

THE COMPLETE LIST OF STATIONS

RADIO WORLD

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VOL. 6. NO. 1. ILLUSTRATED EVERY WEEK

A New 1-Tube Reflex

By *A. P. PECK*

Associate, Institute of Radio Engineers

The Best Set for Your Location

By *N. N. BERNSTEIN*

Technical Editor

Three Stages of Resistance-Coupled AF

By *WAINWRIGHT ASTOR*

Radio Engineer

A 2-Tube-and-Crystal Reflex, Using Only One Control

By *BYRT C. CALDWELL*

The Four Most Popular Circuits

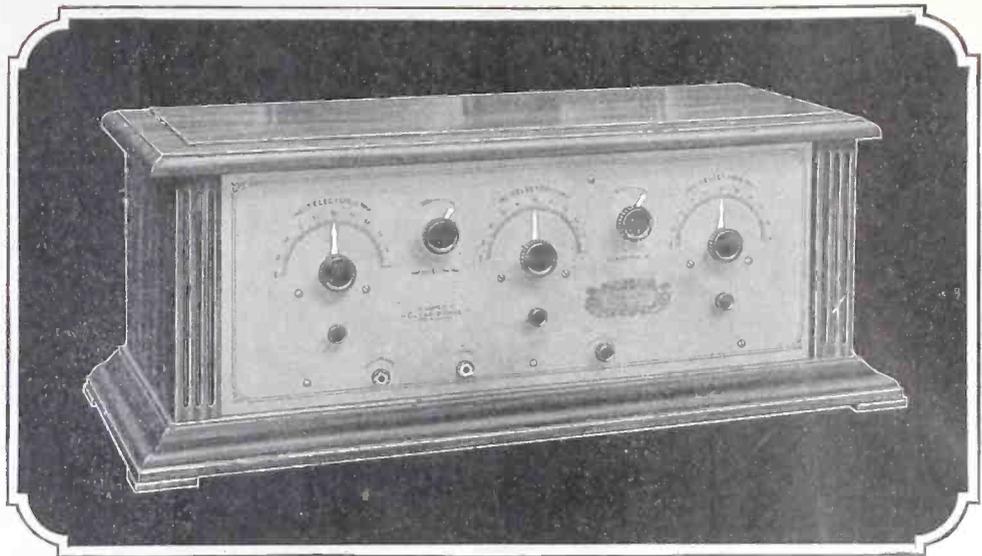
How to Make a Telephone Relay for Tubeless AF

By *A. F. LAPIERRE*

Consulting Engineer



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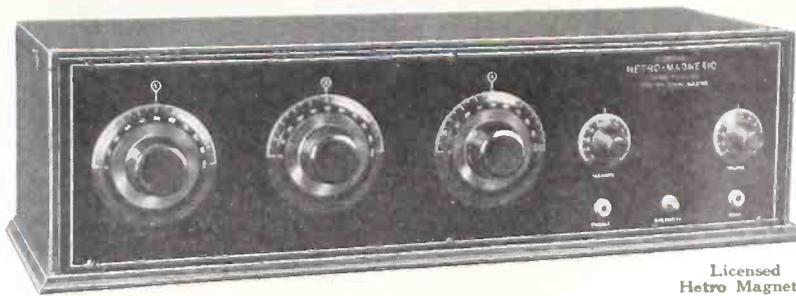
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Rheostats: Standard Klossner.

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Sockets: Hoosick, Bakelite.

Cabinet: Mahogany, Distinctive finish 7x26.

Price: Type "H," receiver only, \$75.00.

Manufactured under special license, granted August 13, 1924

GUARANTEE—Will replace any defective set within two years.

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Sidbenel Radio Equipment Manufacturing Co.

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New York, N. Y.

*Manufactured under license granted August 13, 1924. Dealer inquiries welcome.

RADIO WORLD

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A 1-Tube, No-Crystal Reflex

By A. P. Peck

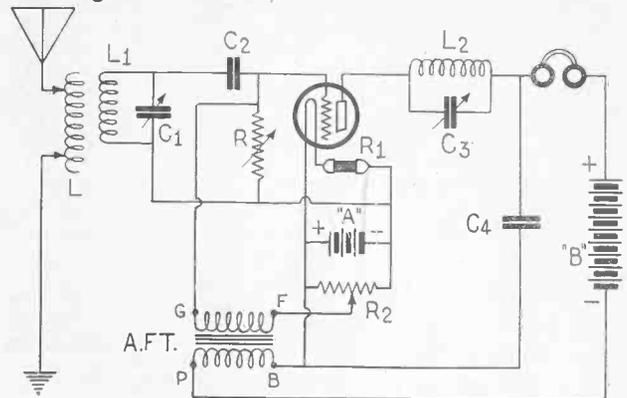
Associate, Institute of Radio Engineers

AFTER several weeks of intensive research and experimenting I have developed the 1-tube reflex published in Radio World, issue of July 12, to a point that makes it one of the most interesting and inviting of reflexes. The critical tuning present in my original circuit has been eliminated. As new paths were being blazed, naturally there was room for improvement.

The outstanding trouble seemed to be with the radio-frequency transformer. Research showed that its function was nothing more or less than that of a feedback coil and that radio-frequency amplification was obtained by means of regeneration. With this point in mind it was comparatively easy to solve the problem. Fixed radio-frequency transformers as a whole are not designed for the work that they had to do in the original circuit and they worked well only on a small band of wavelengths. This is true almost regardless of the type used, although some worked better than others. A transformer that works well over a broad band must be tuned. But why use a radio-frequency transformer at all when we are dealing only with regeneration? I decided to try a tuned impedance coil in the plate circuit of the tube as well as one or two other methods that will be mentioned later.

For most successful control of oscillation I found I had to add a potentiometer. It helped so much that I was not sorry. Gradually the several problems were solved. The results were two circuits that required different instruments but gave the same effects.

In Fig. 1 we see what is practically a standard 3-circuit tuner with an audio-frequency transformer added. The constants of the circuit are: L and L1, stator and rotor respectively of a standard variocoupler (with stator tapped in units and tens); C1, a variable condenser, .0005 mfd.; C2, standard grid condenser; R, variable grid leak. The one that I used contained a liquid resistance element that could be varied by turning the containing tube. This type was not subject to temperature changes. Since I changed the constants of the Peck reflex quite some, I tried to compensate for this. One of the great helps that I found was the use of a fixed filament resistance in place of the rheostat. With a fairly hard tube this was as good as a standard rheostat and of course had the advantage of not requiring adjustment. Therefore, these resistances are shown in both of the accompanying illustrations and are indicated by R1. R2 is a standard 200 to 300 ohm potentiometer connected across the A battery. A switch should be provided so that the battery circuit can be opened when the set is not in use. L2 is a honeycomb coil, 35 or 50 turns. The condenser, C3, should have a maximum capacity of .00035 to .0005 mfd., and should be low-loss. The coil, L2, and the condenser, C3, tune the plate circuit of the tube and provide regeneration, used in this circuit instead of RF amplifi-



-Fig. 1-

PECK'S IMPROVED REFLEX (Fig. 1.), using the 3-circuit tuner, the tube functioning as detector and being reflexed for one stage of AF. The 201A or 301A type of tube is best, but 199 or 299 works well. L and L1 are the stator and rotor of a variocoupler. L should be tapped for units and tens, i. e., tapped each turn for the first ten turns and once for each succeeding total of ten turns. C1 is a .0005 mfd. variable condenser (normally 25 plates); C2 a grid condenser; C3 a .00035 to .0005 mfd. variable condenser (17 to 23 plates), shunting a honeycomb coils L2, of 35 to 50 turns. R is the grid leak, connected directly from the grid post of the socket to the A-post of the battery. R1 is a fixed filament resistance. A rheostat may be used instead. R2 is a potentiometer, 300 to 400 ohms. The midpoint of R2 goes to the F post (S2 on some instruments) of the AF transformer. C4 is .001 mfd. Use 45 volts of B battery.

cation. C4 is a fixed phone condenser, .001 mfd. I had very good results with the Federal and the Shermatran AF transformers. When connecting the transformer be sure that the leads are joined to the proper binding posts as indicated in the illustrations.

The circuit given in Fig. 2 is the Peck reflex applied to a so-called single-circuit tuner. The constants here are practically the same as in Fig. 1. The only difference is that a series variable condenser is used. This is the preferred method in this circuit and the condenser is preferable even if a coupler tapped in units and tens is used. All of the foregoing remarks relative to Fig. 1 apply to Fig. 2 also.

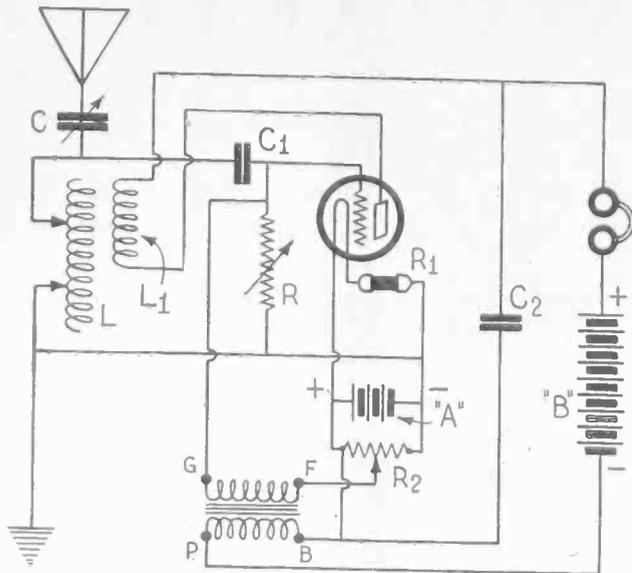
Throughout all my work, the one point kept in mind was to make the circuits work with instruments that almost all radio fans have on hand. No funny coils or special condensers were used. In fact the two circuits can be made from standard sets of the types mentioned by merely adding an audio-frequency transformer, a potentiometer and probably one or two fixed condensers.

The set may not work properly the first time or even the second. But in all cases the trouble can be traced to some fault in the wiring or in the apparatus.

Mounting Parts

Using a 7x14" panel, drill the hole for the variocoupler centershaft at left, 4" from the end of the panel. Measuring 6" to the right from the hole just drilled, bore the hole for the shaft of C1 and proceed similarly for the shaft of C3. The tube is fastened to the baseboard, behind the position to be occupied by C1. The rheostat is in front of C1 or at right of panel. If a jack is used it should be of the single-circuit type

Wiring Peck's Reflex



- Fig. 2 -

FIG. 2—Another form of Peck's Improved Reflex, using the double circuit instead of the triple one. Fig. 1 is more selective. Note that in Fig. 2 the tuning condenser is in series with the aerial. The tickler of the variocoupler is used for regeneration, instead of a honeycomb coil and condenser.

and placed at right of the rheostat. The AF transformer is placed between the condensers C1 and C3 and the tap switches at top to left of variocoupler.

Tap Switches

In connecting the switch points and taps pursue the following course: Scrape a little of the insulation off the wire taps on the stator. These are identified by the loops on the stator. To these solder the one end of each of the connecting wires that are to join these leads to the switch points. Flexible leads are preferred and this means stranded wire, insulated. However, No. 18 DCC wire or annunciator wire may be used. Leave these leads a few inches longer than necessary. Now determine just where the switch is to go. If you are making your own switch be sure to leave enough room on the panel for it in calculating your measurements. Place one switch knob above the other. Drill for the ten points that will connect to the aerial, then for the five going to the ground. After the switch holes are drilled, mount the coupler temporarily, inserting the shaft through the hole drilled in panel therefor and see just how much wire is needed for each tap lead from coil to switch point. Leave $\frac{1}{2}$ " free space and cut the wire. Then remove the coupler, after all these lengths are determined, and solder the remaining ends of these leads to lugs. These lugs are secured to the switch points with setscrews that also hold the points in place. In this way you avoid most uncomfortable soldering after the coupler and switch are permanently mounted.

Wiring Directions

1. Connect the A plus direct to the F plus post of the socket, also to one side of the potentiometer R2 and to the B post of the AF transformer, sometimes designated P2. The A minus is connected from the battery to one side of the fixed resistance, R1, the other end of this resistance going to the F minus post of the socket. Connect the A minus to the remaining side of R1.

2. Connect the aerial to the knob controlling one series of tap switches (ten switch points being advisable) and connect the ground to the other tap switch knob. The tap switch connections to the coupler stator have been described previously in this article.

3. Connect the beginning to L to one side of the grid condenser C2 and to the stator plates of the variable condenser C1. Connect the end of L1 to the rotor plates of this condenser and to the minus A on the battery or the battery side of the fixed resistance. Do not connect this lead to the socket side of the resistance.

4. Connect the P post of the socket to one side of the variable condenser C3 and to the beginning of the honeycomb coil, L2. The end of L2 goes to the remaining side of C3 and to one side of the fixed condenser C3, this lead also connecting to one of the phones. If a jack is used, the lead goes to one of the springs of the single-circuit jack.

5. Connect the other phone or jack spring to B plus 45 volts and connect the B minus to the P post (sometimes designated P1) of the AF transformer. The B post, or P2, is connected to the remaining unconnected side of the fixed condenser C4. The G on the transformer (S1 on some transformers) goes to the grid post of the socket. The F post or S2 on the AFT goes to the midpoint of the potentiometer.

Before testing for signals, disconnect the lead to B plus and see if the tube lights. If it does, reconnect the B plus lead.

List of Parts

One standard variocoupler, stator tapped in units and tens. (1 LL1)

Two 4" dials.

One double tap switch, or a series of switch points for making ten connections controlled by one knob and 4 or 5 controlled by another.

One low-loss variable condenser, .0005 mfd., normally 23 plates. (C1)

One variable condenser, .00035 mfd. to .0005 mfd., normally 17 to 23 plates. (C3)

One 50-turn honeycomb coil. (L2)

One fixed condenser, .001 mfd. (C4)

One audio-frequency trans-

former, 5-to-1 or 6-to-1 ratio. (AFT)

One 300 or 400 ohm potentiometer, R2.

One fixed resistance or rheostat, R1.

One variable grid leak, R.

One cabinet, 7 x 14".

One panel, 7 x 14".

One pair of earphones.

One tube (201A or 301A preferred).

One socket to match tube.

One A battery to match tube.

One B battery, 45 volts.

Note: As this set can work nearby locals on a loud speaker, if such operation is desired a speaker should be purchased also.

Why Battery Readings Differ

A HIGH gravity storage battery has a greater percentage of sulphuric acid in the electrolyte or battery solution, and is fully charged when the hydrometer reads 1.285. The full charge reading of a low gravity battery is 1.250. Automobile storage batteries are generally high gravity. A low gravity battery generally lasts longer because the acid solution is not as strong.

Restoring Tube's Sensitivity

WHEN the 199 or 299 tube is subjected to excessive A battery current the tube is likely to lose its sensitiveness. The tube can generally be restored by disconnecting the B battery and operate the set as usual for about twenty minutes, with the A battery current 10 per cent. in excess of the normal rating. Some tubes require more than a twenty-minute test to bring the tube back to normal.

Buying a Complete Set

By *N. N. Bernstein*

Technical Editor

YES, brother radio fans, we are all getting the same old thrill—old, yet ever new, like life, love and marriage. The exquisite thrill is of knowing that DX is in the air, winging its untrammelled way through everlasting space. You wonder if the old radio set is going to eclipse its record of last year. You wonder if you really ought to live up to your promise made during the Summer that you would build a new and up-to-date receiver with the most modern improvements. Or maybe you want to donate the old set to your cousin, nephew or uncle and wish to buy a complete outfit all “ready to wear,” something that will look like a real piece of furniture in the home.

Almost weekly a new set appears on the market. But there are only two fundamental tube circuits, regenerative and radio-frequency. This, of course, leaves out the crystal set.

Reflex circuits are merely radio-frequency or regenerative circuits so wired as to use one or more tubes twice, obtaining amplification without the use of extra tubes.

Referring to the table, under the head of Regenerative Circuits, first comes the single-circuit regenerative set. This type uses a variometer and condenser for tuning and regeneration. It depends entirely on circuit oscillation for its ability to pick up signals. Properly designed, this set is fairly sensitive, but as oscillation is almost continually present, and because tuning is rather broad, this circuit has almost passed out of popular use. Its great drawback is that it radiates energy from the oscillating detector, which oscillation travels for great distances and is heard in every receiver, sometimes for several square miles around. Thus, the single circuit type of set is obnoxious to those radio fans who understand the serious annoyance its squealing causes to others.

The double-circuit receiver, employing either two honeycomb coils or a variocoupler, is almost in the same class as the single circuit outfit in that it is great “squealer” or oscillator. The tuning with this circuit is a great deal sharper than with the single circuit set, but still it is fast going into disuse simply on account of its annoying proclivities.

The 3-circuit honeycomb coil set employs one coil for the primary, another for the secondary and a third as the tickler or regenerator coil. This circuit is more stable in operation than those previously mentioned, and oscillation is easily controlled. In this class there is also the three-circuit set using variometers for grid and plate tuning (the plate tuning regulates the regeneration) and the three-circuit set using aperiodic primary (untuned), condenser tuned secondary and tickler coil regeneration.

