipped with radio sets in four sections of the city. One, the most elaborate, is in Greeland Hills. One is in Oak Lawn and two are in Oak Cliff.

Instead of going to the prospective owner's house and installing temporarily a radio set of only one type or model the salesman takes the prospect to the nearest of the homes or arranges to meet him there at a certain hour during the evening. Every model radio set handled by Mr. Lynch is hooked up ready to turn on. There is no delay of erecting an antenna, fixing a ground and connecting batteries.

With the wide variety of models before him the customer can pick out the kind of set he desires and the one best fitted for his pocketbook, Mr. Lynch said.

Radio engineers have erected the antennas for the homes and established perfect grounds. The radio sets are hooked up permanently and scientifically, just as they will be in the home of the customers after the sales.

## Trade Association Formed in Spokane

SPOKANE, Wash.

Organization of the Spokane Radio Trades Association was effected recently at the Davenport Hotel when a group of radio jobbers and dealers got together under the guidance of George H. Thompson, secretary of a similar body in Portland.

C. W. Bell, head of the radio department of the Sherman-Clay company, was elected president; L. F. Olney of the Stewart-Warner Products Company was named vice president and C. E. Frazier of the Interstate Radio Company was elected secretary treasurer.

The board of directors consists of N. P. Rich of Tull & Bibbs, T. Farbro of the Crescent, William E. Chase and A. M. Oldershaw of the Inland Battery Company.

"There is no reason why you Spokane jobbers and dealers can not put on a radio show here next year that will bring nationally advertised products here for display," declared Mr. Thompson, in outlining plans of the association and its activities.

## Sears Develops Five Tube Set

Lieutenant Sterling G. Sears, United States Naval Reserve, well-known as a pioneer in radio research and for several previous radio achievements, has perfected a fine new five tube receiver said to improve home reception about 100 per cent. Due to special features devised by Lieut. Sears and improvements of his own, this set is extraordinary selective and powerful, easy to operate and eco-

nomical on battery consumption, the draw being very low.

It embodies among other features, one stage of radio frequency amplification, which through special design, is equal to two, remarkably sensitive detector, one stage of transformer and two stages of resistance coupled. The tone quality is marvelously life-like with natural reproduction of all tone frequencies. The set is being merchandised in a solid mahogany cabinet at a price less than the cost of the parts therein by the Naylor Radio Corp., 161 Chambers Street, New York City. This concern has a new and novel sales plan which will be sent to all who write for it.

## Federal and Brandes Merger Is Announced

TOLEDO.

Two of the oldest radio companies in this country, the Federal Telegraph Co., California, founded in 1911, and the Brandes Products Corporation, founded in 1908, announce the completion of a merger under the name of Federal-Brandes, Inc., with an authorized capitalization of \$10,000,000. Both companies are pioneers in their respective fields of commercial radio communication and radio acoustics.

Headquarters of the new corporation are located in the Hobart building, San Francisco, with five plants manufacturing radio equipment at Newark, N. J.; Palo Alto, Calif.; Toronto, Canada, and Slough, England.

## Kits Keep Apace of Big Sale of Sets

CLEVELAND.

Has the greatly increased sale of factory built radio receivers had any effect on the demand for kits and instruments which can be assembled and wired at home? This question was put to D. J. Vogt, head of a radio company which bears his name.

He replied:

"There is more demand for dependable kits than ever before. There's plenty of business for both sets and kits and they don't compete with each other."

## STORE CHANGES HANDS

NEW BREMEN, O.

Another business change was effected in New Bremen recently, when Paul Gilbert and Earl Hegemeier, well known radio men, became the sole owners of the radio store operated in recent years by I. J. Speckman & Company. A large stock of radios and accessories has been bought. The store is to be known in the future as the Peoples Radio and Gift Shop.

## FIRE IN DAVEN PLANT

NEWARK, N. J.

An overheated tub, used for drying purposes, started a small fire recently in the Daven Radio Company factory, here. The loss was confined to a batch of resistance couplers, which were in the receptacle being dried. A fire was left burning under the tub.

## NEW CORPORATIONS

Salt Lake Radio and Manufacturing Company, Salt Lake, Utah, \$75,000; 75,000 shares. Directors: Ross S. Lund, president; George A. Wootton, vice-president; George A. Amussen, treasurer; Fred Pepper, secretary; Andrew T. Clark, Louis K. Falckand, D. A. Wootton, Vivian Lund Roberts. (Incorporated under the laws of Utah). Service Radio, Salem, Oregon, \$2,500, general radio repair and supply business; E. D. Suitor, F. A. Rogers, Dana J. Kenney, Portland, Ore. Atty., Dan J. Kenney, 305 Western Bond Company, Portland, Oregon. (Incorporated under the laws of Oregon).

## 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.

RADIO WORLD,

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

I desire to receive radio literature

Name .....

Address .....

City or town.....

State .....

Harry Hohenstein, 99 Simonson Place, Port Richmond, Staten Island, N. Y.

Eddie Edwards, 1922 N. W. 5th Place, Miami, Fla.

Geo. B. Gibney, 663 Mohawk Ave., Norwood Station, Pa.

W. G. Van Earcom, 826 West Main St., Lansing, Mich.

James Pearson, 172 West Meller Ave., Akron, Ohio.

R. A. Phillips, 200 Altamont Ave., Schenectady, N. Y.

Thomas A. Melton, 701 Cherry St., Chattanooga, Tenn.

John Covill, Route 5, Box 125, Danbury, Conn.

William Kersting, 128 Hinrod St., Brooklyn, N. Y.

John R. Gimes, Box 593 Ft. Landerdale, Fla.

H. W. Carlie, 1465 Laurel Ave., St. Paul, Minn.

James Muirhead, 22 McDougall Ave., Jersey City, N. J.

James Langford, Box 1507, Lakeland, Fla.

C. N. Walker, 1043 48th St., Oakland, Cal.

W. L. Moss, 1511 Pearl, Joplin, Mo.

A. B. Moses, Boyce, La.

L. J. McGee, Box 127, Sunset Heights, Tex.

Wayne H. Foley, 1010 West Wood St., Bloomington, Ill.

J. F. MacKinnon, 37 Fleet St., Moncton, N. B.

Melvin Schulz, 4486 25th St., Detroit, Mich.

W. G. Armes, Box 640, Motor Route 10, Sacramento, Cal.

A. G. Carroll, Box 145, Capital Hill Station, Oklahoma City, Okla.

G. D. Freeland, Dawes, W. Va.

M. Charles Paul, 161 Prospect St., Bristol, Conn.

W. R. Westcott, 128 Biddle St., Kane, Pa.

Leslie M. Royers, 67 Richmond Ave., Mt. Sterling, Ky.

Frank T. Doeing, 1236 Cornell Ave., Berkeley, Cal.

Myron Turner, 1825 South Pasfield St., Springfield, Ill.

Melvin Schulz, 4486 25th St., Detroit, Mich.

A. J. Johnson, 1633 West I. St., Forrest City, Ia. (Dealer).

Frank Coupal, Brebeuf, Co. Terrebonne, Quebec, Canada.

H. E. Paynter, 916 Macadam St., Chester, Pa.

S. A. Larson, 1001 East 76th Place, Los Angeles, Cal.

John Mitchell, 5352 North Naterloo, Philadelphia, Pa.

Harry Stahl, 4067 Oakland Crescent, Chicago, Ill.

Elton A. Parent, 37 Church St., Mittineage, Mass.

J. H. Black, 3409 43d St., Sacramento, Cal.

Anthony Peters, Box 162, Scotch Plains, New Jersey, N. J.

W. C. Hess, Margaret, Ala.

Chas. W. Hallowell, 2909 Zorkship Road, Camden, N. J.

## MIDDLE WEST INTEREST IN RADIO RUNS HIGH DENVER.

A merchandising survey conducted by statisticians shows a greater interest in radio in proportion to population in the Middle West than in any other part of the country. This is believed to be explained by the interest of farmers in receiving market quotations and weather reports. While city fans consider their radio sets as valuable means of entertainment, many farmers feel that the radio is indispensable to them in the conduct of their business.