The variometer circuit uses a variocoupler to tune the antenna, and one variometer in series with the grid of the detector tube and secondary of the coupler to tune the grid, and another variometer in the plate circuit for regeneration. This set is probably the most difficult of all sets to tune, but really remarkable results are had from this circuit by persons who have long experience in tuning. When all three circuits are correctly balanced there is an extraordinary degree of sensitivity and regenerative amplification obtained.

In the same class comes the last-named of the 3-circuit sets, the one using a fixed or aperiodic primary. The secondary circuit of this type of set is tuned with a variable condenser and incidentally it is the grid of the detector that is thus tuned. The regeneration is controlled by the movable tickler coil, or rotor. This circuit is very selective and sensitive, bringing in sta-

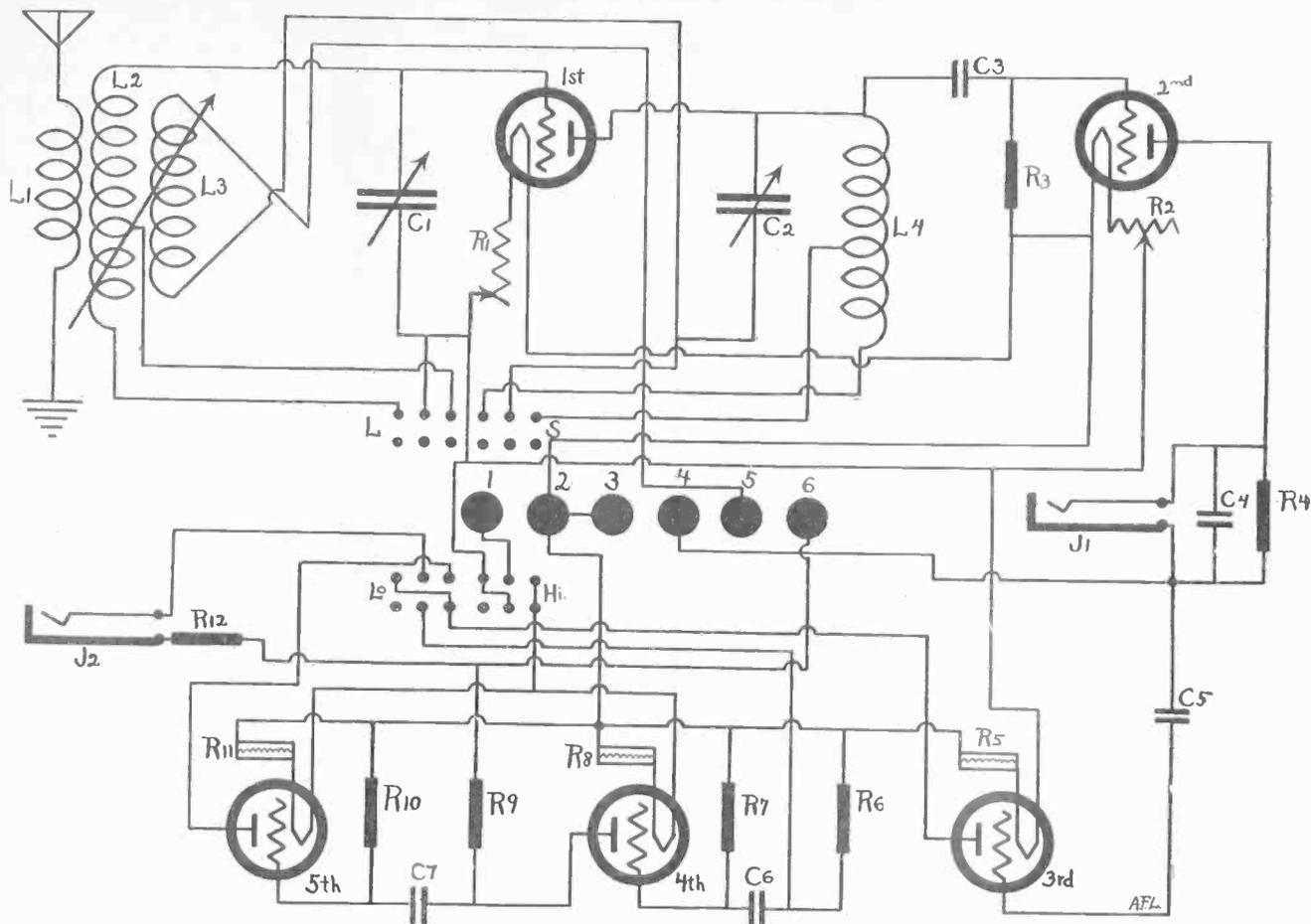
tions at great distances, under favorable conditions. These three 3-circuit sets are all squealers if improperly operated, but as oscillation is easily controlled, and also because the radio public is fast learning how to operate such circuits without interfering with neighbors, this type remains in popular demand. No interference is caused by this type of circuit if the detector is not caused to go into oscillation. This is accomplished by tuning the set to the actual voice or music of the radiocasting station, rather than first picking up the whistle or carrier wave.

The most recent development in regenerative circuits is the commercial adaptation of the Super-Heterodyne principle, known and used for several years experimentally before its perfection for the public. The Super-Heterodyne in its original commercial form employed eight tubes. The first tube was an ordinary detector, the second an oscillator, the next three intermediate frequency transformers, the sixth tube another detector and the last two audio-frequency amplifiers. The first tube rectified the signals brought in from the outdoor or loop antenna and impressed them on the second tube, which was in a continual state of oscillation. The second tube or oscillator may be likened to a miniature transmitting station. The voice from the first tube impressed itself on the carrier wave of the oscillator, which is in turn amplified three times. The resultant signal was again detected by the second detector (sixth tube) and the signal amplified twice at audible frequencies for the loud speaker. Properly constructed and operated, the Super-Heterodyne is the most sensitive set extant.

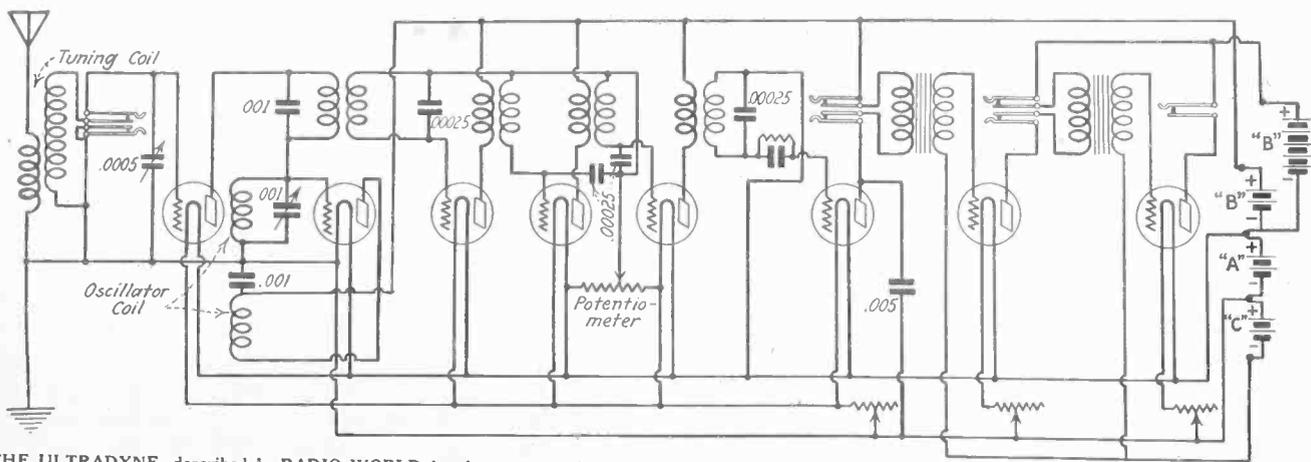
Under the head of radio-frequency we have not many choices. The first RF sets used fixed transformers, having the most efficient amplification peak at a predetermined wavelength, and because of that fact would only work well over a narrow band of frequencies. Next came the tuned radio frequency sets, employing the well known Neutroformers or similar coils. These transformers are tuned with variable condensers, thus giving high amplification efficiency over the entire wavelength of the transformers. The tuned radio-frequency circuit has developed into the most popular circuit in use today, owing to its great sensitivity and selectivity, and to the ease with which the set may be tuned for any desired station. As tuned RF circuits have a tendency towards self-oscillation, small capacities are placed between the grids and plates of the RF tubes to prevent this oscillation, and thereby prevent the set from sending out energy to interfere with other receiving sets. This is the neutralization. Some RF sets employ compensating coils which do not need neutralization. There are also some sets using a combination of fixed and tuned RF, but the general demand is for straight tuned RF. There are very few commercial sets using RF amplification employing variable inductances as tuning elements, probably because they are so difficult of quantity and quality factory production.

Reflex sets use either tuned radio frequency amplification or regeneration as a primary means of building up the signals. Commercially, either crystal or vacuum tube is used for detection. The drawback to crystal detection is that sooner or later the sensitivity of the crystal is destroyed due to the excessive strength of the signals, and the presence of a local battery current, which, although not directly in the crystal circuit, induces a current into that circuit. Of course, one tube is saved by the use of a crystal detector, and in cases where there is only one stage of RF, the

Circuits Fans Rave About



THE LATEST DEVELOPMENT of the Superdyne circuit, using low-loss coils and condensers throughout. It uses 3 stages of resistance-coupled audio-frequency amplification. The substitution of resistance for transformer amplification reduces the cost of the complete outfit. The two cam switches used provide the change-over facilities from short to long waves if taps are desired, and the other cam switch the high and low volume of the amplifiers. The new Superdyne, described fully in RADIO WORLD in the issues of August 23 and 30, is a sure-fire set.



THE ULTRADYNE, described in RADIO WORLD for August 30 and September 6, is a Super-Heterodyne. Provision is made for the use of outdoor antenna or a loop. Two tuning controls are used, one for the antenna and the other for the oscillator.

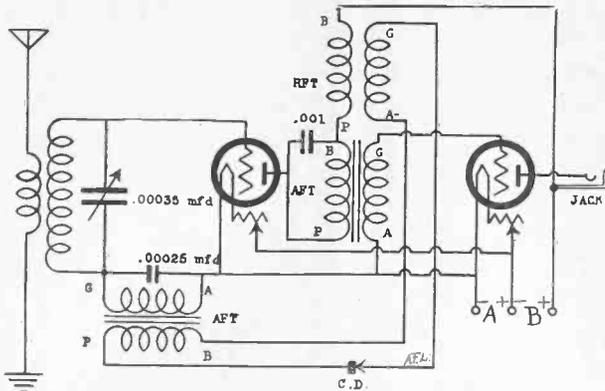
tubes used. Although they are not supposed to, many reflex sets do oscillate, thereby detracting greatly from their best efficiency. As reflex sets may be successfully operated on loop antennas, they are in demand in locations where outdoor antennas are impractical.

The only commercial product that uses tuned radio-frequency, tuned grid and regeneration has met with a high degree of success everywhere, and although a bit difficult for the novice to tune it has great sensitivity that makes it a favorite.

If you are at a loss as to what to buy, go to your local radio shop and listen to sets in operation. You will be able to tell which gives what you consider the

best results. If you are located in a large city where there are a number of radiocasting stations, you will require a set that is very selective. Bear that in mind, so there will be no regrets later at your selection. Super-Heterodyne, Neutrodyne and 3-circuit tuner are in that class, also reflexes and the Superdyne. If you are situated in the country, far from any station, you will need an extra sensitive set, where selectivity may be sacrificed. The foregoing descriptions of the various circuits will guide you as to the type of circuit which will suit your needs. The number of tubes you wish, and the quality of set you want to own will be governed largely by the dictates of your pocketbook.

A 2-Tube Reflex, 1 Control



COMBINED circuit diagram and assembly layout of the 2-tube, 1-control reflex, which gives excellent tone quality (Fig. 2). The variable condenser, the only tuning control, is .00035 mfd., 17 plates, and should be low-loss. The crystal detector may be fixed or adjustable, but in the experimental set an Ambrose vernier crystal was used with excellent results, the adjustment lasting for several days, hence not being a ratable control. It is important to use an excellent crystal, one that stands up on a reflex circuit, which places more exacting demands on the crystal. The crystal may be mounted on the P post of the first audio-frequency transformer, on the baseboard or on the panel. The placement, of course, is more convenient if panel mounting is employed. The only objection to this is voiced by persons who do not regard a crystal on the panel as decorative. The Ambrose crystal is mounted behind the panel, however, and only the levers protrude. One rheostat may be used for both tubes, instead of the two shown. In that case use 20 ohms for 201A and 301A.

By Byrt C. Caldwell

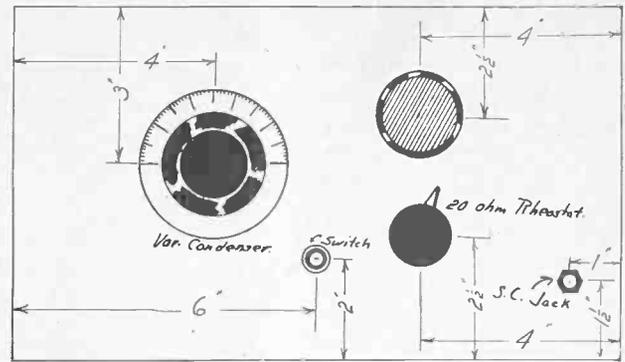
WHEN I built the 1-tube receiver described in RADIO WORLD, issue of September 20, the results were so good that I knew a 2-tube receiver, similar in design, but with one control, would be great. This receiver is described in this article.

This machine is for the person who desires more volume on the loud speaker than one tube will give. Very good volume over distance of several hundred miles is usually possible and the volume on the local stations is sufficient for the largest home.

The panel is 7" x 12" in dimensions and is made according to the layout shown in Fig. 1.

Fig. 2 shows the arrangement of the instruments and also illustrates the wiring. It is important that the arrangement of the instruments be followed as shown.

The tuned radio-frequency transformer is made from a 3" diameter bakelite radion tube, 3" long. Sixty turns of No. 24 DSC wire is wound on this. About eight layers of paper are wound over this wire and six turns of the same wire are wound in the center of the paper, in the same direction, for the primary. This transformer is fastened to the rear plate of the variable condenser, which must be one of the low-loss type. The



A PANEL 7" x 12" is used for the set. The only control is the condenser dial, which preferably should be 4" diameter. The switch is optional and would interrupt the A+. However, as rheostats are provided, but no potentiometer used, the switch, unless you have one handy, may be omitted, as it is in Fig. 2 (at left).

tube is placed so that it comes up in the middle of the tuned RF transformer.

A rheostat is included in this circuit, although it is not vital. One of the automatic filament control devices will give satisfactory results.

The antenna and ground may be brought to the front of the receiver or they may be brought out of the rear of the cabinet, the same as the battery connections.

The fixed condensers must have a mica dielectric and all installation must be bakelite, radion or some other high grade material. The reason for this is that resistance must be kept down to a minimum to allow maximum selectivity and sensitivity.

Wiring must all be done very carefully and soldering must be done so that the solder seems to flow out and join with the wires. Rosin is preferable as a flux and a large size wire (bus bar) must be used. Fig. 2 shows how the wiring is done so that results will be at their best.

The best tubes are the 201A for storage battery and 199 for dry cell use. The B battery voltage should be 90 volts for satisfactory loud-speaker operation. Up to 150 volts may be used for great volume and as low as only 45 volts if only phones are to be used.

Tuning, of course, is done with the dial only, as the rheostat is non-critical.

You will find that this receiver equals the average good 3 and 4-tube circuits of the non-reflex type. Selectivity is of a very high order if good low-loss parts are used and the wiring and soldering is carefully done. There is no howling or radiation and the tone is exceptionally good.

Does Reflexing Cut Tube's Life?

By G. E. M. Bertram
Chief Engineer, Acme Apparatus Company

THE life of a vacuum tube is not shortened nor in any way impaired when the tube is used in a properly designed reflex circuit. It is incorrect to assume that reflexing a tube exhausts the thorium coating on the filament. The only way to destroy the thorium coating on the filament is by excessive B battery voltage and excessive filament current. The way in which tubes are operated, and not the type of circuit they are used in, is the chief factor in the length of their useful service.

Any tube to amplify properly must have copious electron emission. Due to the

peculiar properties of the tube the thorium coating on the filament can often be restored by burning the tube at rated filament voltage for one and one-half times the period that the tube was burned in making it do double duty. The plate voltage is not applied to the tube when restoring the thorium.

Loss of electron emission is caused only by evaporation of the thorium on the filament. In a vacuum tube a layer of thorium atoms is formed on the surface of the filament. This layer is of high electron emissivity. As fast as atoms of thorium evaporate from the surface there is a movement of atoms inside the body of the material which places another atom in the surface layer in the same position occupied by evaporated atom, thus re-

storing the equilibrium of the thorium inside the filament.

In sets using the same tube for both radio and audio frequency amplification, the radio frequency amplification makes the receiver more sensitive; that is, it brings in the distant stations.

A LOW-LOSS 3-CIRCUIT TUNER, by Neal Fitzalan, Sept. 13 issue. Send 15 cents or start your subscription with that number. Radio World, 1493 Broadway, N. Y. C.

A DX SET ON 5" x 5" PANEL, 1-Tube Regenerator, by Herman Bernard. Sept. 13 issue of Radio World. Send 15 cents or start your subscription with that number. Radio World, 1493 Broadway, N. Y. C.

RHEOSTATS, by A. P. Peck, in Radio World, issue of Sept. 13. Send 15 cents.

New and Revised List of U. S.

STATIONS

Complete and Up-to-Date

HEREWITH is published a complete list of all the radiocasting stations in the United States. This list contains 521 stations, the number holding licenses on September 19, the date to which the list was compiled.

The call letters are given, the name of the station owner, the location of the station and the wavelength in both meters (M) and kilocycles (K).

Table with columns: Call, Owner, Location, M, K. Lists radio stations across the United States, including entries like KDKA-W'tghouse Co., E Pittsb'gh, Pa. 326 920 and KFLB-Signal Mfg. Co., Menominee, Mich. 248 1210.

Call	Owner	Location	M	K	Call	Owner	Location	M	K	Call	Owner	Location	M	K
WCBC	H. S. Williams	Pacagoula, Miss.	236	1270	WHAM	Univ. of Rochester	Rochester, N. Y.	283	1060	WPAJ	Doolittle Radio Corp.	New Haven, Conn.	268	1120
WCBI	Nicoll, Duncan & Rush	Bemis, Tenn.	225	1330	WHAP	Otta & Kuhns	Decatur, Ill.	360	830	WPAK	N. Dak. Agr. College	Agricultural College, N. D.	360	620
WCBJ	J. C. Mans	Jennings, La.	242	1230	WHAR	Par. R. & E. Co.	Atlantic City	231	1300	WPAL	Superior Rad. Tel. & Equip. Co.	Columbus, Ohio	286	1050
WCBK	E. R. Hall	St. Petersburg, Fla.	266	1130	WHAS	Courier-Journal Times	Louisville, Ky.	400	750	WPAM	Auerb's & Guettel	Topeka, Kan.	360	830
WCBL	N. Radio Mfg. Co.	Houlton, Me.	280	1070	WHAV	Wilmington Elec. Spec. Co.	Wilmington, Del.	360	830	WPAP	T. D. Philips	Winchester, Ky.	360	830
WCBM	Charles Swartz	Baltimore, Md.	229	1310	WHAZ	Rensselaer Pol. Inst.	Troy, N. Y.	380	760	WPAQ	Gen. Sales & Eng. Co.	Frostburg, Md.	360	830
WCBN	J. Boland, Ft. Ben	Harrison, Ind.	266	1130	WHB	Sweeney Sch. Co.	Kan. City, Mo.	411	730	WPAR	Ward Bat. Co.	Beloit, Kan.	236	1270
WCO	Radio Shop, Inc.	Memphis, Tenn.	250	1200	WHK	Radio Box Co.	Cleveland, Ohio	283	1060	WPAU	Concordia Col.	Moorehead, Minn.	360	620
WCOB	1st Baptist Ch.	Nashville, Tenn.	236	1270	WHN	Loew's Theatre	N. Y. C.	360	830	WPAZ	Dr. J. R. Koch	Charleston, W. V.	273	1100
WCBR	Univ. of Miss.	Oxford, Miss.	242	1240	WHO	Bankers Life Co.	Des Moines, Ia.	526	570	WQAA	H. A. Beale	Parkeburg, Pa.	360	830
WCBT	Clark Univ.	Worcester, Mass.	234	1180	WHI	Mich. L. & C. Co.	Rogers, Mich.	300	1000	WQAC	E. B. Gish	Amarillo, Texas	360	830
WCBU	Arnold Wire. Co.	Arnold, Pa.	253	1260	WIAB	Joslyn Auto Co.	Rockford, Ill.	252	1190	WQAE	Moore Radio	Springfield, Vt.	275	1090
WCBV	Tullah's R. C.	Tullahoma, Tenn.	252	1190	WIAC	Gal'ston Tribune	Galveston, Tex.	360	830	WQAF	Sandusky Register	Sandusky, O.	240	1250
WCBW	G. P. Rankin, Jr.	Macon, Ga.	226	1330	WIAD	H. R. Miller	Philadelphia, Pa.	254	1180	WQAL	Coles Co. Tel. & Tel. Co.	Mattoon, Ill.	258	1160
WCBY	Forbes Elec. Shop	Buck Hill Falls, Pa.	268	1120	WIAG	Jour'l-Stock'n Co.	Omaha, Neb.	278	1080	WQAM	Elec. Equip. Co.	Miami, Fla.	283	1060
WCBZ	Copotelli Bros.	Chgo. Hts. Ill.	248	1210	WIAO	School of Eng.	Milwaukee, Wis.	246	1220	WQAN	Scranton Times	Scranton, Pa.	280	1070
WCK	Stix-Baer & Co.	Fuller Co. St. Louis, Mo.	360	830	WIAQ	Chronicle Pub. Co.	Marion, Ind.	226	1330	WQAO	Calvary Baptist Chr.	N. Y. C.	360	830
WCX	Detroit Free Press	Detroit	517	580	WIAS	Home Elec. Co.	Burlington, Ia.	360	830	WQAP	W. Tex. Rad. Co.	Abilene, Tex.	285	1050
WCY	Tampa Daily Times	Tampa, Fla.	360	830	WIAU	Am. T. & S. Bank	Le Mars, Ia.	360	830	WQAX	Prince-Walter Co.	Lowell, Mass.	266	1130
WDAE	Kan. City Star	Kan. City, Mo.	411	730	WIAY	Woodward & Lathrop	Washington, D. C.	273	1100	WQAZ	Rad. Equip. Co.	Peoria, Ill.	360	830
WDAF	J. L. Martin	Amarillo, Texas	263	1140	WIL	Continental Elec. Sup. Co.	Washington, D. C.	360	830	WQB	Calumet-Rainbo Co.	Chicago, Ill.	448	670
WDAH	Trinity Church	El Paso, Texas	268	1120	WIK	K. & L. Elec. Sup. Co.	McKeesport, Pa.	360	830	WRAB	B. of P. Ed.	Savannah, Ga.	360	830
WDAJ	A & W P R R Co.	Chgo. Park, Ga.	360	830	WIP	Gimbel Bros.	Philadelphia, Pa.	509	590	WRAL	Nor. S. P. Co.	St. Croix Falls, Wis.	248	1210
WDAP	Board of Trade	Chicago, Ill.	360	830	WJAB	Ann. Elec. Co.	Lincoln, Neb.	229	1310	WRAN	Black Hawk Elec. Co.	Waterloo, Iowa	236	1270
WDAR	Lit. Bros.	Philadelphia	395	760	WJAD	Jackson's R. E. L.	Waco, Tex.	360	830	WRAO	Radio Ser. Co.	St. Louis, Mo.	360	830
WDAS	S. A. Waite	Worcester, Mass.	360	830	WJAG	Norfolk D'ly News	Norfolk, Neb.	283	1060	WRAR	J. C. Thomas	David City, Neb.	226	1330
WDAU	Slocum & Kilburn	New Bedford, Mass.	360	830	WJAK	C. L. White	Norfolk, Neb.	360	830	WRAY	Antioch Col.	Yellow Sprgs, O.	242	1240
WDAY	Fargo Radio Co.	Fargo, N. D.	244	1280	WJAM	D. M. Perham	Greentown, Ind.	254	1180	WRAW	Ave. Radio Shop	Reading, Pa.	360	830
WDBB	A. H. White Co.	Taunton, Mass.	229	1310	WJAN	Peoria Star	Peoria, Ill.	280	1070	WRAX	Flaxon's Garage	Gloucester City, N. J.	268	1120
WDBC	Kirk, Johnson & Co.	Lancaster, Pa.	258	1160	WJAO	Capper Pub.	Cedar Rapids, Ia.	268	1120	WRAZ	Radio Shop	Newark, N. J.	233	1290
WDBD	H. E. Buns	Martinsburg, W. Va.	268	1120	WJAR	Outlet Co.	Providence, R. I.	360	830	WRC	Radio Corp. of Am.	Washington	469	640
WDBF	R. G. Philips	Youngstown, O.	246	1220	WJAS	Pittsburgh Radio Sup. House	Pittsburgh, Pa.	250	1200	WRCB	Emmanuel Luth. Church	Valparaiso, Ind.	278	1080
WDBH	C. T. Sherer Co.	Worcester, Mass.	268	1120	WJAX	Union Trust Co.	Cleveland, O.	390	760	WRK	Doron Bros.	E. Co. Hamilton, O.	360	830
WDBI	Radio Spec. Co.	St. Petersburg, Fla.	226	1330	WJAZ	Chicago Rad. Lab.	Chicago	448	670	WRL	Univ. Col.	Schenectady, N. Y.	360	830
WDBJ	Richardson-Wayland Elec. Co.	Roanoke, Va.	229	1310	WJD	Dennison Univ.	Granville, O.	229	1310	WRM	Univ. of Ill.	Urbana, Ill.	360	830
WDBL	Wisc. Dept. of Markets	Stevens Point, Wisc.	278	1080	WJY	Radio Corp. of Am.	N. Y. C.	405	740	WRR	City of Dallas	Dallas, Tex.	360	620
WDBN	Elec. Light & Power Co.	Bangor, Me.	252	1190	WJZ	Radio Corp. of Am.	N. Y. C.	455	660	WRW	Tarrytown Radio Res.	Tarrytown, N. Y.	273	1100
WDBO	Rollins College	Winter Park, Fla.	240	1250	WKA	H. F. Paar	Cedar Rapids, Ia.	360	830	WSAB	S. E. Mo. State Teachers Col.	Cape Girardeau, Mo.	360	830
WDBP	State Normal School	Superior, Wisc.	261	1150	WKAP	U. S. Radio Sup. Co.	Wichita Falls, Texas	360	830	WSAC	Clemson Agr. College	Clemson College, S. C.	360	830
WDBQ	Morton Radio Sup. Co.	Salem, N. J.	234	1280	WKAN	Un. Bat. Co.	Montgomery, Ala.	226	1330	WSAD	J. A. Foster Co.	Providence, R. I.	261	1150
WDBR	Tremont Temple	Boston, Mass.	256	1170	WKAP	D. W. Flint	Cranton, R. I.	360	830	WSAL	U. S. Play. Card Co.	Cincinnati	390	970
WDBS	S. M. K. Radio Corp.	Dayton, Ohio	283	1060	WKAQ	Radio Corp. of P. R.	San Juan, Porto Rico	360	830	WSAJ	Grove City Col.	Grove City, Pa.	360	830
WDBT	Taylor's Book Store	Hattiesburg, Miss.	236	1270	WKAR	Mich. Agr. Col.	E. Lansing, Mich.	280	1070	WSAP	7th Day Adv. Chr.	N. Y. C.	263	1140
WDBU	Somerset Radio Co.	Skowhegan, Me.	258	1160	WKAY	WKY Radio Shop	Oklahoma City, Okla.	360	620	WSAR	Doughty & Welch Elec. Co.	Fall River, Mass.	254	1180
WDBV	Strand Theatre	Fort Wayne, Ind.	258	1160	WLAG	Cutting & Walsh	Radio Corp., Minneapolis, Minn.	417	720	WSAU	C. Marienfeld	Chesham, N. H.	229	1310
WDBX	Otto Bauer	New York City	233	1290	WLAH	S. Woodworth	Syracuse, N. Y.	234	1250	WSAX	Chicago R. Lab.	Chicago	268	1120
WDBZ	Boy Scouts Ama.	Kingston, N. Y.	233	1290	WLAL	Naylor Elec. Co.	Tulsa Okla.	360	830	WSAY	Irv. Austin	Portchester, N. Y.	230	1300
WBOI	E. B. Peddicord	New Orleans	242	1240	WLAP	W. V. Jordan	Louisville, Ky.	360	830	WSAZ	Chase Radio Co.	Pomeroy, O.	258	1160
WBOC	Ch. of Covenant	Wash'ton, D. C.	234	1280	WLAQ	A. E. Schilling	Kalamazoo, Mich.	283	1060	WSB	Atlanta Journal	Atlanta, Ga.	429	700
WBDJ	J. L. Bush	Tuscola, Ill.	248	1210	WLAW	Elec. Shop	Pensacola, Fla.	254	1180	WSL	J. & M. Elec. Co.	Utica, N. Y.	273	1100
WDEA	Fallain & Lathrop	Flint, Mich.	280	1070	WLAX	Police Dept.	N. Y. C.	360	830	WSY	Ala. Pow. Co.	Birmingham, Ala.	360	830
WDEB	W. E. Co. (A. T. & T.)	N. Y. C.	492	610	WLB	Putnam E. Co.	Greencastle, Ind.	231	1300	WTAB	Fall River Daily Herald	Fall River, Mass.	248	1210
WDEI	Wichita B. of T.	Wichita, Kan.	244	1230	WLB	Univ. of Minn.	Minneapolis, Minn.	360	830	WTAC	Penn. Traf. Co.	Johnstown, Pa.	275	1090
WDEJ	Cornell Univ.	Ithaca, N. Y.	286	1050	WLB	Sears Roebuck Co.	Chicago, Ill.	345	870	WTAF	J. Gallo	New Orleans, La.	268	1120
WDEK	Univ. of S. D.	Vermillion, S. D.	280	1070	WLC	Crosley Mfg. Co.	Cincinnati, O.	309	970	WTAG	Kern Mus. Co.	Providence, R. I.	258	1160
WDEP	Borough, North Plainfield	N. J.	252	1190	WMA	C. B. Meredith	Cazenovia, N. Y.	261	1150	WTAH	Carmen Ferro	Belvidere, Ill.	236	1270
WDEQ	Shepard Co.	Providence, R. I.	273	1130	WMAF	Round Hills Radio Corp.	Dartmouth, Mass.	360	830	WTAJ	The Radio Shop	Portland, Me.	236	1270
WDEA	State Univ.	Columbus, O.	360	830	WMAH	Gen. Sup. Co.	Lincoln, Neb.	254	1180	WTAL	Swan-Bower Co.	Steubenville, O.	266	1130
WDEB	Mobile Radio Co.	Mobile, Ala.	360	620	WMAK	Norton Lab.	Lockport, N. Y.	273	1100	WTAM	Toledo Rad. & Elec. Co.	Toledo 252	190	
WDEU	Davidson Bros. Co.	Sloux City, Iowa	360	830	WMAJ	Trenton Hw. Co.	Trenton, N. J.	256	1170	WTAN	Willard Stge. Bat. Co.	Cleveland 390	776	
WEAY	W. Horowitz	Houston, Texas	360	830	WMAK	Broad St. Bap. Ch.	Columbia, O.	286	1050	WTAP	Cambridge Rad. Elec. Co.	Cambridge, Ill.	242	1240
WEB	Benwood Co.	St. Louis, Mo.	360	830	WMAQ	Utility Bat. Ser.	Easton, Pa.	246	1270	WTAQ	S. Van Gordon	Oseo, Wis.	226	1330
WEBB	Electric Shop	Highland Park, N. J.	233	1290	WMAV	Ala. Poly. Inst.	Auburn, Ala.	250	1200	WTAR	Reliance Rad. & Elec. Co.	Norfolk, Va.	280	1070
WEBC	W. C. Bridges	Superior, Wisc.	242	1240	WMAW	Kingshighway Pres. Church	St. Louis, Mo.	280	1070	WTAS	G. D. Carpenter	Elgin, Ill.	275	1090
WEBD	Elec. Equip. & Svc. Co.	Anderson, Ind.	246	1220	WMAZ	Mercer Univ.	Macon, Ga.	261	1150	WTAU	Ruegg Bat. & Elec. Co.	Tecumseh, Nebr.	360	830
WEBE	Third Ave. R. R. Co.	N. Y. C.	273	1100	WMC	Com. Appeal	Memphis, Tenn.	500	600	WTAW	Agri. & Mech. College	College Stations, Tex.	254	1180
WEBF	Grand Rapids Radio Co.	Grand Rapids, Mich.	261	1150	WMU	Doubleday-Hill Elec. Co.	Washington, D. C.	261	1150	WTAX	Williams Hdwe. Ofg. Co.	Streator, Ill.	231	1300
WEBG	Radio Corp. of Am. (portable)		226	1330	WNAC	Shepard Stores	Boston, Mass.	278	1080	WTAY	The Oak Leaves	Oak Park, Ill.	226	1300
WEBH	Radio Co.	Hamilton, O.	250	1200	WNAD	Univ. of Okla.	Norman, Okla.	360	830	WTAZ	T. J. McGuire	Lambertville, N. J.	280	1070
WEBI	Hurlbert-Still Elec. Co.	Houston	263	1140	WNAL	R. J. Rockwell	Omaha, Neb.	242	1240	WTG	Kans. State Agr. College	Manhattan, Kan.	360	830
WEBJ	St. Louis Univ.	St. Louis, Mo.	261	1150	WNAN	Pec. T. & C. Co.	Knoxville, Tenn.	236	1270	WTK	H. G. Saal Co.	Chicago	268	1120
WEBK	Dallas News & J'r'l	Dallas, Texas	476	620	WNAP	Wittenberg Col.	Springfield, O.	230	1300	WWAD	Wright & Wright, Inc.	Philadelphia, Pa.	360	830
WEAF	C. F. Woese	Syracuse, N. Y.	234	1280	WNAR	C. Rhodes	Butler, Mo.	231	1300	WWI	Ford Motor Co.	Dearborn, Mich.	273	1100
WEAG	Times	St. Cloud, Minn.	485	620	WNAT	Lenning Bros. Co.	Philadelphia 360	830	WWJ	Detroit News	Detroit	517	580	
WEAH	Hutchinson Elec. Ser. Co.	Hutchinson, Minn.	286	1050	WNAW	Pen. R. C.	Pt. Monroe, Va.	360	830	WWL	Loyola Univ.	New Orleans	280	1070
WEAV	U. of Neb. Dept. of Elec. Eng.	Lincoln, Neb.	275	1090	WNAZ	Dakota Radio Ap. Co.	Yankton, S. Dak.	244	1280	WWT	McCarthy Bros. & Ford	Buffalo	360	830
WEBC	Concours Radio Co.	N. Y. C.	273	1100	WOAB	Val. Radio	Grand Forks, N. D.	280	1070					
WEBC	Ainsworth Radio Co.	Cincinnati	309	970	WOAC	Mausy Radio Co.	Lima, Ohio	266	1130					
WEBC	Strawbridge & Gotsier	Philadelphia	395	760	WOAD	Friday Bat. & Elec. Corp.	Sigourney, Iowa	360	830					
WEBC	Lancaster Elec. Sup. Co.	Lancaster, Pa.	248	1210	WOAE	Midland Col.	Fremont, Neb.	360	830					
WEBC	E. Lloyd	Pensacola, Fla.												