## RADIO MEN OPEN STORE

COLUMBUS, O.

J. A. Brush and F. H. Lee, radio men, have opened up a new radio store, known as the Lee and Brush Radio Shop.

## Fixed Condensers Face Many Tests

When considering fixed condensers the fan thinks mainly in terms of capacity. This is particularly true of relatively high capacitance value, such as bypass and filter condensers.

A topic seldom discussed is the insulation resistance of condensers. This term is the value of resistance offered by the dielectric of the condenser, to the flow of direct current. The dielectric medium is the solid insulation material located between the active metal surfaces. In fixed capacities this is usually mica or a high grade of paraffined or waxed paper. The insulation resistance plays a very important part in condenser considerations, for upon it is dependent the breakdown voltage of the completed unit. The lower the insulation resistance of a condenser the lower will be its breakdown voltage. Furthermore, the value of the insulation resistance plays an extremely important part in the calculation of the power fac-

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The average fixed capacity is usually subjected to high values of either DC or AC voltage. The higher the insulation resistance of the unit, the higher can the applied voltage be, without fear of breakdown. And the higher the insulation resistance the less the leakage in the condenser and the greater its operating efficiency. Consequently, it is paramount to maintain the insulation resistance of fixed capacities at the highest possible level.

Consistent with the improvements in the various phases of radio receivers improvements have also been effected upon fixed capacities. Comparative measurements conducted in the laboratory of the Aerovox Wireless Corp. upon capacities to determine the improvements effected upon present day devices over those manufactured at the advent of regular broadcasting, showed the insulation resistance of the present day products to be many times those of the hectic days after the advent of radio broadcasting. To quote exact figures the insulation resistance of several large size condensers (fixed) of yesteryear was found to vary between 10,000,000 and 50,000,000 ohms, where as similar condensers of present design showed insulation resistance values of 1,250,000,000 ohms.

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**HICKORY TABLE AND NOVELTY CO.**  
Hickory, North Carolina.

### HARD RUBBER

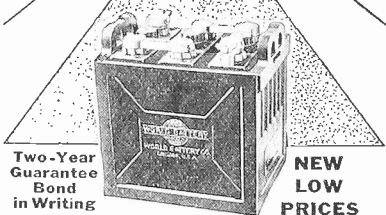
SHEET — ROD — TUBING

Special Hard Rubber Parts Made to Order  
**RADION and HARD RUBBER  
PANELS, ANY SIZE**

Send for Price List

WHOLESALE RETAIL  
**NEW YORK HARD RUBBER TURNING CO.**  
212 Centre Street New York

## DESIGNED to OUTLAST World Storage 'A' Battery



Two-Year  
Guarantee  
Bond  
in Writing

**NEW  
LOW  
PRICES**

Famous the world over for reliable, enduring performance. Solid Rubber Case lasting protection against acid or leakage.

**Approved and Listed as  
Standard by Leading  
Authorities**

Including Radio News Laboratories, Popular Sci. Inst. Standards, Pop. Radio Laboratories, Radio Broadcast Laboratories, Radio in the Home and Lefax, Inc.

**Send No Money**

Just state number wanted and we will ship same day order is received, by express C.O.D. Pay expressman after examining batteries. 5% discount for cash with order. Remember, you save 50% on World Batteries—so send your order today.

**WORLD BATTERY COMPANY**  
Dept. 17  
1219 S. Wabash Ave., Chicago, Ill.

KDKA WABC WEAJ KYW

**Solid Rubber Case  
Radio Batteries**  
6-Volt, 100-Ampere \$10.00  
6-Volt, 120-Ampere \$12.00  
6-Volt, 140-Ampere \$13.00

**Solid Rubber Case  
Auto Batteries**  
6-Volt, 11-Plate \$10.00  
6-Volt, 13-Plate \$12.00  
12-Volt, 7-Plate \$14.00

Set your radio dial at 223.3 meters for the World Storage Battery Station W5HC. Varies—new talent—always interesting. Jerry Sullivan, Dir. and Announcer, Chi. 524 West 9th



Patented Dec. 7, 1916  
No. 1,610,208



75¢ each  
At all dealers

Once this little jacket of live rubber slips over the tube—you're through!

All over in less than one second! You can get it in sizes to fit every tube. Just ask for the



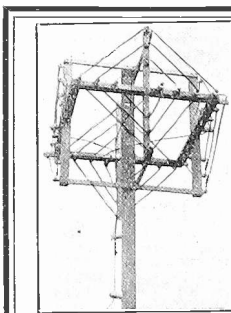
**McDONALD  
HOWL  
ARRESTER**

"It Stops that Howl!"

(TRADE MARK)

Sole Selling Agents for the U.S.A.  
**SPARTAN ELECTRIC CORPORATION**  
350 West 34th Street, New York City

Designed and Manufactured by the  
Scientific Products Canada, Ltd.  
MADE IN U.S.A.



## DX ONE POLE ANTENNA

Patent Pending

More distance, louder signals, less interference. The one pole can be put up most anywhere. This DX ANTENNA has twice the antenna input of any other type—delivers same volume on one-half the current normally used. Saves half the battery current. Is 100% self-directional. Separates stations more easily. Simply installed, rugged construction, takes practically no room.

**DX Antenna Kit Complete, \$13.50** Post Paid

West of Rockies, \$14.00 Canada, \$14.50  
Dealers-Jobbers, Write for Trade Terms

Manufactured by the  
**DX LABORATORIES**

39 Soper Ave., Oceanside, Rockville Center, N. Y.  
Tested and Approved by Radio World Laboratories

## R. H. Butler Becomes Butler-O'Brien, Inc.

R. H. Butler, widely known for the effective handling of extensive and productive advertising campaigns, not only in radio, but also in other fields, has joined forces with Donald R. O'Brien, and the new firm has opened a suite of offices at 25 West 43rd Street, New York City under the firm name of Butler-O'Brien, Inc.

Mr. O'Brien was for five years with Erwin-Wasey and is well-experienced in all branches of the advertising business. R. H. Butler has put over many now nationally famous products and is handling the Martin-Copeland (Mar-Co) one of the outstanding campaigns in the radio field. He has a wide knowledge of merchandising under difficult conditions coupled with an expert grasp of all angles of advertising. Mr. Butler was until recently at 461 Eighth Avenue, New York City.

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Fred Niblo, noted film director, recently said that broadcast sermons, illustrated by movies, are feasible and will be used very shortly. The churches subscribing to this service would receive advance prints on the proposed sermons, with other topics, and would choose from the list.

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"The result is that the average radio listener, reading over the programs and trying to determine which he shall listen to, sometimes is in considerable doubt as to the exact nature of the programs.

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"Since commercial programs not only support broadcasting but are, as a rule, the best programs on the air, the radio station is finding it necessary to give these programs better advertising than can be had from a daily program schedule of all stations.

"The day rapidly is passing when the broadcaster can expect to be coddled and nursed along by outside agencies. It must stand on its own feet and prove the right to its existence. Stations which cannot exist by means of their own strength and ability will have to join the failures of other business enterprises."

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not consult the papers. Also, if a prominent artist is to appear for a certain company, the artist's name would be enough to attract an audience, without the addition of the trade name, it was said. It will be necessary, in the future, according to the agreement, for the advertisers to advertise, if they want their name to appear in the paper at all as program sponsor.

## RESULTS

Results Editor:

Last night I sat at my Bernard set and logged the following list of stations during what was only an average evening for reception conditions. All reception was on the speaker. I am practically in the center of the city and judge reception at my point is only about 60 per cent efficient.