Constructing a Telephone Relay for Tubeless AF

[In RADIO WORLD, issues of September 13 and 20, was published a 2-part article by the Rev. Henry A. Judge, S.J., describing a selective crystal set and the use of a telephone relay, or tubeless amplifier, in conjunction with it. A loud speaker was successfully operated. The following article tells how to build the relay.]

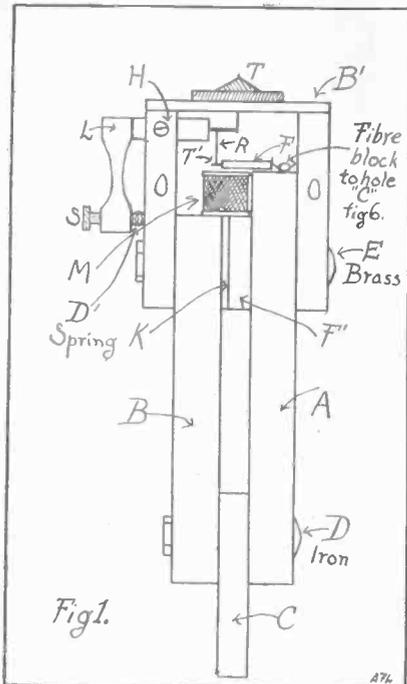


Fig. 1. A WORKING drawing of the complete relay each part lettered for ease of assembly. Care should be taken that all parts are screwed together tightly so that there will be no chance for weakened magnetic currents.

By A. F. Lapierre

Consulting Engineer

A TELEPHONE relay is an electro-mechanical device that receives audible currents and retransmits them in amplified form. A battery, called the "local battery," is required to supply the current whose flow through a microphone is altered by the relay. No tubes are needed to operate a telephone relay and no B battery. The changes in audible frequencies, such as the frequencies of voice, cause corresponding changes of a lever in the relay. This lever actuates the microphone.

In telegraph work the incoming signal, relatively weak, actuates the relay. The relay is an automatic switch and as its contacts are opened and closed by the incoming signal it opens or closes the local battery circuit and in turn operates the sounder or other recording device. In telephone work the lever is connected to a microphone rather than to contacts and the movement of the lever compresses and releases the carbon grains in the microphone, altering its resistance and allowing a local current to flow in direct proportion to the impulse of the incoming signal on the relay magnet. The relay then is nothing more than a remote switch which may be operated at a distance either with a direct wire or by means of radio. The output or what is heard by the operator is not then the original current transmitted but the local current many times amplified by the relay. As the amplified local current is directly proportional to the incoming signal and each incoming impulse, no matter how weak, actuates the microphone, the output

is in the same order as the input. Therefore, the quality will be equal to the original signal impressed on the relay, provided that the relay is carefully constructed and the proportions maintained.

The tools required for constructing a relay are large drills, taps and several files of various shapes and degrees of roughness.

Fig. 1 shows a general assembly plan. A, B and C form a heavy horseshoe magnet, highly magnetized, and is one of the most essential parts of the relay. F is a brass block, as is O-O. L is an adjustable lever and S is the adjusting screw. T is the microphone button. The Skinderviken button is just the thing to use in this place. R is a loop cut out of a piece of light tin or brass, preferably tin. M is the electro-magnet mounted on its core, K, the whole of which is mounted on the leg B of the permanent magnet. F is the armature which vibrates and causes the microphone to vary its resistance in proportion to the pull exerted by the electro-magnet M, which is dependent on the current impressed on its windings.

Three pieces of high carbon (60 point) tool steel are required, one of which is $3'' \times \frac{3}{8}'' \times \frac{3}{4}''$; the other $3\frac{3}{4}'' \times \frac{3}{8}'' \times \frac{3}{4}''$; the third one, C, is $2'' \times \frac{3}{4}'' \times \frac{1}{4}''$. These pieces must be drilled and tapped before they are hardened and magnetized.

Fig. 2 is a template for drilling and machining both ends of the magnet. The two long pieces are clamped together with one end flush and the holes are laid out on the short one and centerpunched.

Fig. 3 shows the appearance of the piece after centerpunching. Then the pieces still clamped together are drilled as shown on the template; that is, the holes marked C are drilled with a No. 25 drill and tapped for 8-32 screws; the center hole is drilled $\frac{3}{16}''$ and tapped for a $\frac{1}{4}''$ screw. The pieces C, F and K are drilled clearance for these screws or No. 17 for the holes C, and 65 M. M. for the $\frac{1}{4}''$ hole. The brass pieces O-O are drilled and tapped, as are the heavy steel pieces at the lower end where they are joined by C. The upper end is drilled clearance also. Now, sum up this clearance and tap drilling; O-O is drilled and tapped as is the lower end of A and B with C. F and K are drilled clearance and are not tapped. If these latter are drilled and tapped they must be redrilled to clearance, as it is vitally important that all these parts are firmly together and have no air space between them.

Now, assemble A, B and C and bring it to a blacksmith to have it hardened. Be sure that it is an oil bath hardening job that is performed. Now, we are ready to magnetize the magnet. Make up two coils and place them over the magnet poles, being sure that the coils are in opposite directions. Each coil should have at least 200 turns of No. 18 DCC and are connected in series. The whole is then connected in series with a 100-watt lamp to a DC circuit, as shown in Fig. 4, and left there for 5 or 10 minutes, after which the magnets are fully magnetized. Now construct core K, as shown in figure 5A, which is exact size. This is cut out of $\frac{1}{16}''$ steel stock. Fig. 5B shows a fibre washer, two of which should be cut the exact size shown in the diagram.

Fig. 5C shows the electro-magnet with the fibre washer in place and wound full of wire. The winding requires extreme

care as the wire is fine and likely to break. It must be wound evenly and smoothly. A thin layer of wax paper is wound on the tab of K and a washer, Fig. 5B, is then pushed into place. The other washer is placed at the extreme end of the tab. No. 40 DSC is then wound on until the spool is full. This will require about 90 to 100 feet of wire. The spool should have 900 turns. The resistance will be approximately 75 ohms. This value is ample for crystal sets; but if for use with a vacuum tube a balancing step down transformer must be used. After the winding is in place, a covering of tape should be wound over the wire to protect it from mechanical injury.

Fig. 6A shows how the ends of O-O are machined for 8-32 brass screws, and the hole C in figure 6A is on the face of the pole piece, Fig. 1A. Fig. 6B shows the mounting plate for the microphone button. The hole E is $\frac{1}{4}''$ in diameter and the binding holes in the corners are drilled clearance. The transmitter button is centered on this and then switched on, care being exercised that it is in the exact center.

Fig. 7 shows three essential parts—lever, armature and connecting link. The lever proper is made in three parts. The arm E is $\frac{1}{4}''$ square brass stock with a slot $\frac{1}{4}''$ deep, $\frac{1}{8}''$ wide cut in on one end. The shank is cut out as shown in Fig. 7. The lower end is drilled and tapped to take a 6-32 screw. To do this drill with a No. 33 drill and run a 6-32 tap through the hole. A piece of brass $1'' \times \frac{1}{8}'' \times \frac{1}{4}''$ is now fitted in the slot and sweated in. Half way from the end spots B are made with a drill on both sides. These should not go through but should be rather shallow. On the end a piece of brass rod is tapped in and fitted to the small tip on the microphone button. This tip is marked A on the diagram. The fit here should not be a driving fit, but should be tight with no rattle, so as to allow free motion. D is a small coil spring to maintain tension on the microphone diaphragm. It consists of 3 or 4 turns of light gauge spring wire, slipped over the end of screw C, between the lever and the supporting block O. The armature, F, is cut out of $\frac{1}{16}''$ steel stock, cut to size as shown in Fig. F. On the narrow side a small hole is drilled and a piece of brass rod is forced in, making a driving fit. It is then cut off, allowing about $\frac{1}{8}''$ projecting. Fig. 7R is a small hair pin made of spring brass or steel wire, which straddles 7G and is soldered to the tip T in this diagram. This is left for the last operation. This hair pin is about $\frac{1}{4}''$ long and made of about 30-gauge wire.

The only hard part is now ready to be done—that is, the machining of the slot in block O for supporting the lever L. Fig. 8 shows how this is done. The block is perforated according to dimensions shown after drawing the section to be removed; then by the use of a file the edges are smoothed off. A small hole for No. 6 screw is drilled right through block and tapped 6-32. These screws are for holding the lever into place, and the ends are pointed to fit into the spots B in Fig. 7.

We are now ready to complete the assembly, as all parts have been made.

Refer to Fig. 1. The screws holding A, B and C together are iron; all the other screws are brass. Now assemble the winding with its core K and the brass

Detector Tube Linked with Relay

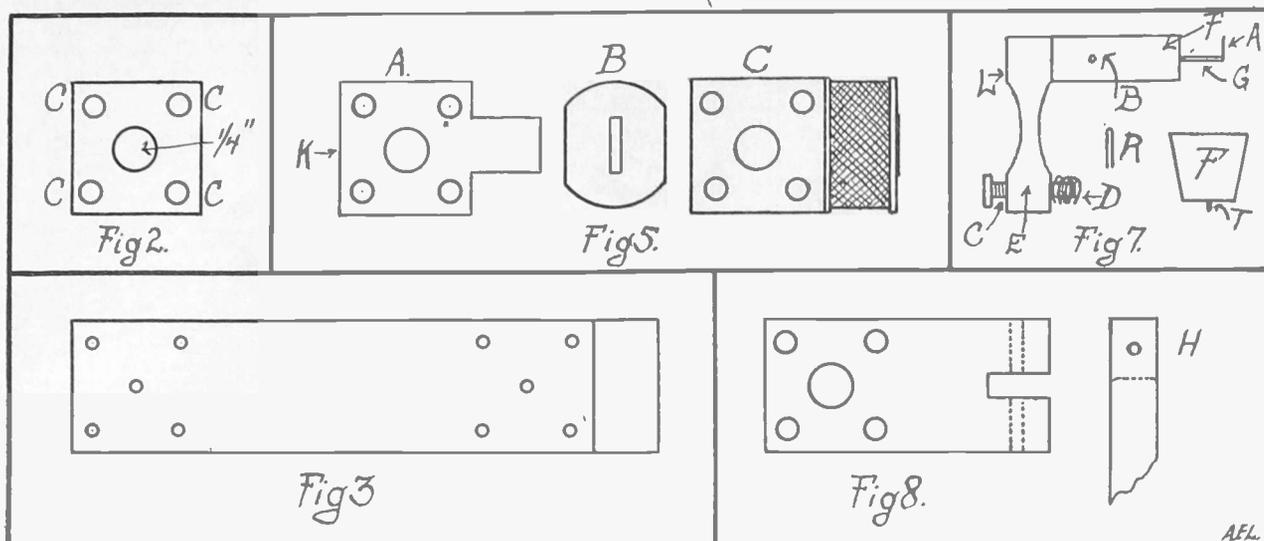


FIG. 2 is the template for laying out magnet holes. Fig. 3 shows the appearance of Block B after center-punching. Fig. 5A shows magnet core exact size cut out of 1/16" soft iron or steel; B shows fibre washer of which two are made; C is the complete electro-magnet. Fig. 7 shows the details of the lever L, armature F and the connecting link R, all exact size. The lever should be chamfered so as to reduce weight. Spot B should be a shallow drill hole. Fig. 8 gives details of the machining to be done on one of the brass blocks O. It is full size and should be transferred to the block before any work is done.

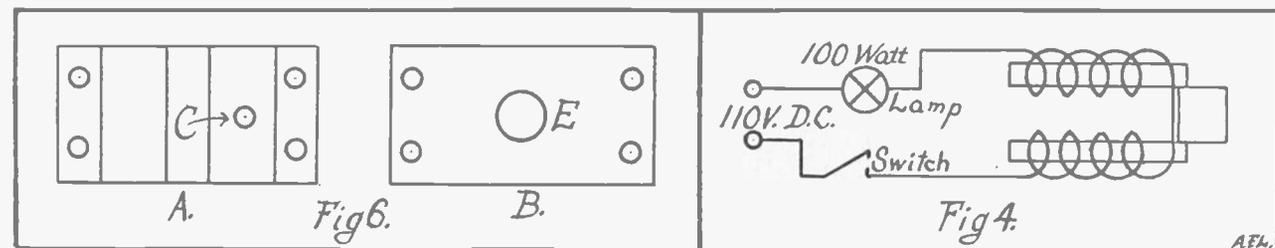


FIG. 6B gives details of microphone plate B'. Use it as a template. A shows the drilling to be done on blocks O-O for mounting the microphone T on plate B'. Fig. 4 shows the procedure to follow for magnetizing the permanent magnet ABC. Direct current should be used. That obtained from a battery charger will do. No particular care need be taken of polarity.

block F and place them between the poles A and B, the core K nearest the shorter pole. Then placing the block O-O on the outside of the poles, the one with the slot next to the short pole, screw them together with brass screws. Now, 7B is placed on top of O-O and is screwed into place with 6-32 round head brass machine screws. The lever L is now put into its slot, care being taken that the spring is in place, and the two screws that have been prepared are screwed into the spotted holes to hold it into position. See that the action is free without chattering. This being accomplished, the projection G in Fig. 7 is then made fast on the tip of the microphone button. The armature is now placed on the long pole piece and over the core K. The connecting link R is now slipped over the lever and soldered to tip T of the armature. It is advisable to place a small piece of fibre in the rear of the armature to keep it in position. This may be made fast by hole C, Fig. 6. The wiring consists of only four leads, two of which go from the magnet winding to two binding posts, and the other two from the peak of the microphone and from the screw mounted on the mica diaphragm. The input is to the coil, and the output to the loud-speaker and battery.

The instrument is now complete for crystal operation, and may be mounted in a wooden box with four binding posts mounted on the bakelite cover.

As has been mentioned before, the resistance and impedance is ample for crystal operation, but when tubes are used the amplifier will not operate efficiently, for the impedance does not match the impedance of the tube. Therefore, we must build a transformer whose primary matches the tube plate to filament impedance, and whose secondary matches that of the magnet winding. For the

primary and core, obtain an old audio-frequency amplifying transformer whose secondary has been burned out or mechanically damaged. Test the primary for an open circuit with battery and phones. If a click is heard we have a good start. Remove the secondary with a good sharp knife, being careful that the primary is not damaged.

Now wrap the primary with three or four layers of heavy wax paper and then wind 80 turns of No. 40 DSC wire. Do not end the wire here but wrap the winding with 3 layers of wax paper and wind back 80 turns more. Wrap 3 more layers of wax paper and another layer of 80 turns of wire. The result should now be

240 turns of No. 40 wire in three layers of 80 turns each. Now wrap carefully with wax paper, and impregnate the whole in molten paraffin. After the paraffin has hardened wind on a couple of turns of tape to protect the winding mechanically. The winding we have just put in constitutes the output of the transformer and is connected to the input or electro magnet of the relay. The primary is connected in the plate circuit of the vacuum tube in the set the same as a pair of phones or ordinary amplifying transformer.

The impedances now being balanced the set should work properly with the relay and if all has been properly constructed will work well.

Core RF Transformers Tuned or Untuned?

It is our contention that "tunable radio-frequency" is the correct way to handle the coupling (very necessary for the sharp tuning obtained). It is true that "fixed transformer coupled" are constructed to function over a given range, or band of waves or frequencies. They are somewhat broad (especially where they have an iron core), so we would not exactly say that they were tuned. It is apparent that where the couplings are fixed they will have a period where they operate at the same efficiency that a tuned coupling does, this being the point where the primary and secondary are in perfect resonance.

I have found that in my "Super-Het" experiments that by building up my intermediate frequency coils and using a light

iron core and tuning the secondaries that I have gotten far better results. I have gotten volume at the second detector and very sharp tuning, that is, after I have tuned the intermediate couplings to resonance and fixed the capacities.

At the Radio Show just closed here it was very apparent which type was popular. Out of perhaps 100 different makes of sets ninety-five had tuned radio-frequency. (Tunable, I should say). Neutrodyne predominated, with Super-Heterodynes running a close second. There were very few if any regenerative and scarcely any fixed or untuned RF sets.

H. S. WALLING,
U. S. Electrical Mfg. Co.,
583 Howard St., San Francisco, Cal.

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Thomas R. Coffey, Caddo, Okla.
Eugene Moisan, 74 des Prairies, Quebec, Can.
James Cunningham, Stillwater, Saratoga Co., N. Y.
John McCarthy, Stillwater, Saratoga Co., N. Y.
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Will you be good enough to tell me why my set will not operate in its cabinet? When it is out, everything comes in clear and loud. I have left the cover wide open but it makes no difference. I can only hear very faintly. I would like to know what I can do to keep the set in its cabinet.—Emily W. Brown, 1201 East Marquette Road, Chicago.

Trouble similar to yours indicates that there is something wrong with the wiring of the set. Probably when you place the panel with the attached instruments tight up against the sides of the cabinet and screw it on, that separates a loose connection, thus causing faint signals. Examine

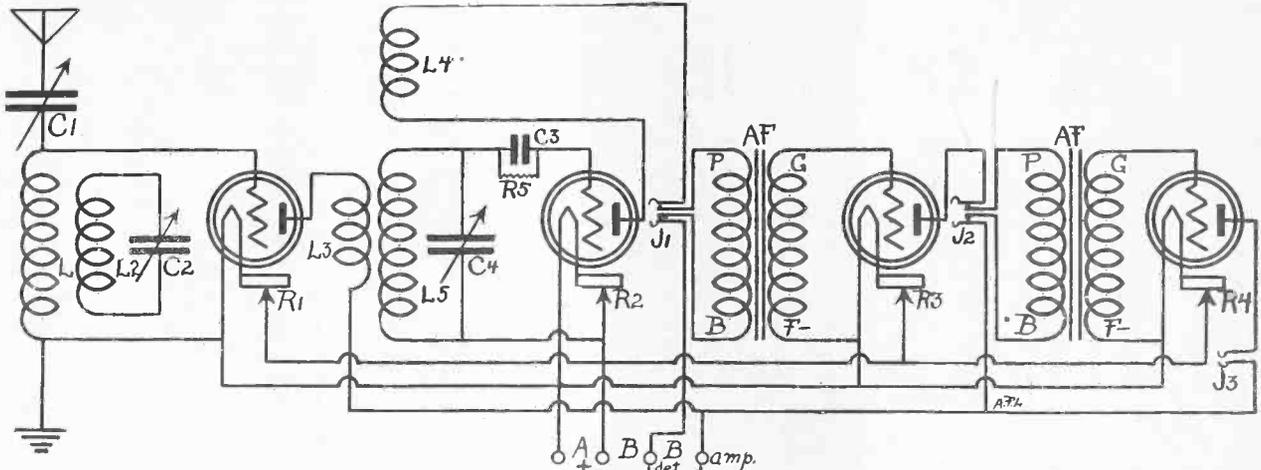


FIG. 37—Diagram of the circuit asked for by E. L. Strebe, 452 Morgan St., Tonawanda, N. Y. It is a regenerative circuit with the addition of one stage of radio-frequency amplification. Coil L2 and condenser C2 constitute the absorption circuit, functioning the same as a wave trap. The antenna is tuned with C1 and the detector grid circuit with C4.

all the soldered connections carefully and you will no doubt find the one that is causing you the trouble. Placing the set inside the cabinet should have absolutely no effect on the signals.

Is there any such thing as a set being hard on B batteries? I have a portable 3-tube set and use four 22½-volt B batteries. Their life seems to be very short. I have had the set only a few months and am on the second set of batteries now. When my B batteries start to get weak I hear a whistling sound which I cannot get rid of until I put more voltage on the plate. I use C12 tubes.—L. J. Cole, 62 N. Brockett St., Kenosha, Wis.

There is no reason why your B batteries should not last through their usual period of life. You say that your set is portable, which means therefore that you probably use the small-size batteries. This would immediately account for their apparent short life. If you use the large size battery blocks they will last for months without change. Inserting a C battery will make a B battery last longer.

Kindly tell me of a 1-tube circuit with which I can get good results.—Chester Kosiol, 1007 N. Winchester Ave., Chicago.

For a good 1-tube circuit see the article on the Dynoflex published in Radio World for August 9. This circuit will give excellent results on local and distant stations. It is a reflex, using crystal detector and an AF transformer.

1—Can a Skinderviken Microphone Button be used in radio telephony? 2—Is there any possible way in which to restore life to a run-down B battery?—Lester Rasmussen, Franksville, Wis.

1.—The Skinderviken is a miniature microphone and functions exactly the same as telephone or radio microphones. Therefore it certainly will work on small-power radio telephone sets, as it is not large enough to withstand heavy currents. 2.—No.

Kindly inform me of a good 1-tube regenerative hookup.—Paul Kanstorom, 156 South Crawford Ave., Chicago.

A good 1-tube 3-circuit set is described in Radio World for September 13. The article is complete with diagrams and constructional details.

The Radio University

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In going over my old copies of RADIO WORLD I find in the issue of August 9, under the Radio University department, Fig. 27, a diagram of a honeycomb coil regenerative set. Please inform me if one stage of radio-frequency and two stages of audio-frequency could be added to this hook-up to advantage. If so, will you please publish a diagram?—E. L. Strebe, 452 Morgan St., Tonawanda, N. Y.

Fig. 37 is the regenerative circuit as appearing in the August 9 issue with the addition of the radio and audio-frequency stages that you asked for. The absorption coil is moved over next to the radio-frequency tuning unit where it will be of the most use. Referring to the diagram, the constants are: C1, .0005 mfd, variable; C2, .0005 mfd, variable; C3, .00025 fixed; C4, .0005 mfd, variable; L, 50 turns on 3/8" tube; L2, 40 turns on 3/8" tube; L3, 10 turns on 3/8" tube; L5, 50

volts and try the set with and without grid leak. Also see that the insulation on the phone jacks is clean and free from soldering flux.

In the issue of August 16 an article by Brewster Lee on "How to Instal Charger and Batteries in Cabinet" interested me very much. I am using four blocks of 24 volts each in my storage B battery and am using my Tungar to charge them with. The attachment only charges at 2/10 amperes for each 24-volt unit, making it necessary for me to charge each one separately. Would it be possible for me to use a light bulb, as Mr. Lee suggested, so that I could charge two blocks, or 48 volts, at about ¼ ampere charging rate, which is the right rate for the battery? If this were possible I could charge it in two charges instead of four as at present. Might it be possible to charge the whole 96 volts of four blocks at one charging?—Jas. A. Slack, M.D., Friars Point, Miss.

turns on 3/8" tube; L4, 30 turns on 23/8" tube; R1, 2, 3, 4, rheostats to match tubes; R5, 2 meg. leak; J1 and 2, double-circuit jacks; J3, open-circuit jack. Coils L and L2 are wound on the same tube, and coils L3 and L5 are wound on the same tube. L4 is wound on the separate smaller size tube. All wire is No. 22SCC.

I have a 3-tube Reinartz set but cannot get very much satisfaction from out-of-town stations. I use a 201A for detector and 301A for amplifiers. Everything in the set is compact and the wiring perfect. I tried changing condensers but with no better results. My antenna is a 50-foot ribbon with 20-foot lead-in, pointing north and south. The batteries are all in good condition. What can I do to improve reception and get out-of-town stations?—Charles Kramer, 216 N. Homan Ave., Chicago.

Everything taken into consideration, your set is working well, with the exception that you are unable to pick up distant stations. You will greatly improve reception by making your antenna at least 90 or 100 feet long, raising it up as high as possible over surrounding objects. Increase the B battery voltage on the 201A detector tube to 45

There is no necessity at all for charging each 24-volt unit separately, as the proper way is to charge the entire battery at one time. Simply connect two sets of two blocks each in series, connect these two pairs in parallel, and place it on your Tungar battery charging attachment. Thus the effective charging voltage for the four blocks will be the same as for one block, as you have approximately the same resistance by placing two 48-volt units in parallel. This method is the one used by Mr. Lee in his battery charging article.

In RADIO WORLD for August 30 the first article, which is about the low-loss antenna, is very interesting. I have been using one since last April with excellent results. My antenna is about 50 feet high and 75 feet long, with a 20-foot lead-in. About what is the approximate wavelength of this antenna?—W. J. Rogers, 710 Washington St., Portsmouth, Va.

The approximate natural wavelength of your antenna is 190 meters. There may be some slight change in this figure, depending on how high above the roof or other objects the flat top part of the antenna is.

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

In going over my old copies of RADIO WORLD I find in the issue of August 9, under the Radio University department, Fig. 27, a diagram of a honeycomb coil regenerative set. Please inform me if one stage of radio-frequency and two stages of audio-frequency could be added to this hook-up to advantage. If so, will you please publish a diagram?—E. L. Strebe, 452 Morgan St., Tonawanda, N. Y.

Fig. 37 is the regenerative circuit as appearing in the August 9 issue with the addition of the radio and audio-frequency stages that you asked for. The absorption coil is moved over next to the radio-frequency tuning unit where it will be of the most use. Referring to the diagram, the constants are: C1, .0005 mfd. variable; C2, .0005 mfd. variable; C3, .00025 fixed; C4, .0005 mfd. variable; L, 50 turns on 3/8" tube; L2, 40 turns on 3/8" tube; L3, 10 turns on 3/8" tube; L5, 50

volts and try the set with and without grid leak. Also see that the insulation on the phone jacks is clean and free from soldering flux.

In the issue of August 16 an article by Brewster Lee on "How to Instal Charger and Batteries in Cabinet" interested me very much. I am using four blocks of 24 volts each in my storage B battery and am using my Tungar to charge them with. The attachment only charges at 2/10 amperes for each 24-volt unit, making it necessary for me to charge each one separately. Would it be possible for me to use a light bulb, as Mr. Lee suggested, so that I could charge two blocks, or 48 volts, at about 1/4 ampere charging rate, which is the right rate for the battery? If this were possible I could charge it in two charges instead of four as at present. Might it be possible to charge the whole 96 volts of four blocks at one charging?—Jas. A. Slack, M.D., Friars Point, Miss.

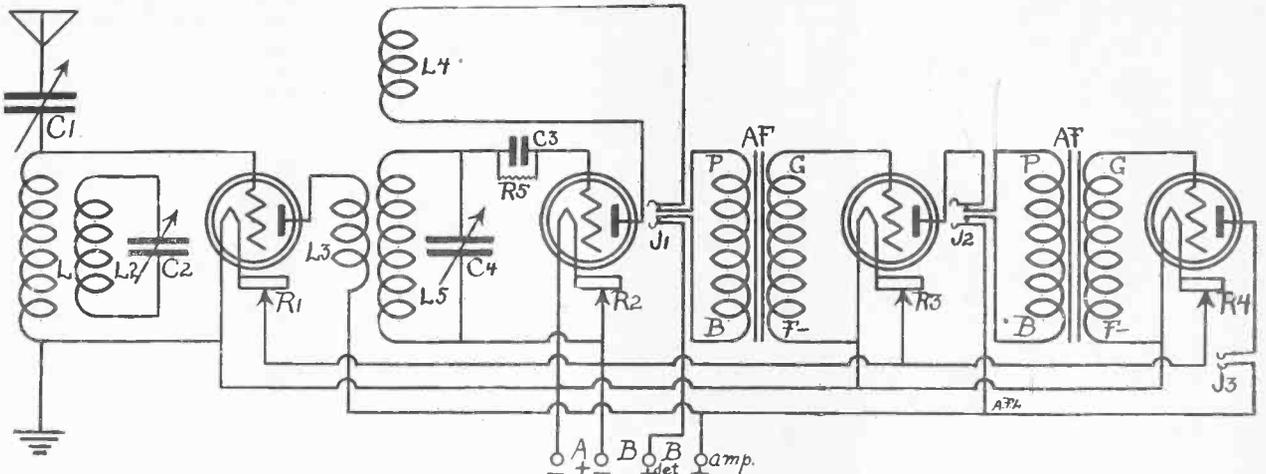


FIG. 37—Diagram of the circuit asked for by E. L. Strebe, 452 Morgan St., Tonawanda, N. Y. It is a regenerative circuit with the addition of one stage of radio-frequency amplification. Coil L2 and condenser C2 constitute the absorption circuit, functioning the same as a wave trap. The antenna is tuned with C1 and the detector grid circuit with C4.

all the soldered connections carefully and you will no doubt find the one that is causing you the trouble. Placing the set inside the cabinet should have absolutely no effect on the signals.

Is there any such thing as a set being hard on B batteries? I have a portable 3-tube set and use four 22 1/2-volt B batteries. Their life seems to be very short. I have had the set only a few months and am on the second set of batteries now. When my B batteries start to get weak I hear a whistling sound which I cannot get rid of until I put more voltage on the plate. I use C12 tubes.—L. J. Cole, 62 N. Brockett St., Kenosha, Wis.

There is no reason why your B batteries should not last through their usual period of life. You say that your set is portable, which means therefore that you probably use the small-size batteries. This would immediately account for their apparent short life. If you use the large size battery blocks they will last for months without change. Inserting a C battery will make a B battery last longer.

Kindly tell me of a 1-tube circuit with which I can get good results.—Chester Kosiol, 1007 N. Winchester Ave., Chicago.

For a good 1-tube circuit see the article on the Dynoflex published in Radio World for August 9. This circuit will give excellent results on local and distant stations. It is a reflex, using crystal detector and an AF transformer.

1—Can a Skinderviken Microphone Button be used in radio telephony? 2—Is there any possible way in which to restore life to a run-down B battery?—Lester Rasmussen, Franksville, Wis.

1—The Skinderviken is a miniature microphone and functions exactly the same as telephone or radio microphones. Therefore it certainly will work on small-power radio telephone sets, as it is not large enough to withstand heavy currents. 2—No.

Kindly inform me of a good 1-tube regenerative hook-up.—Paul Kanstoroom, 156 South Crawford Ave., Chicago.

A good 1-tube 3-circuit set is described in Radio World for September 13. The article is complete with diagrams and constructional details.

turns on 3/8" tube; L4, 30 turns on 2 3/4" tube; R1, 2, 3, 4, rheostats to match tubes; R5, 2 meg. leak; J1 and 2, double-circuit jacks; J3, open-circuit jack. Coils L1 and L2 are wound on the same tube, and coils L3 and L5 are wound on the same tube. L4 is wound on the separate smaller size tube. All wire is No. 22SCC.

I have a 3-tube Reinartz set but cannot get very much satisfaction from out-of-town stations. I use a 201A for detector and 301A for amplifiers. Everything in the set is compact and the wiring perfect. I tried changing condensers but with no better results. My antenna is a 50-foot ribbon with 20-foot lead-in, pointing north and south. The batteries are all in good condition. What can I do to improve reception and get out-of-town stations?—Charles Kramer, 216 N. Homan Ave., Chicago.

Everything taken into consideration, your set is working well, with the exception that you are unable to pick up distant stations. You will greatly improve reception by making your antenna at least 90 or 100 feet long, raising it up as high as possible over surrounding objects. Increase the B battery voltage on the 201A detector tube to 45

There is no necessity at all for charging each 24-volt unit separately, as the proper way is to charge the entire battery at one time. Simply connect two sets of two blocks each in series, connect these two pairs in parallel, and place it on your Tungar battery charging attachment. Thus the effective charging voltage for the four blocks will be the same as for one block, as you have approximately the same resistance by placing two 48-volt units in parallel. This method is the one used by Mr. Lee in his battery charging article.

In RADIO WORLD for August 30 the first article, which is about the low-loss antenna, is very interesting. I have been using one since last April with excellent results. My antenna is about 50 feet high and 75 feet long, with a 20-foot lead-in. About what is the approximate wavelength of this antenna?—W. J. Rogers, 710 Washington St., Portsmouth, Va.

The approximate natural wavelength of your antenna is 190 meters. There may be some slight change in this figure, depending on how high above the roof or other objects the flat top part of the antenna is.

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RADIOCAST PROGRAMS

Thursday, September 25

WOR, Newark, N. J., 405m, E. S. D. S. T.—6:15 P. M., Albert E. Sonn, in his weekly talk on "Radio for the Layman." 6:30 P. M., "Music While You Dine." 7:20 P. M., day's sports with "Jolly Bill" Steinke.

WIP, Philadelphia, 509m, E. S. D. S. T.—1:30 P. M., official forecast. 3 P. M., artist recital. 6 P. M., weather forecast. 6:05 P. M., dinner dance music. 6:45 P. M., agriculture livestock and produce market reports. 7 P. M., Uncle Wip's Stories.

WJY, New York, 405m, E. S. D. S. T.—7:30 P. M., weekly French lesson. 8:15 P. M., Warren Scofield, baritone. 8:45 P. M., Warren Scofield, baritone. 9 P. M., Al Reiser's Club Ferreri Orchestra.