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WEAO	Columbus, Ohio	46-46
WGN	Chicago, Ill.	49-49
KDKA	Pittsburgh, Pa.	51-51
KOA	Denver, Col.	55-55
WJAZ	Mt. Prospect, Ill.	57-57
WBZ	Springfield, Mass.	58-58
WJAX	Jacksonville, Fla.	59-59
WLS	Chicago, Ill.	61-61
WCAM	Camden, N. J.	62-62
WNJ	Newark, N. J.	62-63
WEAN	Providence, R. I.	66-66
WJJD	Moosebeart, Ill.	67-67
WGY	Schenectady, N. Y.	69-69
WTAM	Cleveland, O.	71-71
WHT	Chicago, Ill.	73-72
WCCO	St. Paul, Minn.	76-76
WLW	Cincinnati, O.	77-77
WNAC	Boston, Mass.	78-79
WOC	Davenport, Iowa	86-85
WEAF	New York	88-88
WJR	Detroit, Mich.	90-89
WTAG	Worcester, Mass.	94-93

W. T. Sullivan,  
5 Garden Court,  
Norwich, Conn.



**RADIO CLAMP Blackburn Ground Clamps**

Telephone companies using MILLIONS. Adjustable—fits any size pipe. Requires no pipe cleaning—screw bores through rust and scale. Send 12 cents for sample and postage.

Blackburn Specialty Company  
1260 E. 66th St., Cleveland, O.

## Lowest Wholesale Prices!

On Everything for Radio. If Your Set Needs It—We Stock It!

3-Hour Shipping Service on Every Advertised Accessory—Popular Circuits—LC-27, Hammarlund-Roberts, Ultradyne I.R.-4, Infradyne, Alden Truptionic—As Well As All Those Hard-to-Get Parts!

Our Goal—the Lowest Prices in America—Get this Free Book—and See for Yourself Whether We've Reached It!

New 1927 BUYING GUIDE for Radio Dealers and Set Builders—100 Pages of Latest Prices—Just off Press—One Copy is YOURS! (If You Send for It NOW.)

Direct Representative of the Committee of 21 Manufacturers

Address Dept. R.W.

## Allen-Rogers Incorporated

Incorporated

Kit Headquarters

118 East 28th St., New York, N.Y.



**Radio Gift for \$2.50**

PLEASE your radio friend with the wonderful new invention that gives smooth, positive control of tone volume from a whisper to maximum.

Ask at the radio store for a Centralab Modu-Plug. It gives any radio set improved tone control of latest high-priced sets. Attaches instantly without tools.

## Centralab Modu-Plug

\$2.50 at your radio dealer's

You are sure of buying wisely. Centralab products are used by 60 makers of leading standard sets, and specified in the new and popular Bruno, Infradyne, Henry Lyford, Varion, and many other circuits.

CENTRAL RADIO LABORATORIES

13 Keefe Ave., Milwaukee, Wis.



## LIGNOLE Two-Tone Panel Chosen for Universal Victoreen

After a thorough canvass of the field for a front panel that combined the highest electrical efficiency with beauty unsurpassed two-tone Lignole was chosen for the Universal Victoreen. The most discriminating radio engineers and designers regularly choose Lignole, the NEW specially treated wood that meets all panel requirements.

LIGNOLE CORPORATION OF AMERICA

508 SOUTH DEARBORN STREET

CHICAGO, ILL.

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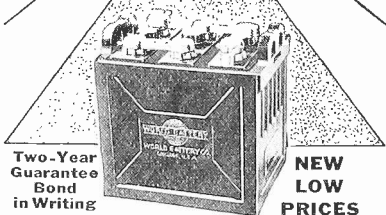
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**HICKORY TABLE AND NOVELTY CO.**  
Hickory, North Carolina.

### HARD RUBBER SHEET - ROD - TUBING

Special Hard Rubber Parts Made to Order  
**RADION and HARD RUBBER  
PANELS, ANY SIZE**  
Send for Price List  
WHOLESALE RETAIL  
NEW YORK HARD RUBBER TURNING CO.  
212 Centre Street New York

## DESIGNED to OUTLAST World Storage 'A' Battery



Two-Year  
Guarantee  
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in Writing

NEW  
LOW  
PRICES

Famous the world over for reliable, enduring performance. Solid Rubber Case lasting protection against acid or leakage.

Approved and Listed as  
Standards by Leading  
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Including Radio News Laboratories, Popular Sci. Inst. Standards, Pop. Radio Laboratories, Radio Broadcast Laboratories, Radio in the Home and Lefax, Inc.

### Send No Money

Just state number wanted and we will ship same day order is received, by express C.O.D. Pay expressman after examining batteries. 5% discount for cash with order. Remember, you save 50% on World Batteries—so send your order today.

**WORLD BATTERY COMPANY**  
Dept. 17  
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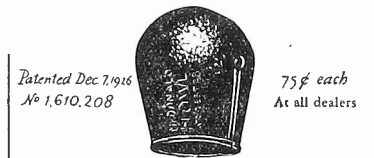
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KDKA WSBG WEAF KYW

BLUE PRINT and Book, DIAMOND of the AIR sent on receipt of 50c. Guaranty Radio Goods Co., 145 West 45th Street, New York City.



Once this little jacket of live rubber slips over the tube—you're through!

All over in less than one second! You can get it in sizes to fit every tube. Just ask for the



"It Stops that Howl!"

(TRADE MARK)

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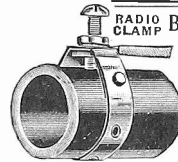
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W. T. Sullivan,  
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Norwich, Conn.



**RADIO CLAMP Blackburn Ground Clamps**

Telephone companies using MILLIONS. Adjustable—fits any size pipe. Requires no pipe cleaning—screw boros through rust and scale. Send 12 cents for sample and postage.  
Blackburn Specialty Company  
1969 E. 66th St., Cleveland, O.

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Direct Representative of the Committee of 21 Manufacturers

Address Dept. R.W.

## Allen-Rogers Incorporated

Kit Headquarters

118 East 28th St., New York, N.Y.



Radio Gift for \$2.50

PLEASE your radio friend with the wonderful new invention that gives smooth, positive control of tone volume from a whisper to maximum. Ask at the radio store for a Centralab Modu-Plug. It gives any radio set improved tone control of latest high-priced sets. Attaches instantly without tools.

## Centralab Modu plug

\$2.50 at your radio dealer's

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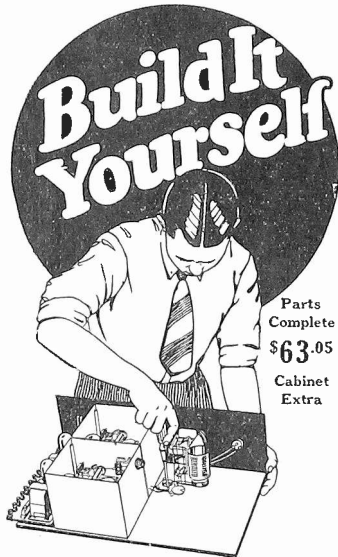
# EVEN VARIATION MARKS RESISTOR

Adjustable Unit May Be Calibrated and Used for Precision Work—Dissipates 3 Watts

By H. G. Richter

Chief Engineer, Electrad, Inc.

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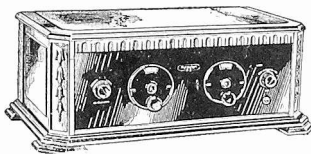
IMAGINE a radio without oscillation, without variation of volume on different wave lengths! Imagine a 5-tube receiver with the power of most expensive 8-tube sets! Imagine knife-like selectivity even in crowded areas! And tone quality as clear and pure as the natural broadcast signal!

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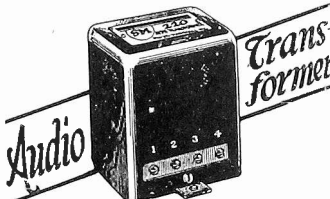
1182-V Broadway :: New York

With the advent of radio broadcasting, radio engineers realized what a great field of use that was in radio for a compact little variable resistor that could not only be used in the input circuits of receiving tubes, but that could also be used in the output circuit of power amplifier tubes in receiving sets. These scientists learned that a real problem presented itself here and they proceeded to push ahead in the development, step by step, until, today, we have the ultimate answer in one of the standard units of this type that was produced by an engineering and manufacturing concern that specializes in resistances, and, after all, it is quite logical that a serious problem of this nature should have been solved by a specialist.

In the past there have been some variable high resistance units that have appeared on the market, consisting of a carbon resistance element, different resistance values being obtained by means of

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220 and 221



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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 metallic contact, moving over the upper surface of the carbon element. This method was all right where no degree of accuracy was necessary, but due to the fact, that in the majority of cases, it is extremely desirable that we be able to turn the contact lever to the same point on the resistance element, and get the same value of resistance each time, the carbon resistor with metallic contact, never attained any degree of popularity.