WJZ, New York, 455m, E. S. D. S. T.—1 P. M., Nathan Abas Hotel Pennsylvania Orchestra. 5:30 P. M., State and Federal agricultural reports; closing quotations New York Stock Exchange; Evening Post News. 7:55 P. M., Colliers Weekly. 8 P. M., Wall Street Journal review. 8:30 P. M., Wanamaker organ concert. 9:30 P. M., John V. L. Hogan, "The Outline of Radio History." 10:30 P. M., Waldorf-Astoria Dance Orchestra.

WJAR, Philadelphia, 395m, E. S. D. S. T.—11:45 A. M., daily almanac. 12 Noon, organ recital; features from the Studio; Arcadia Concert Orchestra. 2:3 P. M., Arcadia Concert Orchestra; artist recital from Studio. 4:30 P. M., artist recital from Studio; Magazine Corner. 5 P. M., educational talks. 5:45 P. M., sporting results. 7:30 P. M., Dream Daddy.

WRC, Washington, 469m, E. S. T.—5:15 P. M., instruction in international code. 6 P. M., children's hour. 6:15 P. M., baseball scores. 7:45 P. M., talk auspices American Automobile Association. 8 P. M., violin recital by Leopoldo Alvarado. 8:15 P. M., "Leadership," by Major General E. A. Helmick. 8:30 P. M., Ethel Holtzclaw Gawler, soprano. 8:45 P. M., Steve M. Wright, pianist and Jimmy Harris, banjoist. 9:30 P. M., concert by Columbia Male Quartet. 9:55 P. M., time signals and weather forecasts.

WHN, New York, 360m, E. S. D. S. T.—6:30 P. M., violin solos by Olcott Vail; Stephen Balogh at the piano. 7 P. M., Paul Szecht's Alamac Orchestra. 9:30 P. M., Al Genesen, violinist, and Sydney Cohen, pianist. 10 P. M., Spear's dance orchestra. 10:30 P. M., Phil Romano's Roseland Dance Orchestra. 11 P. M., Wright and Bessinger, harmony kings. 11:15 P. M., Arthur Stone, world's famous blind pianist. 11:30 P. M., Loew's vaudeville artists. 12:12-30 P. M., Ted Lewis and his symphonic clowns.

KHJ, Los Angeles, 395m, P. T.—6 P. M., Art Hickman's concert orchestra. 6:30 P. M., children's program, Prof. Walter Sylvester Hertzog, stories of American history; Dickie Brandon, screen juvenile; bedtime story by Uncle John. 8 P. M., program, courtesy Dramatic Order, Knights of Klrossan; band program. 9:30-10 P. M., Charlie Wellman, tenor, and Bill Hatch, pianist. 10:11 P. M., Art Hickman's dance orchestra.

WNAC, Boston, 278m, E. S. D. S. T.—10:35 A. M., WNAC Women's Club Talks. 1 P. M., Shepard Colonial Orch. 4 P. M., Shepard Colonial Orch. 6:30 P. M., WNAC dinner dance. 7:30 P. M., talk—Oil Burners. 7:40 P. M., talk—Boston Motor Club. 8 P. M., concert program.

WEAF, New York, 492m, E. S. D. S. T.—11:12 A. M., talks to housewives, and market and weather reports. 4-5 P. M., children's stories and George Gordon, bass baritone. 6-11 P. M., dinner music from the Hotel Waldorf-Astoria; Federation Services Father Octavian Muresen, Rumanian Basso; talk by the Bank of America; "Touring with the Packard Eight," with Charles D. Isaacson as conductor; Col. John A. Pattee, old soldier fiddler; Adam Carroll, pianist; Vincent Lopez and his orchestra from the Hotel Pennsylvania.

WLW, Cincinnati, 423m, E. S. T.—11 A. M., weather forecast and business reports. 3 P. M., market reports. 4 P. M., piano recital by Miss Adelaide Apfel. 10 P. M., United States Civil Service. 10:03 P. M., Milnor Instrumental Trio. 10:30 P. M., popular program and entertainment by the Doherty Melody Boys.

WBZ, Springfield, Mass., 337m, E. S. T.—7:05 P. M., market reports. 7:10 P. M., letter from New England Homestead; "At the Theatres,"

with A. L. S. Wood, dramatic editor. 7:30 P. M., bedtime story for the kiddies. 7:45 P. M., concert by Charles R. Hector with his St. James Theatre Orchestra. 8:15 P. M., Railroad Night.

KDKA, Pittsburgh, 326m, E. S. D. S. T.—6:30 P. M., dinner concert. 6 P. M., baseball scores. 6:30 P. M., The Children's Period. 6:45 P. M., address by Automobile Club of Pittsburgh. 7 P. M., baseball scores; "More About Shade and Ornamental Trees," by the Fruit Growers Nurseries. 7:15 P. M., program by National Stockman and Farmer. 7:40 P. M., stockman reports of the primary livestock and wholesale produce markets. 8 P. M., concert arranged especially for reception in Spanish speaking countries. 9:55 P. M., time signals; weather forecast; baseball scores.

KYW, Chicago, 536m, C. S. D. S. T.—5:02 P. M., news, financial and final markets. 5:35 P. M., children's bedtime story told by "Uncle Bob." 6 P. M., dinner concert from Congress Hotel. 7 P. M., "Twenty Minutes of Good Reading," by Rev. C. J. Perrin. 7:20 P. M., musical program. 8:15 P. M., "Safety First" talk by Chicago Motor Club. 9:10-30 P. M., "At Home" program.

Friday, September 26

WOR, Newark, N. J., 405m, E. S. D. S. T.—6:15 P. M., popular piano solos by Vincent R. Stortz. 6:30 P. M., "Man in the Moon" stories. 7 P. M., Arthur Fischer, one-string violin soloist. 7:20 P. M., resume of the day's sports with "Jolly Bill" Steinke.

WIP, Philadelphia, 509m, E. S. D. S. T.—1:30 P. M., weather forecast. 3 P. M., artist recital. 6 P. M., weather forecast. 6:05 P. M., dinner dance music. 6:45 P. M., agriculture livestock and produce market reports. 7 P. M., Uncle Wip's bedtime stories.

WJY, New York, 405m, E. S. D. S. T.—7:30 P. M., Leonard Nelson's Knickerbocker Grill Orchestra. 8:15 P. M., Time Pop Question Game.

WJZ, New York, 455m, E. S. D. S. T.—5:30 P. M., State and Federal agricultural reports. 7 P. M., Lafayette Hotel Orchestra. 8 P. M., Wall Street Journal review. 8:10 P. M., The Radio Franks—Wright and Bessinger. 8:30 P. M., Loeseleaf current topics; Dr. William H. Allen. 9 P. M., "Chats With a Radio Editor." 9:15 P. M., U. S. Navy Night; music by Navy Band.

WAAM, Newark, N. J., 263m, E. S. D. S. T.—8 P. M., Newark Radio Trio. 8:15 P. M., Rev. Edmund Hains and John A. Scott. 8:30 P. M., Dan Nenneth and Bob Buchanan. 9:30 P. M., Cattelos Radio Entertainers. 10 P. M., surprise program.

WJAR, Philadelphia, 395m, E. S. D. S. T.—2:3 P. M., Arcadia concert orchestra; playlet. 4:30 P. M., dance program. 5:45 P. M., sporting results. 7:30 P. M., Dream Daddy. 8 P. M., "Turning the ages," a book review; "WDAR Walter Greenough Players." 10 P. M., meeting of the "Morning Glory Club"; Howard Lanin's dance orchestra. 1 P. M., features from Studio.

WRC, Washington, 469m, E. S. T.—3 P. M., fashion developments of the moment by "Women's Wear." 3:10 P. M., Arthur McCormick, baritone. 3:20 P. M., "Beauty and Personality" by Elsie Pierce. 3:25 P. M., current topics. 3:35 P. M., piano recital. 3:50 P. M., Magazine of Wall Street. 4 P. M., song recital. 5:15 P. M., time signals and weather forecasts. 6 P. M., stories for children by Peggy Albion.

WHN, New York, 360m, E. S. D. S. T.—6:30 P. M., violin solos by Olcott Vail, accompanied by Stephen Balogh at the piano. 7 P. M., dance music by Paul Specht's Alamac Orchestra. 9:30 P. M., Dan Gregory's Crystal Palace Orchestra. 10 P. M., Gem Safety Razor Orchestra. 11 P. M., Benny Leonard, lightweight champion of the world. 11:15 P. M., Loew's vaudeville stars. 11:30 P. M., Sam Wooding's Club Alabama Orchestra by direct.

KHJ, Los Angeles, 395m, P. T.—6 P. M., Art Hickman's concert orchestra from the Biltmore Hotel. 6:30 P. M., children's program, Prof. Walter Sylvester Hertzog telling stories of American history. Richard Headrick, screen juvenile; bedtime story by Uncle John. 8 P. M., program by Zarah Myron Bickford. 9:30 P. M., Hatch Graham, singer and banjoist. 10 P. M., Art Hickman's dance orchestra.

WNAC, Boston, 278m, E. S. D. S. T.—10:35 A. M., WNAC Women's Club Talks. 1 P. M., Shepard Colonial Orchestra. 4 P. M., Shevard Colonial Orchestra. 6 P. M., children's half-hour. 6:30 P. M., WNAC dinner dance. 8 P. M., concert program.

WEAF, New York, 492m, E. S. D. S. T.—11:12 A. M., musical program; health talk and market reports. 4:5 P. M., club program for women. 6-10 P. M., dinner music from the Rose Room, Hotel Waldorf-Astoria; children's stories by Blanche Elizabeth Wade; "The Happiness Boys," Billy Jones and Ernest Hare; Florence Steele,

contralto; musical program by G. Schirmer, Inc. B. Fischer and Company's "Astor Coffee" Orchestra.

WLW, Cincinnati, 423m, E. S. T.—11 A. M., weather forecast and business reports. 1:30 P. M., market reports. 3 P. M., stock quotations. 4 P. M., piano recital by pupils of Leo Stoffregen; other features.

WBZ, Springfield, Mass., 337m, E. S. T.—6 P. M., dinner concert by the WBZ Trio. 7 P. M., results of American and National leagues. 7:05 P. M., market reports. 7:10 P. M., current book review. 7:30 P. M., bedtime story for the kiddies. 10 P. M., Raymond J. Kelley, tenor, playing his own accompaniments. 10:30 P. M., soprano recital by Jean Livingstone Sherborn, accompanied by Mertina Bancroft, pianist and accompanist. 10:55 P. M., time signals; official weather reports. 11 P. M., WBZ Trio.

KDKA, Pittsburgh, 326m, E. S. D. S. T.—5:30 P. M., organ recital by Paul E. Fleeger. 6 P. M., baseball scores; dinner concert. 6:30 P. M., The Children's Period. 6:45 P. M., news bulletins. 7 P. M., baseball scores. 7:40 P. M., stockman reports of the primary livestock and wholesale produce markets. 8 P. M., concert by the Ingram Ladies Choral Society, assisted by Marie Bennett, soprano and Adolph MacLuckie, tenor. 9:55 P. M., time signals; weather forecast; baseball scores.

KYW, Chicago, 536m, C. S. D. S. T.—5 P. M., news, financial and final markets; Dun's Review and Bradstreet's Weekly Review of Chicago Trade. 5:35 P. M., children's bedtime story told by Uncle Bob. 6 P. M., dinner concert. 6:30 P. M., program from KYW's studio. 7 P. M., speeches auspices American Farm Bureau Federation. 8 P. M., midnight revue. 9:30 to 9:45 P. M., "Around the Town with KYW in Chicago" (Stage Reviews). 9:45 P. M., continuation of midnight revue.

Saturday, September 27

WOR, Newark, N. J., 405m, E. S. D. S. T.—6:15 P. M., "Music While You Dine"—the Cinderella Wolverines. 7:15 P. M., resume of the day's sports with "Jolly Bill" Steinke. 8 P. M., concert by the Naborhood Trio. 9:10 P. M., Louis Bromfield, novelist. 9:35 P. M., negro spirituals and negro signal songs by Clement Wood. 9:45 P. M., contralto solos by Mollie Chapin Ely. 10 P. M., program of popular music by the Ben Friedman Entertainers.

WIP, Philadelphia, 509m, E. S. D. S. T.—6:05 P. M., dinner dance music arranged by Harry Link. 6:45 P. M., agriculture livestock and produce market reports. 7 P. M., Uncle Wip's bedtime stories. 8 P. M., Braun School of Music. 8:30 P. M., New Year's Eve Services, auspices Philadelphia Branch United Synagogue of America; introduction by Rabbi Samuel Friedman; Hebrew Melody, Cantor M. Kaufman and choir; address, "New Year's Thoughts." 10:30 P. M., dance music by Harvey Marburger and his vaudeville orchestra. 11:05 P. M., organ recital by Karl Bonawitz.

WJZ, New York, 455m, E. S. D. S. T.—4:30 P. M., Roger Wolfe's Hotel Biltmore Tea Orchestra. 5:30 P. M., State and Federal agricultural reports; farm and home reports; closing quotations of the New York Stock Exchange; foreign exchange quotations; Evening Post News. 7 P. M., Waldorf-Astoria Dance Orchestra. 8 P. M., "Planting in the Fall," Thomas V. Peck. 8:30 P. M., Leif Ericson Day Celebration. 9:30 P. M., Orchestra of the S. S. "Paris." 10:30 P. M., Hotel Astor Dance Orchestra.

WJAR, Philadelphia, 395m, E. S. D. S. T.—11:45 A. M., daily almanac; 12 Noon, organ recital from the Stanley Theatre; features from Studio; Arcadia Concert Orchestra. 2:3 P. M., Arcadia Cafe Concert Orchestra; artist recital from Studio. 4:30 P. M., dance program by the Cotton Pickers. 5:45 P. M., sporting results. 7:30 P. M., Dream Daddy with the boys and girls.

WRC, Washington, 469m, E. S. T.—5:15 P. M., instruction in international code. 6 P. M., children's hour by Peggy Albion. 6:15 P. M., baseball scores. 7:45 P. M., bible talk. 8 P. M., song recital. 8:15 P. M., "Reception of the Very Short Wave Broadcasting Stations" by H. A. Walls, Bureau of Standards. 8:30 P. M., piano recital. 8:45 P. M., concert by the Capital Male Quartet. 9:55 P. M., time signals and weather forecasts.

WHN, New York, 360m, E. S. D. S. T.—9 P. M., "Humorous Stories" by Sam Hellmann. 9:15 P. M., Harvey Hewitt, piano solos. 9:20 P. M., Arthur Ball, ballad tenor. 9:30 P. M., "Where Are We Heading" by Jos. T. Cashman. 9:45 P. M., Fitzpatrick Brothers. 10 P. M., Melody Four Male Quartette. 10:20 P. M., Samuel Shankman, pianist. 10:30 P. M., Frank Onida, harmonica soloist. 10:45 P. M., Madeline Killeen, of the Farody Club in songs of today. 11 P. M., Jimmy Clarke and his entertainers. 11:30 P. M., Fletcher Henderson's Roseland Orchestra.

KHJ, Los Angeles, 395m, P. T.—12:30 P. M., program of news items and music. 6 P. M., Art Hickman's Concert Orchestra from the Biltmore Hotel. 6:30 P. M., children's program, Prof. Walter Sylvester Hertzog, stories of American history; Vondelle Dar, screen juvenile; bedtime story by Uncle John. 8 P. M., program, courtesy Golden State Electric Co. 10 P. M., Art Hickman's dance orchestra.

WNAC, Boston, 278m, E. S. D. S. T.—10:35 A. M., WNAC Women's Club Talks. 1 P. M., Shepard Colonial Orchestra. 4 P. M., Eva Audet, pianist; Auroa Cherron, soprano. 6:30 P. M., WNAC Dinner Dance. 8:05 P. M., dance music. 9:15 P. M., dance music. 10:15 P. M., dance music; popular songs; Ted and Dick Waterson; Don Ramsay, accompanist; popular songs, Irving Crocker.

Who Is America's Most Popular Radio Entertainer?

The Answer Will Be Published in the October 4 Issue

To enable RADIO WORLD readers on the West Coast to mail their ballots for the most popular entertainer, in time for counting, the closing time was extended to September 24. All ballots had to be in RADIO WORLD's Office by September 24, or bear postmark not later than 11:59 P. M. of September 24. The votes are now being counted.

Marching Onward

WEAF, New York, 492m, E. S. D. S. T.—4:5 P. M., Clifford Lodge Orchestra. 6:11 P. M., dinner music from the Rose Room of the Hotel Waldorf-Astoria; "Thrilling Adventures" Stories for Boys; Halfred Young, tenor; Carlo Restivo, accordion player; Christine Thompson, pianist; Hazel Fleener Loye, mezzo soprano; Vincent Lopez and his orchestra.

WLW, Cincinnati, 423m, E. S. T.—11 A. M., weather forecast and business reports. 1:30 P. M., market reports.

WBZ, Springfield, Mass., 337m, E. S. T.—7 P. M., results of American and National leagues. 7:05 P. M., market reports. 7:30 P. M., bedtime story for the kiddies. 7:40 P. M., concert by the Hotel Kimball Trio. 9 P. M., program by Mrs. Pauline Hammond Clark, singers and instrumentalists. 10:55 P. M., time signals; weather reports.