## Two Types of Resistors

The reason that the carbon resistance with the metallic contact sliding over its surface was inaccurate was due to the fact that the movement of the contact resulted in either putting a polish on the surface of the resistance or wearing out the contact, either of these results being conducive to widely varying resistance values in the operation of the unit in question. This serious objection to this type of unit was overcome to a slight extent by placing a spring washer between the carbon resistance element and the sliding contact, but, in the final analysis we find that this refinement only tends to prolong the time before the polishing effect becomes noticeable, and we still have an inaccurate resistance unit, not even considering its current carrying characteristics.

Then there was the compression type of variable high resistance unit, consisting of a number of carbon or graphite discs, or carbon granules, resistance variation being obtained by changing the pressure on these resistance elements. This type of unit was quite satisfactory, but it could not be calibrated, so you had no assurance that the control knob being set at a particular position would produce the same resistance as it produced in a previous instance.

## Can Be Calibrated

What appears to be the answer to this problem, is a new type of variable high resistance unit called the "Royalty" which approximates the ideal. The resistance element consists of an impregnated strip which is calibrated before assembly. At equal intervals, all along its length, this resistance element is embedded with short pieces of wire which, in the completed unit, engage the movable contact, and function as a means of contact between the contact arm and the resistance unit. There is an equal amount of resistance between each of the 150 pieces of wire that are embedded in the resistance element, and due to the manner in which contact is made, the resistance is a fixed quantity, and what you practically have, is a high resistance that is variable in 150 equal steps.

The contact arm is made of phosphor

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bronze, nickelplated, and as it engages the wire pieces that are embedded in the resistance strip, there is no chance for depreciation or wear, on the latter. This unit can be calibrated and once this is done, you will always find the values the same. They will not change. Thus, these units can be used for adjustable voltmeter multipliers, high frequency capacity and inductance bridges, galvanometer and telephone shunts, and series resistances wherever a variable high resistance is needed, that will stand a reasonable amount of current.

**Use for Precision Work**

From the viewpoint of using the "Royalty" units in precision circuits, the first question that arises is what about the inductance and capacity, as well as the current carrying capacity of the unit itself.

The variable resistance units in question can be considered non-inductive and non-capacitive, since the capacity and inductance between terminals at the maximum resistance position, for all types of "Royalty" units, is 2 micro-microfarads and .05 micro-microhenrys, respectively. They will carry a 3 watt load. Thus, the current carrying capacity is a function of the total resistance in the unit, the higher the resistance the smaller the amount of current it will carry.

From the foregoing, you can see that a 2000 ohm variable resistor of this type will carry between 35 and 40 milliamperes which means that it can be used in a power amplifier, in the low side of the power tube plate circuit to effect a variable biasing potential for the grid of the tube. At this point in the circuit about 20 mils is all that it would be called upon to carry, and it would do this easily.

**LINCOLN SUPER**

(Concluded from page 12)

of the first audio frequency transformer. Its maximum value is 200,000 ohms.

There are three rheostats in the receiver which should not be employed for volume control, but only for adjusting the filament current to normal values in accordance with the state of charge of the storage battery. These rheostats are R2 in the filament circuit of the oscillator tube and the two rheostats R4 and R7 in the filament circuits of the audio tubes.

A Super-Heterodyne such as the circuit under discussion must be able to handle a great deal of volume without distortion of the signal. Hence power tubes must be used. Up to the last two ordinary 201-A type tubes are adequate to handle the signal but the last two must be larger. Therefore the last tube is a

171 and the preceding tube is a 112 tube.

Power tubes require high voltages on the plates to give best results. Hence a voltage of 180 is used on the last and 135 on the next preceding.

Grid bias voltages must also be adjusted correctly for best results. The 171 tubes requires about 40 volts when the plate voltage is 180 and the 112 tube requires from 10 to 13 volts when the plate voltage is 135. The intermediate frequency tubes and the oscillator require about 3 volts when the plate voltage on them is 67½ volts, which is the voltage that should be used on them.

The 171 tube draws a heavy plate current, much more than is safe to pass through the windings of most loud speaker units. Consequently it is necessary to separate the AC component from the DC component of the output of the tube and only pass the AC to the speaker. This separation is accomplished by means of an output transformer OT, the primary of which must be able to carry continuously about 20 milliamperes without heating up.

The one microfarad condenser connected across the 180 volt battery is an important addition to the circuit in that it prevents distortion arising from the resistance of the plate battery.

A super-heterodyne employing as many as eight tubes some of which are power tubes will cause a considerable drain on the B battery. In view of this fact it is economical to use extra heavy duty bat-

teries. While these cost more to buy they are less expensive in the long run because they are proportionately cheaper.

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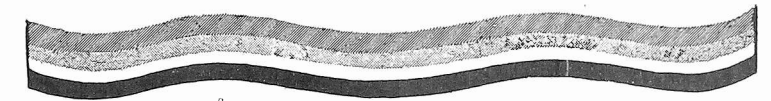
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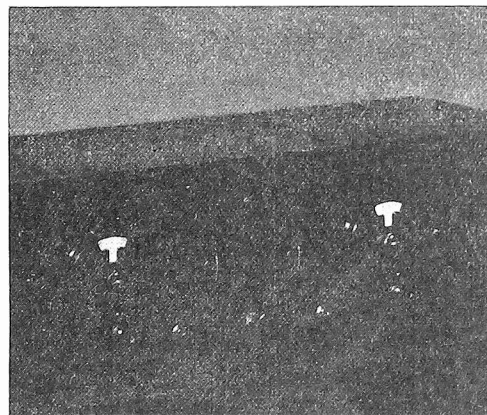
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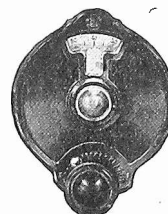
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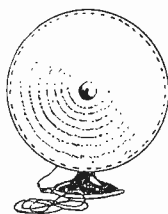


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# THE ELIMINATION OF INTERFERENCE

(Concluded from page 7)

to adjust it will find that it renders relief from the interference of some station that is particularly obnoxious.

The simple wave trap consists of a sharply tuned radio frequency circuit. A low loss condenser and a low loss coil connected together are the essentials. Sometimes an extra coil coupled to the main tuning coil is added to the trap circuit, which is used for certain connections of the trap.

When there is a station which is interfering with the reception of another the trap may be connected in series with the antenna lead. If it is accurately tuned to the interfering station, the signal from that station is eliminated. The trap may also be used by connecting the second winding in series with the antenna lead and then tuning the main trap circuit to the interfering station. Again it is rejected.

An effective wave trap very popular, especially with the station so fiercely crowded as today, that may be employed advantageously for rejecting interference,

is called the Steinite Interference Eliminator and is manufactured by the Steinite Laboratories, Atchison, Kansas.

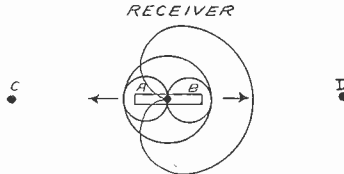


FIG. 3

The pick-up characteristic of a loop has the shape of a figure eight, or more accurately that of two circles placed side by side, as is shown in Fig. 3. This means that the intensity of the pick-up is proportional to the distance from the center of the figure to the circumference of either circle. Thus the maximum pick-up is in the direction of either C or D, and it is proportional to the diameter of the small circles. In the direction at right angles to the line CD the distance from the center of the figure to the curve is zero because the curves cross the line at that point. AB represents the loop as seen from above.

The pick-up of the antenna is given by the large circle, and is proportional to the radius of that figure. If the coupling between the antenna and the grid circuit of the first tube is adjusted so that the signal intensity introduced into the grid circuit by the antenna is equal to that introduced by the loop, the radius of the antenna circle is equal to the diameter of either of the small loop circles. When these two intensities are taken together, the resultant intensity is the algebraic sum of the two intensities. That is on one side they add together and on the other they subtract. Since they have been adjusted to equality, in the direction D the sum is equal to twice the radius of the

small circle and in the direction D the intensity is zero. The resulting curve is the cardioid or heart-shaped figure shown.

If C is a transmitting station it will not be received even if it is operating on exactly the same frequency as a station located at D. This station will be received. If D is desired and if C should lie in some other direction other than D, the two can still be separated by simply turning the loop until the "blind spot" on the cardioid points to the station that is not wanted. Of course, if both C and D are in the same direction both will either be received or both will be blotted out.

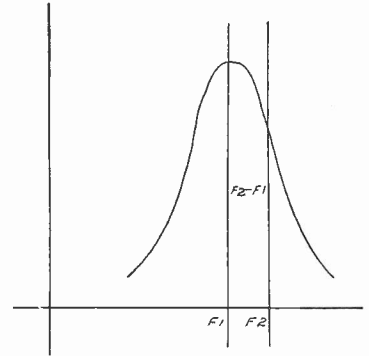


FIG. 4

$F_1$  represents the frequency of a transmitting station operating on the longer wave and  $F_2$  that of the station operating on the shorter. The distance between the two represents the beat frequency between the two stations, that is,  $F_2 - F_1$  represents the beat frequency. The receiver is tuned to the carrier having the lower frequency, and the signal strength is proportional to the distance up to the curved line. The higher frequency carrier being off tune is suppressed somewhat as the distance from the base line up to the curve at  $F_2$  is shorter. However, enough is picked up on the higher frequency to cause considerable interference.

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## Cadiz on 400 Meters

Editor Radio World: Cadiz, Spain

I have just seen in your issue the new wavelength assigned to the European stations and I wish to advise you that the wavelength of our station is really 344.8 meters and the station of Seville is 400 meters.

This change is due to the fact that a station of 400 meters was not suitable for Cadiz because of the Marconi telegraph stations and due to the ships that are constantly in this port.

Francisco de la Viesca.



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# CHOKO COIL RF AVOIDS SQUEALS

## Extra Tube Is Needed, But Amplification on the Higher Wavelengths Is Strengthened

One great difficulty encountered in the operation of radio receivers is uneven amplification in the radio frequency stages. A receiver designed to function efficiently on 250 meters will fall far below the standard when tuned to a 500 meter wave. Vice-versa, if the set is designed for good operation at 500 meters, a host of squeals and howls will be met on the lower waves.

A receiver then, that will amplify almost evenly over the entire waveband is something to be desired. Properly to effect these results, however, it was found necessary to employ six tubes instead of five as is the present custom.

The principle of this receiver is based on a system of tubes coupling which, while not uncommon in the past, is rarely seen in sets of modern design. The reference is to choke-coil coupled radio frequency amplification. If properly designed, it has a very far volume amplification and at the same time adds power and sensitivity to a receiver without additional front-panel controls.

If an inductance, having a greater natural wavelength than 550 meters, is placed in the plate circuit of an RF tube, such tube having the conventional grid tuning, and a condenser of small capacity connected from the plate of this tube to the grid of the detector tube—pro-

vision being made for a grid leak from grid to negative filament—then any signal below 550 meters, with the exception, of course, of very short waves, will be heard through this coupling connection on virtue of the choke-coil's impedance and impressed upon the grid of the detector tube. Thus we have one stage of radio frequency amplification and a detector with but one control.

As the grid circuit of such a receiver is tuned closer to the natural wavelength of the choke-coil, the signal strength increases due to regenerative effects in the radio frequency tube caused by plate and grid circuits being almost in resonance. Since the wavelength of the choke-coil is 550 meters, it will be apparent that a set of this kind would be more sensitive on 550 meters than on 250 meters.

If we combine this effect with that of a tuned radio frequency amplifier which has greater amplification on the very low wavelengths, then it is again evident that a fairly even amplification will be obtained over the entire waveband. This can be accomplished by tuning the grid

circuit of the first tube, coupling the second tube with the choke coil arrangement, tuning the grid circuit of the third tube and coupling the detector to this output with condenser and choke coil. This gives us three stages of radio frequency amplification with only two controls.

Due to lack of response to lower waves in the choke-coil coupled stages, it may be found necessary to increase the number of turns on the primary of the tuned transformers to overcome this effect. This, in turn, will tend to make tuning of the receiver rather broad, but such tendency can be eliminated by employing very small variable condensers, as blocking condensers for the choke coil coupled stages. By varying setting of these condensers, almost any degree of selectivity within the limits of this circuit can be obtained.

The special apparatus needed for the choke coil stages follows: two grid leak mountings; two Silver Marshall shock wave choke-coils No. 275, two three-plate, ohm grid leaks and two Silver Marshall midget variable condensers, No. 140.

A receiver built in this manner will be simple to tune and work very easily. A signal for grid leak coils will be of a specific frequency, well below the natural

squeal on any wavelength in the broadcast band.

## THE VICTOREEN

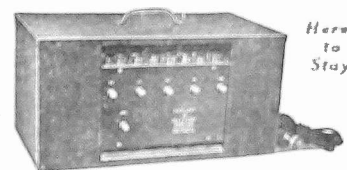
(Continued from page 19)

on the distance between the coils and on their shape. At first they may be placed so that the angle is about 90°. If the set oscillates when turned on full force, the angle must be reduced. If it does not oscillate the angle may be increased until it does. A slight reduction in the angle should then suffice to stop oscillations and leave the circuit in the most sensitive condition.

The placement of the audio frequency transformers is not so important for they are shielded and there is no appreciable magnetic field about them to cause any trouble.

Attention is especially called to the method of tuning this receiver. Transformers are attached to the shafts of the tuning condensers, and these gears engage with a rack. Movement of the rack will bring the centers of the condensers simultaneously up. The rack is actuated by a piston or by another gear of small diameter. This receiver effect is obtained in turning the rotors. Since this is a Super-Heterodyne, exact tuning of both circuits cannot be obtained in this manner. Therefore a small compensating circuit is used to tune the antenna circuit to exact resonance with the incoming wave. This method of tuning simplifies the operation of bringing in stations.

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# Steinite

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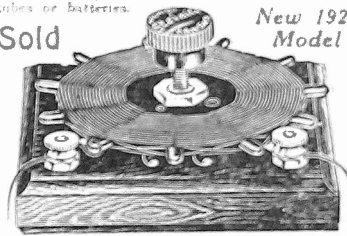
Select stations at will. Especially necessary for 1 and 2 dial controlled sets. Under present conditions the average set fails to bring in the best stations properly. The Steinite Interference Eliminator shorts out all other interference. You get one station at a time, the way you want it, tune in loud and clear. Operates on any set—attach to any wire in the set—no changes—no extra tubes or batteries.

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Try entirely at my risk the wonderful improvement this interference little device will make in the reception of your set. Immediate results on both crystal and tube sets that use any kind of aerial except loop antenna. Clears up reception wonderfully, increases volume and partially absorbs static. Money-Back Guarantee.

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**\$1 Postpaid** if you are not delighted with results you get your dollar back

The New Steinites 7-Tube Radio costs only \$12.00. Loud speaker built in. Complete with 5000-1175 with motor battery. Operates from 110's socket in an hour. Write for descriptive literature before buying an expensive battery set. New Steinite Loud Distance Crystal Set 10-6-Tube Battery Set \$45.00. WRITE TODAY.

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(Concluded from page 9)

correct resistance of 3,000 to 5,000 ohms, no standard rheostat that I know of being able to carry 60 milliamperes. This combination is in series with the fixed resistance R3 of 3,000 ohms. The A minus, B minus and C plus are a common terminal.

### Milliammeter Connection

A filament milliammeter having a scale reading 0-75 should be placed in series with the A plus lead. A normal fluctuation in the AC input house supply will not greatly change the filament voltage. After the first adjustments are made it may be found necessary to make readjustments after a period of two to three minutes, when no further adjustment will be found necessary. By carefully following the schematic (Fig. 2) and the picture wiring diagram (Fig. 1) the builder should not experience any difficulty. All



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BARAWIK CO., 560 Monroe St., CHICAGO, U. S. A.

wires should be covered with Celatsite tubing or be of heavy insulation.