KDKA, Pittsburgh, 326m, E. S. D. S. T.—6 P. M., baseball scores; dinner concert. 6:30 P. M., Children's Period. 6:45 P. M., Last Minute Helps to Teachers. 7 P. M., baseball scores; sports review. 8 P. M., concert by Westinghouse Band.

KYW, Chicago, 536m, C. S. D. S. T.—5:02 P. M., news, financial and final markets. 5:35 P. M., children's bedtime story. 6 P. M., dinner concert. 7 P. M., musical program. 8:05 P. M., talk by Vivette Gorman. 8:10 P. M., Youth's Companion.

Sunday, September 28

KPO, San Francisco, 423m, P. T.—11-12 Noon, undenominational and non-sectarian church services; Dr. W. A. Phillips, pastor St. Johns Presbyterian; soloist, Lucile Phillips Kemp, coloratura lyric soprano; organ selections by Theodore J. Irwin. 8:30-10 P. M., concert by Rudy Seiger's Fairmont Hotel Orchestra.

KGW, Portland, Ore., 492m, P. T.—6 P. M., church services.

WHO, Des Moines, Ia., 526m, C. S. T.—7:30-9 P. M., musical program, The Bankers Life Radio Orchestra; Myrtle Williams, soprano.

WIP, Philadelphia, 509m, E. S. T.—7:45 P. M., evening service, Holy Trinity Church.

WGY, Schenectady, N. Y., 380m, E. S. T.—11 A. M., service of First Presbyterian Church, sermon by Rev. Robert W. Anthony. 8 P. M., Rosh-Hashanah service from Temple Beth Emeth, Albany; Dr. Marius Ranson, rabbi.

KGO, Oakland, Cal., 312m, P. T.—11 A. M., service of First Congregational Church. 3:30 P. M., concert by KGO Little Symphony Orchestra. 7:30 P. M., service of First Congregational Church, San Francisco.

WOO, Philadelphia, 509m, E. S. T.—10:30 A. M., morning services from Bethany Presbyterian Church; Rev. A. Gordon MacLennan, pastor; benediction on stroke of twelve. 2:30 P. M., Sunday afternoon session, Bethany Sunday School. 6 P. M., old-time hymns and melodies and sacred chimes.

WOAW, Omaha, Neb., 526m, C. S. T.—9 A. M., radio chapel service by Rev. R. R. Brown. "Bible Sunday of the air." 9 P. M., musical chapel service by First Methodist Episcopal Church, Dr. James E. Wagner, pastor.

WCAE, Pittsburgh, 462m, E. S. T.—3 P. M., People's Radio church services. 6 P. M., dinner concert.

KYW, Chicago, 536m, C. S. D. S. T.—10 A. M., Central church service; Dr. F. F. Shannon, pastor; musical program. 1:30 P. M., studio chapel service.

Monday, September 29

KPO, San Francisco, 423m, P. T.—4:30 P. M., Rudy Seiger's Fairmont Hotel Orch. 5:30 P. M., children's hour stories. 7 P. M., Rudy Seiger's Fairmont Hotel Orch. 8 P. M., program auspices San Francisco Women's Press Club. 10 P. M., Bradford's Versatile Band.

KGW, Portland, Ore., 492m, P. T.—11:30 A. M., weather forecast. 3:30 P. M., literary programme by Portland Library Association. 7:15 P. M., police reports. 7:30 P. M., baseball scores, weather forecast and market reports. 8 P. M., concert.

WHO, Des Moines, Ia., 526m, C. S. T.—7:30-9 P. M., musical program. 11:15-12 P. M., organ recital by L. Carlos Meier.

WMAQ, Chicago, 448m, C. S. T.—4 P. M., sport results. 4:10 P. M., Mothers in Council. 4:30 P. M., musical program. 6 P. M., Chicago theater organ recital. 6:30 P. M., Hotel LaSalle orchestra.

WAAW, Omaha, Neb., 286m, C. S. T.—7:30 P. M., Frank Wright and Frank Bessinger, the "Radio Franks" of N. Y. City.

WGY, Schenectady, N. Y., 380m, E. S. T.—10 A. M., program from Temple Beth Emeth, Albany, N. Y.; morning service for "Rosh-Hashanah." 6 P. M., produce and stock market quotations; news bulletins. 7:15 P. M., address, "Farm Credit." 7:45 P. M., program by WGY Orchestra; Hepzibah C. James, soprano.

CKAC, Montreal, 425m, E. S. T.—1:45 P. M., Mount Royal Hotel concert orchestra. 4 P. M., weather and stock news.

KGO, Oakland, Cal., 312m, P. T.—1:30 P. M., N. Y. and S. F. stock reports and weather. 3 P. M., studio musical program. 4 P. M., Henry Halstead's Dance Orchestra. 5:30 P. M., Aunt Betty stories. 6:45 P. M., stock reports. 8 P. M., educational program. 10 P. M., dance music.

WOO, Philadelphia, 509m, E. S. T.—12 Noon, luncheon music. 4:45 P. M., grand organ and trumpets. 7:30 P. M., sports results and police reports; dinner music. 8:30 P. M., special program. 9:30 P. M., Fox Theater Grand Orchestra.

WBAP, Fort Worth, Tex., 476m, C. S. T.—7:30 P. M., moments from Majestic Theater. 9:30 P. M., popular and classical music.

WOAW, Omaha, Neb., 526m, C. S. T.—6 P. M., dramatic hour. 6:30 P. M., dinner program. 9 P. M., program from vocal studio.

THOUSANDS of fans will build the receiver to be described by Herbert C. Hayden in RADIO WORLD next week, issue of October 4, on sale Wednesday, October 1. It is closely modeled after the Radiola III. Many fans would like to have such a set because it is very selective, produces splendid tone quality and fine volume, while reaching out to DX stations with amazing certainty. It is easy to build. Care must be exercised, to be sure, but the simplicity is there nevertheless, and due in no small measure to the sixteen detail photographs of the set in its actual course of construction in RADIO WORLD's laboratory. A circuit diagram is the seventeenth illustration. It is a tried, true and tested set, something unusually attractive. It is probably as good a 1-tube set as you could hope to have. And it is decidedly inexpensive. You make all the coils yourself. They aren't many and they aren't hard. Be sure to read what Mr. Hayden, noted radio engineer, writes on this subject.

Byrt C. Caldwell, whose articles are among the most popular published, will describe how to make a 4-tube receiver, consisting of one RF, detector and two AF, that compares favorably with the popular Neutrodyne. Mr. Caldwell will tell how to make the low-loss coils. By the way, Mr. Caldwell was one of the pioneers in the Land of Low-Loss. Complete diagrams will illustrate the text.

"Non-Radiating Regeneration" is the title of Brewster Lee's contribution, describing a 2-tube reflex comprising a stage of RF detector and one AF stage.

"The Best Coil" will be Herman Bernard's article. The different kinds of coils will be fully discussed and the author's reasons presented for selecting a particular kind as the best. How to make what he finds is the best coil will be explained in lucid detail.

"My Adventures With Circuits," by Knolleys Satterwhite, will be of particular interest to those who have decided to make a set but are not quite sure which one they should construct. While Mr. Satterwhite does not recommend any particular circuit, he analyzes nearly all of them in a way that makes it easy for you to decide. This article is well suited as an introduction to a series in which experts will tell what their favorite receiver is and why.

"The Tube as a Detector," by N. N. Bernstein, Technical Editor, will be an expert's exposition of the operation of the 3-element vacuum tube, illustrated with favorite 1-tube circuit diagrams.

Charles H. M. White, radio authority, will describe a 2-tube set in which a variable condenser controls oscillations.

The result of Radio World's quest for the most popular entertainer, a test patiently made for several months, will be announced in that issue.

WFAA, Dallas, Tex., 476m, C. S. T.—12:30 P. M., Mrs. Charles E. Osborne, on "Character Building." 8:30 P. M., musical entertainment.

WCAE, Pittsburgh, 462m, E. S. T.—6:30 P. M., dinner concert. 7:30 P. M., Uncle Kaybee. 7:45 P. M., baseball scores. 8:30 P. M., piano recital. 11 P. M., late concert. 1 A. M., midnight frolic.

Tuesday, September 30

KPO, San Francisco, 423m, P. T.—2:30 P. M., organ recital by Theodore J. Irwin. 4:30 P. M., Rudy Seiger's Fairmont Hotel Orchestra. 5:30 P. M., children's hour stories. 7 P. M., Rudy Seiger's Fairmont Hotel Orch. 8 P. M., Naval Reserve Night. 10 P. M., Bradford's Versatile Band.

KGW, Portland, Ore., 492m, P. T.—11:30 A. M., weather forecast. 3:30 P. M., children's programme. 7:15 P. M., police reports. 7:30 P. M., baseball scores, weather forecast and market reports. 8 P. M., concert.

WMAQ, Chicago, 448m, C. S. T.—4 P. M., sport results. 4:10 P. M., lecture by Red Cross. 4:30 P. M., Chicago Philharmonic conservatory. 6 P. M., Chicago theater organ recital. 6:30 P. M., Hotel LaSalle orchestra. 8 P. M., Harry Hanson, literary editor. 8:20 P. M., Miss Clara E. Laughlin, travel talk. 8:50 P. M., United States civil service commission. 9:15 P. M., Lyon & Healy program.

WAAW, Omaha, Neb., 286m, C. S. T.—7:30-9 P. M., "The Radio Franks," Wright and Bessinger.

WGY, Schenectady, N. Y., 380m, E. S. T.—11:55 A. M., time signals. 12:30 P. M., stock market reports. 2 P. M., music and talk. 6 P. M., market quotations; news bulletins. 7:45 P. M., WGY Orchestra; Margaret J. Littell, soprano.

11:15 P. M., organ recital by Stephen E. Boisclair.

CKAC, Montreal, 425m, E. S. T.—4 P. M., weather and stock news. 7 P. M., kiddies' stories in French and English. 7:30 P. M., Rex Battle and his Mount Royal Hotel orchestra. 8:30 P. M., S.S. Megantic concert party. 10:30 P. M., Joseph C. Smith and his Mount Royal Hotel orchestra.

KGO, Oakland, Cal., 312m, P. T.—1:30 P. M., N. Y. and S. F. stock reports and weather. 4:15-30 P. M., concert orchestra. 6:45 P. M., stock reports. 8 P. M., mixed chorus. 10 P. M. to 1 A. M., dance music.

WOO, Philadelphia, 509m, E. S. T.—11 A. M., grand organ. 11:30 A. M., weather forecast. 11:55 P. M., time signal. 12 Noon, luncheon music. 4:45 P. M., grand organ and trumpets. 7:30 P. M., sports results and police reports. 9:55 P. M., time signal. 10:02 P. M., weather forecast.

WBAP, Fort Worth, Tex., 476m, C. S. T.—7:30 P. M., dance program. 9:30 P. M., concert by French harp artists.

WOAW, Omaha, Neb., 526m, C. S. T.—6 P. M., popular half hour. 6:25 P. M., dinner program. 9 P. M., program by "The Rosebuds" Federated Commercial Clubs." 12 P. M., wowl frolic.

WFAA, Dallas, Tex., 476m, C. S. T.—12:30 P. M., address, DeWitt McMurray. 8:30 P. M., musical program. 11 P. M., Midnight Melody Men.

WCAE, Pittsburgh, 462m, E. S. T.—6:30 P. M., dinner concert. 7:30 P. M., Uncle Kaybee. 7:45

P. M., baseball scores. 8:30 P. M., musical program. 11 P. M., late concert.

Wednesday, October 1

KPO, San Francisco, 423m, P. T.—12 Noon, time signals; reading of the Scriptures. 1 P. M., Rudy Seiger's Fairmont Hotel Orch. 2:30 P. M., Garry Eisher's Amphians. 4:30 P. M., Rudy Seiger's Fairmont Hotel Orch. 5:30 P. M., children's hour. 7 P. M., Rudy Seiger's Fairmont Hotel Orch. 8 P. M., Bradford's Versatile Band.

KGW, Portland, Ore., 492m, P. T.—11:30 A. M., weather forecast. 3:30 P. M., talk by Jeanette P. Cramer. 7:15 P. M., police reports. 7:30 P. M., baseball scores, weather forecast and market reports. 8 P. M., concert. 10 P. M., dance music.

WMAQ, Chicago, 448m, C. S. T.—4 P. M., sport results. 4:10 P. M., beauty talk. 6 P. M., Chicago theater organ recital. 6:30 P. M., stories for children. 8:30 P. M., WMAQ "play-night." 9:45 P. M., talk from Chicago charities.

WGY, Schenectady, N. Y., 380m, E. S. T.—11:55 A. M., time signals. 12:30 P. M., stock market reports. 6 P. M., produce and stock market quotations; news bulletins; baseball results. 6:30 P. M., "Adventure Story."

KGO, Oakland, Cal., 312m, P. T.—1:30 P. M., N. Y. and S. F. stock reports and weather. 3 P. M., musical program and Cora L. Williams Institute, speaker. 4:50 P. M., concert orchestra. 6:45 P. M., stock reports.

WBAP, Fort Worth, Tex., 476m, C. S. T.—7:30 P. M., concert. 9:30 P. M., concert by Will Foster.

The Aerial Problem

WHAT kind of an aerial have you? What kind of a set? What results do you get? Do you use an indoor aerial? Comparisons will be beneficial to readers. Write your experiences to Aerial Editor, RADIO WORLD, 1493 Broadway, New York City.

MY aerial is 150 feet long. I use regular 2-strand wire. The set is a 3-circuit regenerative, with aperiodic primary, tuned secondary and tickler tertiary. Selectivity is good, volume fine and DX all I desire.

AL OBERENDER,
367 75th Street,
Brooklyn, N. Y.

Kids Again Pershing Out

Fall in t



THE HARMONY GIRLS, the Misses Carpenter and Ingram, who entertain at WLS, Chicago, every Saturday night. Due to their great popularity, they will appear regularly at the Sears-Roebuck station. WLS also radiocasts the Radio World's University, which helps Chicago fans solve their difficulties by diagnosing set trouble over the air.



(Kadel & Herbert)
THE LAST TIME but one that John J. Pershing radiocast as General in command of the Armies of the United States was before WEAF's microphone at a dinner given to him by the Government Club at the Hotel Astor, New York City. Mrs. Geo. S. Owens, president, is beside him.

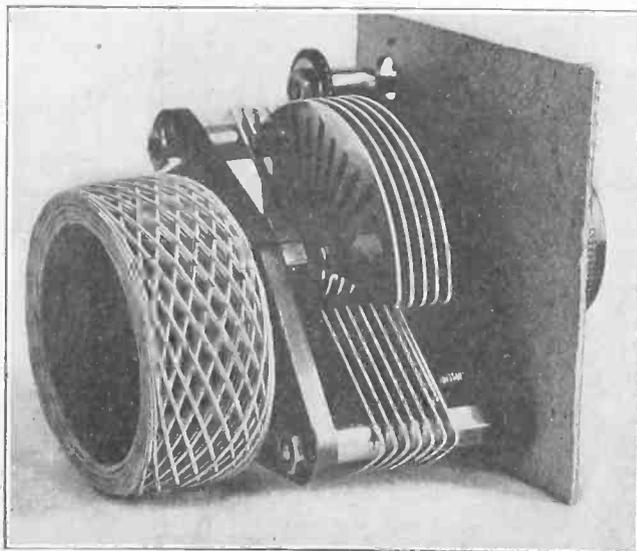


ONE of the most interesting phases of the imminent flight of the ZR-3, giant dirigible built in Germany for the United States and which will attempt to cross the ocean as an act of self-delivery, is the radio installation. Photo shows the radio room and operator aboard the Zeppelin. The ZR-3 is a sister ship of the Shenandoah. The new ship is equipped with tube transmitters that have a daylight range of 500 miles. At night the range will be many times that. On the trip over, the ZR-3 will radiocast the description of the flight and is expected to be heard on both sides of the water. The framework is used for the ground, and a suspended wire constitutes the antenna.



(International Newsreel)

HERE (at right) is how to mount a honeycomb coil onto a variable condenser. These coils are so light that if their beginning and end are fastened respectively to the rotor and stator posts on the condenser end-plates sufficient support is obtained. The 13-plate condenser in this case covers the radiocast band in conjunction with a 100-turn coil. This combination makes a splendid wave-trap and also a stage of impedance RF amplification. The condenser is connected in parallel with the coil, but as a radio frequency stage a series connection is optional. Three coils mounted in this way, on three condensers, make an excellent 3-circuit tuner, with all three circuits tuned. Close inductive coupling is not necessary between plate and grid coils because the self-capacity of the tube is utilized for the transfer of energy from plate to grid.