The high voltage transformer has two leads or wires which are connected to the 110-volt alternating current. From the other side of the transformer provision is made for connections to the filament terminals of the power tube socket, this being lighted by five-volt alternating current.

### Point of Caution

In using the A, B and C power plant, care should be exercised as the potential across the condenser bank and the transformer is of several hundred volts. A severe shock is possible in handling the unit even for a short time after the power transformer has been disconnected from the alternating current. This is due to the fact that the condenser bank stores up a large charge of electricity. Eventually the residual charge in the filter condensers dissipates through the eliminator resistances.

After disconnecting the eliminator plug from the socket and the 110-volt line the condensers may be discharged by placing the metallic part of a screwdriver or similar instrument across the posts of the condenser block for an instant.

### RESULTS

Results Editor:

I have constructed the 4-tube Diamond of the Air and am very much pleased with the results. I bring in stations from all over the country with ease. I have heard many other sets, but never have such a good performer as the Diamond. It is a super sensitive and super selective receiver.

Amos G. Allen,  
141 Brighton Ave.,  
San Francisco, Cal.

\* \* \*

Results Editor:

I have constructed the Diamond of the Air and am more than pleased with its ability. I must commend the excellent manner in which the drawings and directions were given. My set is the envy of all my friends.

Clara Morton,  
141 Picton St., East,  
Hamilton, Ont.,  
Canada.

### INTERESTING TIP

Soda straws, when dipped into varnish for some time, can be used for insulating bus bar wire.

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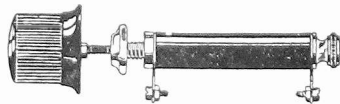
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# The BRETWOOD Variable Grid Leak Is a Remedy for Distortion



Precision Range, 1/4 to 10 Megohms

Much of the distortion present in radio receivers is due to an overloaded detector tube. Too much power for that lone tube to handle with fidelity. The Bretwood Variable Grid Leak permits control of the grid circuit so that the maximum efficiency **without distortion** is achieved. Put a Bretwood Variable Grid Leak in your set and marvel at the difference!

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Enclosed find \$1.50, for which send me one Bretwood Variable Grid Leak (or \$2.00 for leak with grid condenser attached) on five-day money-back guarantee.

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**THE NEW, IMPROVED  
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Complete Kit of Parts, with  
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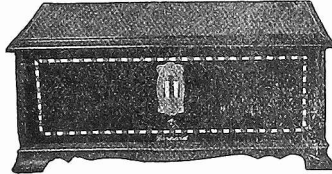
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How to Build the

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Fully described in the October 16 issue of  
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Schematic and picture diagrams of the  
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Fixed Condensers and Resistors  
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**FOUR AND FIVE TUBE  
"DIAMOND OF THE AIR"**  
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The 4-Tube Receiver of Exquisite Tone

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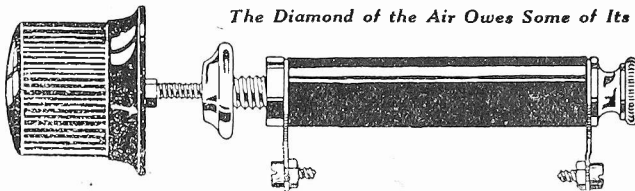
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Variable Grid Leak  
Certified for  
The Diamond



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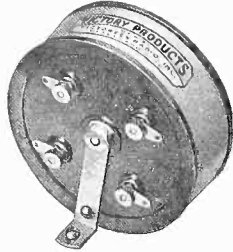
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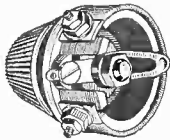
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—breathes a vibrant living message into your home



Victoreen R. F. Transformers  
**\$7.00**

The Victoreen R. F. transformers have been called the heart of the circuit. This unit has a 2 inch diameter air core, permitting a minimum of wire to be used to obtain the proper inductance. The result is a very sharp curve or peak. The field is in close proximity to the coil, practically eliminating feed back and enabling the transformers to be placed in close relation to each other. Interstage oscillation is prevented and the amplification constants are uniform, due to a special adjustment which is made and then sealed at the factory. No other adjustments are required by the purchaser.

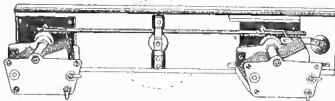


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**\$1.20      \$1.50**

The only rheostat with zero temperature coefficient no matter how warm the unit becomes the resistance remains absolutely constant.

Victoreen rheostats have double the number of turns of wire on ordinary rheostats—that means twice as fine adjustment. This three terminal rheostat simplifies wiring. Made with 5 resistance, 2, 6, 10, 20, 30 ohms.

Victoreen Potentiometers  
200 and 400 ohm resistances.



The Victoreen Master Control Unit **\$19.50**  
Extra Condensers \$4.50

Featuring individual compensation with all the advantages of two dials but eliminating freak dial settings. Not a single dial control.

The Victoreen Master Control is furnished with two .0005 variable condensers attached.

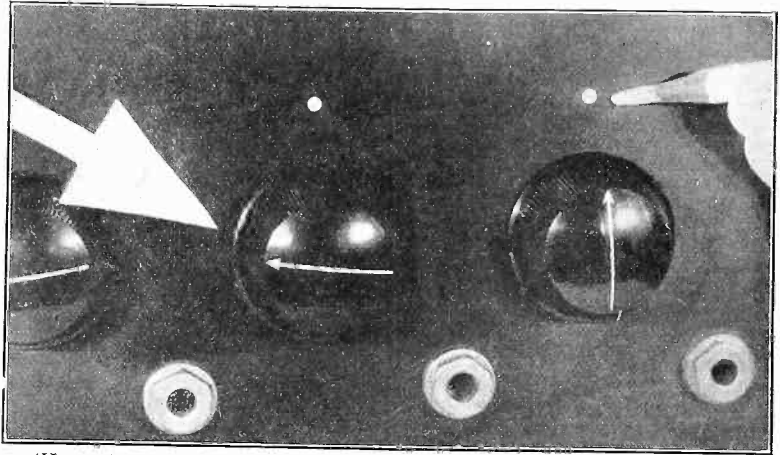
The design of the unit has been so carefully planned that one or two additional condensers may be assembled to the unit by means of the holes provided in the metal unit panel, making it applicable for any multi tube set. In fact, the uses that this unit can be applied to are so broad, that any set requiring two, three or four condensers of .0005 capacity can be easily controlled by the means of one dial. By use of the compensator, attached to the condenser on the extreme end, adjustment is permitted up to 20 degrees, permitting a 360 degree motion of the compensator knob.

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**The George W. Walker Co.**

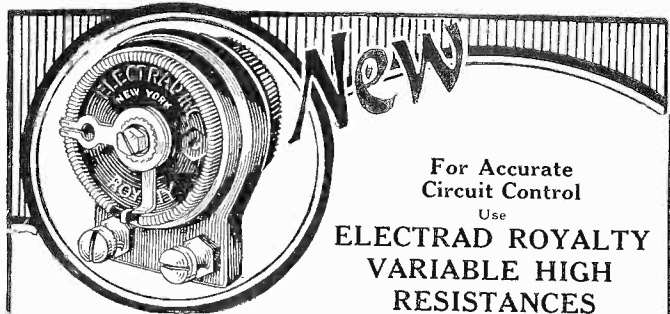
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## MARK RHEOSTAT POSITION



(Hayden)

SO THAT you may know at about what point you should turn your rheostat to obtain maximum results, and if the rheostat knob has to be turned beyond that point the battery needs charging, drill a small hole near point indicating the proper voltage point and whiten.



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(Joel Feder)  
SANTA is busy these days at the mike no less than at the toy counter.

## BOYS' DESERTION OF FARM IS LESS BECAUSE OF RADIO

CHICAGO.

Radio is doing more than any other one thing to bring country boys back to the farm from the cities, according to Harold C. Lewis, who has just completed a survey of the aims and ambitions of 2,500 farm boys who are in his student body of 5,000 this year.

"I do not refer to the obvious entertainment that radio brings to the farm of evenings," said Mr. Lewis.

"I refer to the high wages that radio installation, service and salesmanship have brought to thousands and thousands of country boys. Statistics just made among the 2,500 farm boys who have come to our school this year show that 75 per cent of them are planning to return, upon graduation, to the farm.

"Five years ago in our files I find that 50 per cent of all farm boys coming to us planned to stay in the city the rest of their lives. They wanted to leave the farm. Now they want to get back.

"Radio interested them in electricity. Thousands and thousands of farmhouses today are lighted with electricity and equipped with labor-saving devices merely because the boy of the house got interested in radio, took to fooling with electricity and decided to modernize the old home with electrical conveniences.

"Soon the family is able to milk, thresh, husk corn, sew, wash dishes and separate cream with machinery the boy has installed. Thousands of farm boys are earning from \$50 to \$75 a week outside their farm wages as electrical experts for radio and other electrical equipment. This, considering their living expenses, amounts to much more than the average youth makes in the city."

# Best Christmas Gift

This Marvelous B. S. T. 5 at \$40 will bring as much joy and happiness in a home as the most expensive set.

*Send your order to-day so as to insure Christmas delivery.*

## RADIO NEWS RADIO WORLD GIVE BST-5 CERTIFICATE OF MERIT

A \$75 Set Direct from Factory at \$40

I received my B. S. T. radio set two weeks ago and I am very well pleased with it.

I had the set working in fifteen minutes and at the end of two hours and a half I had twenty-nine stations logged. The set brings in new stations almost every night.

The cabinet is very well constructed and the people that have seen it say that it is a very beautiful set.

G. C. PARRISH, Dallas, Oregon.

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Each receiver is tested and retested, boxed and inspected before leaving factory, and guaranteed to reach you direct in perfect condition. Workmanship throughout guaranteed the best. Assembled by experts.

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With built-in Utah Unit Loud Speaker and commodious compartment in which there is ample room for batteries, charger, eliminators, etc.

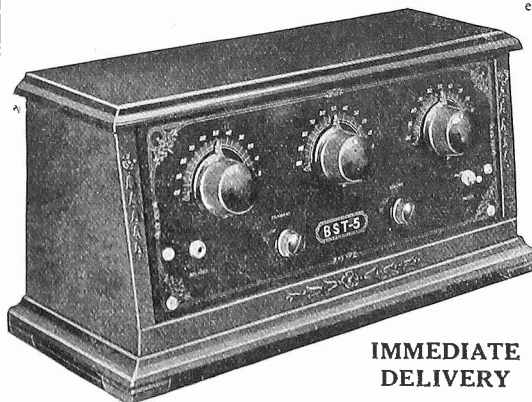
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BST-5  
Loud Speaker and Console

**\$57.00**

As Illustrated

**\$40.**

Send Check or P. O. Money Order



IMMEDIATE DELIVERY

*New model cabinet, Du Pont Duco finish; base 21" long by 8" wide, height 9 1/2", top 21" by 6". Five-ply walnut veneer piano finish.*

THIS highly sensitive, powerful and selective BST-5 radio receiver has all up-to-the-minute improvements. Heavy aluminum automobile type chassis, shielded against stray currents and distortion. Flexible grip, Universal type sockets, eliminating microphonic noises. Has provision for battery eliminator and any power tube. Fahnestock clips on sub-panel for adjusting C battery, has voltages for power tube. Efficient on either long or short aerial, including indoor aerial. This BST-5 sets a new standard for true tone values and selectivity. This BST-5 gives greater volume than many six-tube sets and consumes less current.

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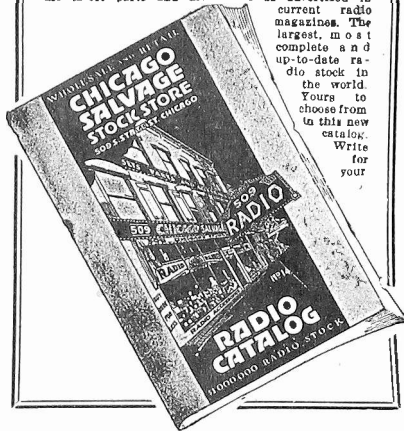
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(Concluded from page 9)

correct resistance of 3,000 to 5,000 ohms, no standard rheostat that I know of being able to carry 60 milliamperes. This combination is in series with the fixed resistance R3 of 3,000 ohms. The A minus, B minus and C plus are a common terminal.

#### Milliammeter Connection

A filament milliammeter having a scale reading 0-75 should be placed in series with the A plus lead. A normal fluctuation in the AC input house supply will not greatly change the filament voltage. After the first adjustments are made it may be found necessary to make readjustments after a period of two to three minutes, when no further adjustment will be found necessary. By carefully following the schematic (Fig. 2) and the picture wiring diagram (Fig. 1) the builder should not experience any difficulty. All

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wires should be covered with Celatsite tubing or be of heavy insulation.

The high voltage transformer has two leads or wires which are connected to the 110-volt alternating current. From the other side of the transformer provision is made for connections to the filament terminals of the power tube socket, this being lighted by five-volt alternating current.

#### Point of Caution

In using the A, B and C power plant, care should be exercised as the potential across the condenser bank and the transformer is of several hundred volts. A severe shock is possible in handling the unit even for a short time after the power transformer has been disconnected from the alternating current. This is due to the fact that the condenser bank stores up a large charge of electricity. Eventually the residual charge in the filter condensers dissipates through the eliminator resistances.

After disconnecting the eliminator plug from the socket and the 110-volt line the condensers may be discharged by placing the metallic part of a screwdriver or similar instrument across the posts of the condenser block for an instant.

#### RESULTS

Results Editor:

I have constructed the 4-tube Diamond of the Air and am very much pleased with the results. I bring in stations from all over the country with ease. I have heard many other sets, but never have such a good performer as the Diamond. It is a super sensitive and super selective receiver.

Amos G. Allen,  
141 Brighton Ave.,  
San Francisco, Cal.

\* \* \*

Results Editor:

I have constructed the Diamond of the Air and am more than pleased with its ability. I must commend the excellent manner in which the drawings and directions were given. My set is the envy of all my friends.

Clara Morton,  
141 Picton St., East,  
Hamilton, Ont.,  
Canada.

#### INTERESTING TIP

Soda straws, when dipped into varnish for some time, can be used for insulating bus bar wire.

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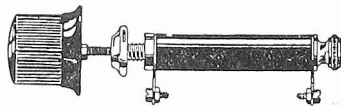
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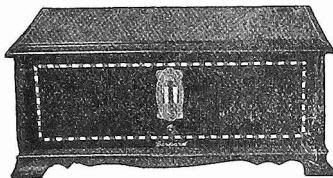
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The 6-Tube Receiver of Exquisite Tone

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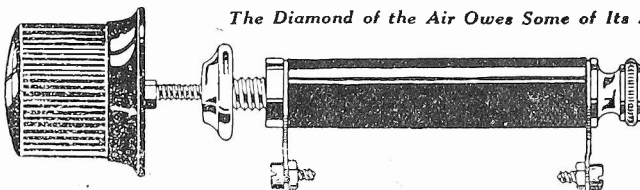
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Certified for  
The Diamond



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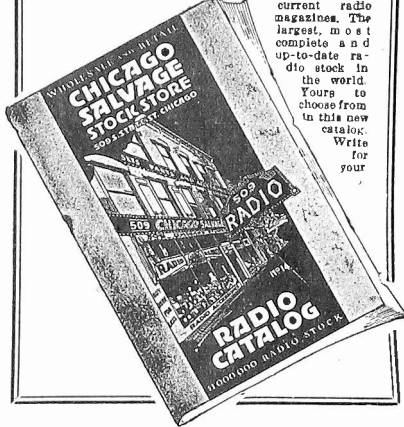
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(Concluded from page 9)

correct resistance of 3,000 to 5,000 ohms, no standard rheostat that I know of being able to carry 60 milliamperes. This combination is in series with the fixed resistance R3 of 3,000 ohms. The A minus, B minus and C plus are a common terminal.

#### Milliammeter Connection

A filament milliammeter having a scale reading 0-75 should be placed in series with the A plus lead. A normal fluctuation in the AC input house supply will not greatly change the filament voltage. After the first adjustments are made it may be found necessary to make re-adjustments after a period of two to three minutes, when no further adjustment will be found necessary. By carefully following the schematic (Fig. 2) and the picture wiring diagram (Fig. 1) the builder should not experience any difficulty. All

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BARAWIK CO., 560 Monroe St., CHICAGO, U. S. A.

wires should be covered with Celatsite tubing or be of heavy insulation.

The high voltage transformer has two leads or wires which are connected to the 110-volt alternating current. From the other side of the transformer provision is made for connections to the filament terminals of the power tube socket, this being lighted by five-volt alternating current.

#### Point of Caution

In using the A, B and C power plant, care should be exercised as the potential across the condenser bank and the transformer is of several hundred volts. A severe shock is possible in handling the unit even for a short time after the power transformer has been disconnected from the alternating current. This is due to the fact that the condenser bank stores up a large charge of electricity. Eventually the residual charge in the filter condensers dissipates through the eliminator resistances.

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#### RESULTS

Results Editor:

I have constructed the 4-tube Diamond of the Air and am very much pleased with the results. I bring in stations from all over the country with ease. I have heard many other sets, but never have such a good performer as the Diamond. It is a super sensitive and super selective receiver.

Amos G. Allen,  
141 Brighton Ave.,  
San Francisco, Cal.

\* \* \*

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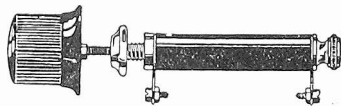
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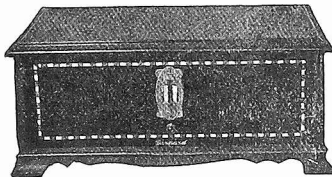
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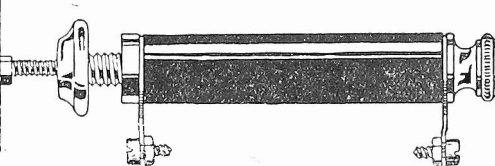
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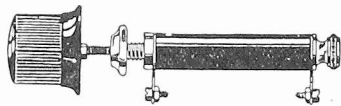
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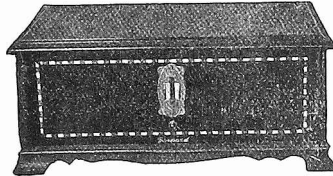
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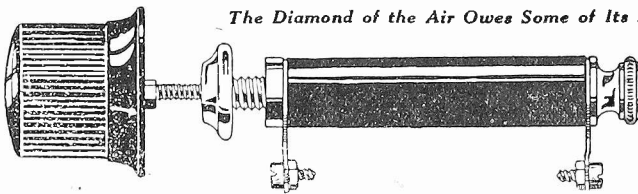
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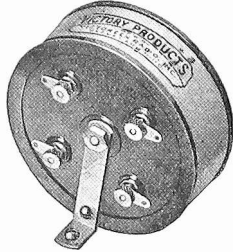
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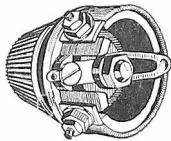
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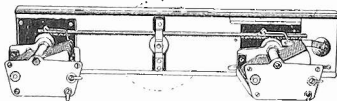


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Victoreen rheostats have double the number of turns of wire on ordinary rheostats—that means twice as fine adjustment. This three terminal rheostat simplifies wiring. Made with 5 resistance, 2, 6, 10, 20, 30 ohms.

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Featuring individual compensation with all the advantages of two dials but eliminating freak dial settings. Not a single dial control.

The Victoreen Master Control is furnished with two .0005 variable condensers attached.

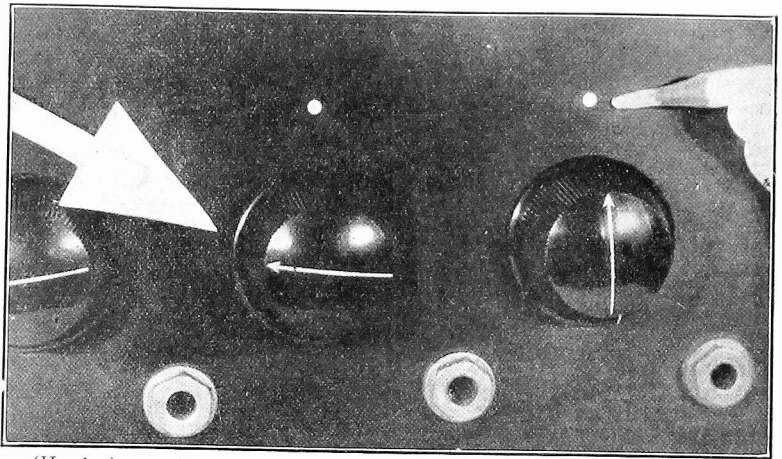
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**The George W. Walker Co.**

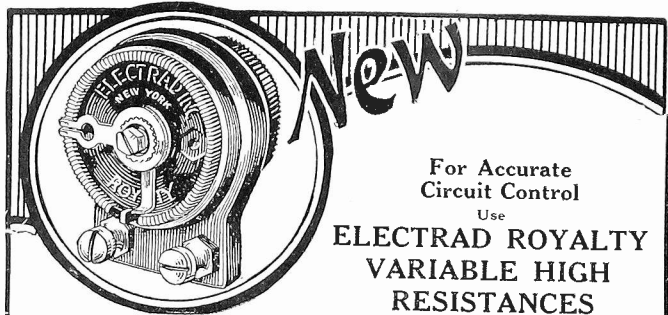
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(Hayden)

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(Joel Feder)

SANTA is busy these days at the mike no less than at the toy counter.

## BOYS' DESERTION OF FARM IS LESS BECAUSE OF RADIO

CHICAGO.

Radio is doing more than any other one thing to bring country boys back to the farm from the cities, according to Harold C. Lewis, who has just completed a survey of the aims and ambitions of 2,500 farm boys who are in his student body of 5,000 this year.

"I do not refer to the obvious entertainment that radio brings to the farm of evenings," said Mr. Lewis.

"I refer to the high wages that radio installation, service and salesmanship have brought to thousands and thousands of country boys. Statistics just made among the 2,500 farm boys who have come to our school this year show that 75 per cent of them are planning to return, upon graduation, to the farm.

"Five years ago in our files I find that 50 per cent of all farm boys coming to us planned to stay in the city the rest of their lives. They wanted to leave the farm. Now they want to get back.

"Radio interested them in electricity. Thousands and thousands of farmhouses today are lighted with electricity and equipped with labor-saving devices merely because the boy of the house got interested in radio, took to fooling with electricity and decided to modernize the old home with electrical conveniences.

"Soon the family is able to milk, thresh, husk corn, sew, wash dishes and separate cream with machinery the boy has installed. Thousands of farm boys are earning from \$50 to \$75 a week outside their farm wages as electrical experts for radio and other electrical equipment. This, considering their living expenses, amounts to much more than the average youth makes in the city."

# Best Christmas Gift

This Marvelous B. S. T. 5 at \$40 will bring as much joy and happiness in a home as the most expensive set.

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I received my B. S. T. radio set two weeks ago and I am very well pleased with it.

I had the set working in fifteen minutes and at the end of two hours and a half I had twenty-nine stations logged. The set brings in new stations almost every night.

The cabinet is very well constructed and the people that have seen it say that it is a very beautiful set.

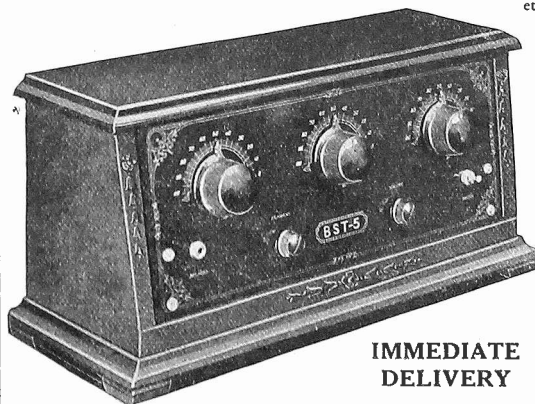
G. C. PARRISH, Dallas, Oregon.

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BST-5  
Loud Speaker  
and Console

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