(Radio World Staff Photo)

OUT among the glorious chasms and colorful cliffs a lilt lightly through the rarified atmosphere and rest set. Here you see two of the aboriginal wanderers papoose punctiliously toted by the better half of the Chief No Antenna) is listening on earphones while



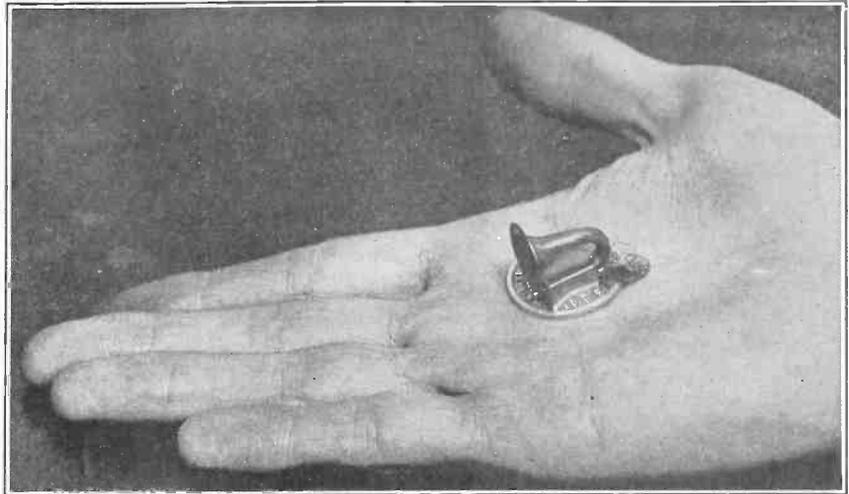
YES, the "smallest crystal set." (International)

the West

It's a Speaker!

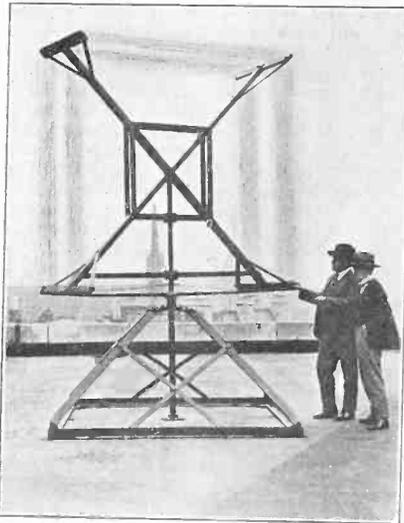


...yons of the wondrous West the radio waves
 ...ubly useful the advantages of the portable
 ...e Inspiring West on a Fall day, with their
 ...nible, as per ancient custom. Mr. Indian (Big
 ...e strikes a posture of squaw-like coyness.



(Kadel & Herbert)

THE FIRST Radio World's Fair opened on Monday at Madison Square Garden, New York City, and many of the thousands of visitors enjoyed seeing the microscopic radio apparatus that ingenious experimenters from all over the country were exhibiting. Here you see a loud speaker so small that its entire dimensions are encompassed on a coin. The speaker consists of two miniature magnets and correspondingly tiny diaphragms. It could be made of two extremely small electro-magnets and a very thin metal diaphragm. The wire with which the magnets are wound is about size 40, finer than a hair. The horn is machined out of a solid piece of metal and the cord attachment soldered right to the ends of the magnet wire, as there is no room for screws.



(Gilliams)

A HUGE LOOP antenna erected in London on one of the tall buildings to pick up signals from America to be amplified locally and re-radiocast.

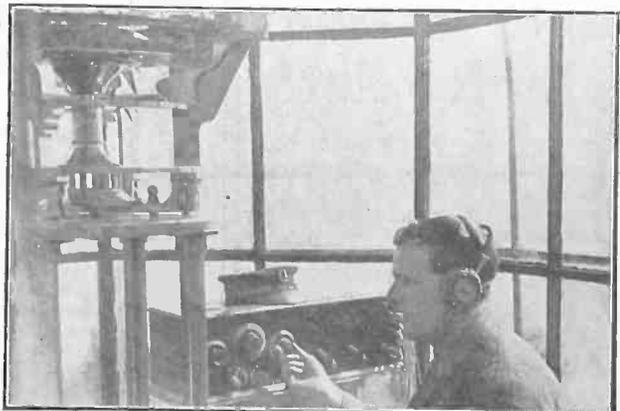


(Kadel & Herbert)

YOU cannot see by radio yet and these are not two radio lenses but two small crystal sets, built by Dr. Hugo Thompson, of Springfield, Mass., and exhibited at the prize exhibition at the first Radio World's Fair.



TESTING the new type Signal Corps radio telegraph and telephone outfit. The meters tell when the set is radiating best.



U. S. MARINE testing receiving set enclosed in metal screen room.

A THOUGHT FOR THE WEEK

—What radio is and what it will be depends as much on the persons whose commercial efforts are concentrated on radio as it does upon any other group.

RADIO WORLD

Trade Reg. U. S. Pat. Off.



TELEPHONE: LACKAWANNA 2062, 6976

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ADVERTISING RATES

RATES—Page, 7 1/2 x 11", \$200.00; half page, 8 1/2 x 11", \$100.00; quarter page, 4 1/2 x 11", \$50.00; one col., 2 1/2 x 11", \$25.00 per inch. Per azate line, 50c. Times Discounts: 52 Consecutive Issues, 20%; 26 Times Consecutive, or E. O. W. One Year, 15%; 4 Consecutive Issues, 10%.

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SEPTEMBER 27, 1924

Letters from Our Readers

Editor, RADIO WORLD:

THE September 6 issue of RADIO WORLD contains a commendable article by Walter Scott, Jr., on the R. C. A. V6-tube Super-Heterodyne. It is written in a way that will appeal to the average reader and is practically a complete story. The article quite correctly points out the necessary factors of skill and patience involved in securing the best that the Super-Heterodyne circuit is capable of affording.

L. M. CLARK,

Vice-President,

Railway Improvement Co.,

1 Pershing Square, N. Y. C.

The Rapid Rise of Sales

*It Gives an Idea of the Even More Tremendous
Growth Ahead*

THE marvelous growth of the radio business, from next to nothing a few years ago to \$350,000,000 a year today, is only a slight indication of the momentous growth that is ahead. One need only recall that there are 3,000,000 radio-equipped homes in the United States, and 20,000,000 homes without radio. In other words two-thirds of the nation represent virgin field for radio sales. With the irresistible appeal of radio as the main factor, and its constant improvement in the character and quality of programs as another strong inducement, there is rife a sort of automatic propaganda bound to sweep radio into twentieth place, or higher, on the list of American industries. Now the money value of its product places it thirty-fourth.

Radio is a deep fascination even if regarded strictly from the viewpoint of the listeners-in. The ranks of experimenters constantly grow. Whether the listeners will show a greater percentage of increase than the experimenters is something the future alone can tell. Certainly there will be sufficient numerical increase to satisfy the trade in both respects.

As for the listener, he represents the larger numerical group. He may not know much about the technique of radio, but he is interested in it, just as any one who marvels at a scientific achievement is keenly desirous of an insight into its workings.

The listener class may be compared to the phonograph owners. Now nearly 9,000,000 homes have phonographs, or three times as many as have radios. This computation includes in both categories the families that have both. Therefore, only 14,000,000 homes have no phonograph, and the phonograph industry is five times as old as the radio trade. If the phonograph trade is to be considered as the direct rival of the radio industry, it is important to recall that there has been a severe drop in the sale of phonographs and records. Meanwhile radio sales have been growing enormously. Freed-Eisemann's sales increased during the last three fiscal quarters as follows: \$42,000, \$115,000, \$687,000, \$2,000,000. While this is an exceptional increase, it is important as a comparison with the fact the best showing in the phonograph trade in that period has been the achievement of not having receded much during each quarter! Another straw to judge the wind is the increasing number of phonograph stores selling radios as a "side line." Soon the tail wags the dog.

Radio is so far from the saturation point, when considering sales growth, that the peak is scarcely within the span of any existing person's life!

Coming down to the present season we find unprecedented opportunities. Receivers have been perfected to such a degree that one may purchase with the assurance of good, steady results. The quality of manufactured parts is high. A Presidential campaign and local campaign are under way. Soon the important candidates will pay oral visits to the homes of all radio owners. The best programs ever given will be heard this fall and winter. The weather will be splendid for DX, and listeners, even with 1-tube sets, may reach out 1,000 miles; others hear stations up to 3,000 miles off, even spanning the continent. Times are good, the people have money to spend on radio. The problem, therefore, is first to have a good product and secondly to see that the public knows about the product and its quality.

As for the experimenters, there need be no fear that they will not keep pace. The lure of the technical side of radio is strong. More and more adults are taking to experimenting and the younger generation is literally crowding into the field, many of them, surprising though it may seem, with real money to spend. And it is money devoted to a most valuable purpose, for experimenting taxes the ingenuity of the experimenter and keeps his mind on the alert.

Ayeno Rings Down Curtain on Iceberg of Dunceness

Day message COLLECT
SANFRAN SEP6-24-1094LL

Eletto Oattanno
Cheap Laundry merchant.
Salt Lake City, Utah.

You turn tables other furniture on your cousin by prolifically sending loquacious telegram much collect stop I Ayeno Tammayato good silk merchant Golden Gate and much high reputation wonderful honesty square and circular dealings say to you Eletto (deletion by Western Union) And moreover and additional you prodigiously great fool to say paintings on front radio set make music noisier stop I try it all and presto selah (see writings great literature demons) after I paint Geisha girls dragons etc, and so forth no more noise come in at simultaneously with synchronous and contrapuntal perfectness (blockheads always can go to dictionary to get innermost soulful meaning)

stop so we close this not so much pleasant correspondence via and by way of airlengths stop no much use casting sparkle like rhinestones before face of lowborn piggery stop before I say with smile no tears good bye to end of forever give still great love to beautiful sister Eshiyama and say I love too torridly even if brother great iceberg of dunceness stop no much use sending me collect telegrammer because why I tell boy take back make other fool pay for words. My set working all right and if yours so so listen some darkness of night and hear what I your cousin Tammayato yell to you across hundreds miles many wireless wires stop perhaps wire burn up because my great heat language goodbye shut up no more

Your never loving disconsiderate cousin

Ayeno tammavato

Per H.

(The End)

MAGNAVOX Radio

BROADCAST RECEIVER



The new Magnavox TRF-5 Receiver is here shown with Magnavox M4 Reproducer, (\$25.00) which insures clearest tone.

The long awaited Broadcast Receiver

Combining supreme efficiency, convenience and beauty, produced at a low cost which brings it within reach of all.

HERE at last is the perfected instrument permitting you to enjoy *simultaneously* the most desirable elements of broadcast reception—features which no one model ever combined before.

The distinctive Magnavox tuned radio frequency circuit is characterized by exceptional clearness and volume as well as selectivity. The Magnavox Unit Tuner does away with all complicated dialing and places the novice on the same footing as the radio expert.

Magnavox Broadcast Receivers and other Magnavox Radio Products are sold by reliable dealers everywhere. Write for new illustrated catalog.

THE MAGNAVOX CO., Oakland, Calif.
New York: 350 West 31st Street San Francisco: 274 Brannan Street
Canadian Distributors: Perkins Electric Limited, Toronto, Montreal, Winnipeg

TRF-5

A 5-tube tuned radio frequency receiver consisting of two stages of tuned radio frequency of special design, detector and two stages of audio frequency.

Cabinet measures: height, 9 $\frac{5}{8}$ in.; length, 20 $\frac{1}{2}$ in.; depth, 14 $\frac{3}{4}$ in.

With Magnavox detector tube, but no batteries or reproducer, \$125.00



TRF-50

This model is identical with TRF-5 but encased in larger carved cabinet with built-in Magnavox Reproducer.

Handsomely carved cabinet measures: height, 14 $\frac{3}{4}$ in.; length, 20 $\frac{1}{2}$ in.; depth, 18 $\frac{3}{4}$ in.

With Magnavox detector tube, \$150.00

\$5,000,000 Export This Year

THE United States still leads in the export of radio apparatus, and is

likely to continue in this position despite restrictions in foreign markets and lack of radiocasting facilities in many foreign

countries. Export for 1925 will probably exceed \$5,000,000.

Three years ago there were not more than a dozen manufacturers of radio apparatus in this country. The only demands were for commercial telegraph equipment. Today a conservative estimate of the number engaged in this growing industry is placed at 325 firms exporting apparatus for commercial interests, amateurs and the listening public.

An idea of the immensity of our export radio business may be gained from the fact that during the past seven months radio exports totaled \$2,123,832, compared with \$1,894,823, during the same period last year, showing an increase of over \$250,000. Since January 1, the average monthly value of radio exports has been well over \$300,000, against an average of approximately \$270,000 last year.

Exporters from the States show a steady growth in business and it is stated by government statisticians that our manufacturers can always compete abroad on a quality basis. Of course in countries where there are restrictions against foreign apparatus, a serious handicap is encountered, but these market restrictions are being lifted gradually. Australia has just opened her ports to competition, so has South Africa, while Poland appears to be inclined to accept American goods. Another difficulty is the fact that some governments levy a "listening-in" tax, which reduces the number of fans. In South Africa this fee amounts to about \$10 a year, and in Australia almost as much is charged for the privilege of operating a first-class receiving set.

In spite of these difficulties in the way of foreign competition, radio exports from the United States have increased steadily month by month this year over the same periods last year, with one exception. During July last year, \$443,000 worth of orders went to Sweden, bringing exports to \$682,885, while the figure for this July is 43% of it.

VICTORY!

SINGLE BASE MOUNTING SOCKET
Made of nickel-plated brass Bakelite base, phosphor bronze prongs—perfect contact.

VICTORY TRIPLE SOCKET

Three on one. Economical combination of three sockets on Formica Bakelite. Special sockets made to specification. Expert drillers, cutters and engravers of Formica panels and tubing. Estimates cheerfully given.

UNITED RADIO MFG. CO.

191 Greenwich St., N. Y. Cortland 4885

For Maximum Amplification Without Distortion and Tube Noises

use the well known Como Duplex Transformers

Push-Pull

Send for literature.

COMO APPARATUS COMPANY

448 Tremont St. Boston, Mass.

BUILD OR REBUILD YOUR SET

WE OFFER YOU MERCHANDISE AT PRICES

BELOW COMPETITION! WRITE NOW!

- \$18.50 No. 51 Crosley 2-tube Receiver.....\$18.00
- \$60.00 Freshman 5-tube "Masterpiece" Receiver.....\$55.00
- \$17.50 Freshman Kit.....\$15.75
- \$ 5.45 Super B Battery, 24 volts, Rechargeable.....\$ 4.95
- 45 V. large B Batteries—\$2.90; 22½ V. large.....\$ 1.45
- Genuine Bakelite Panels, 3-16 in. per sq. in.....\$.02
- \$ 2.00 Fil-Ko-Stat.....\$ 1.65
- \$ 1.50 Lavite Resistances, 12,000 to 100,000 ohms.....\$ 1.25
- \$ 5.00 Acme Radio and Audio Freq. Transformers.....\$ 3.95
- \$12.50 Como Push and Pull Transformers (pair).....\$ 9.90
- 23 Plate Vernier Amesco Condensers.....\$ 3.85
- 43 Plate Vernier Amesco Condensers.....\$ 4.25
- 400 ohms Amesco Potentiometers with dial.....\$ 1.35
- Pioneer moulded Bakelite Variometers.....\$ 4.85
- \$18.50 Gold Seal Homebarg, A.C. current.....\$14.95

Send for our new Price List.

Remittance must include postage.

MARVEL RADIO SPECIALTY CO.
132 Nassau St., Dept. RW, New York City

Radio Tables



Antique Mahogany finish, Mission style Two battery compartments. **\$12.50**

The best table on the market at our price.

RADIO CABINETS

Shipped knock-down. Each joint fitted. Hinges attached. Oak cabinets uncolored.

- 7 x 12...\$1.50
- 7 x 14... 1.60
- 7 x 18... 1.85
- 7 x 21... 2.10
- 7 x 24... 2.35
- 7 x 26... 2.60

Guaranteed perfect. Add parcel post charges to remittances.

Send for literature.

Radio Cabinet Co.

1504 Vine St., Philadelphia, Pa.

DEALERS' DISCOUNT

DIRECT

The Nation's Largest RADIO Mail order House.



WE DEFY COMPETITION ON MAIL ORDERS
Our Prices Are Lower Than Any Other House in the Country—Every Item in Stock Has the Stamp of Highest Quality

Allow us to quote on any parts or standard sets. Send 5c in stamps for catalogue.

PHONES		TRANSFORMERS—PUSH PULL		VARIABLE CONDENSERS	
Ditograph	\$3.89	Hoosick Falls, Panel Mtg.	\$0.75	Amesco, 4 in.	\$0.79
Brandes	4.95	Patent 199	.40	DeForest, 3 in.	.35
Baldwin Type C	7.85	Federal	.79	DeForest, 4 in.	.40
Ambassador	3.25	General Radio	.89	Pathe, 2 in.	.30
N. & K.	6.50	Workrite, 199	.60	Pathe, 3 in.	.40
Scientific	2.90	TRANSFORMERS—PUSH PULL		Pathe, 4 in.	.55
LOUD SPEAKERS		Como Duplex	\$9.90	GENERAL INSTRUMENT LO-LOSS	
Pathe	\$12.98	All American	9.50	all sizes	
Musie Master	24.50	Modern	9.00	General Instrument Lo-Loss, all sizes	
Spartan	9.25	TRANSFORMERS—AUDIO		Heath Lo-Loss, all sizes	
Firth Adjustable	5.98	Star	\$2.95	Heath Vernier Lo-Loss, all sizes	
Sonora	30.00	Modern	4.25	5.00	
New Dictograph	28.50	Acme	3.50	All other lines in stock.	
Magnaphone	28.00	All American	3.35	VOLT METERS	
Plugs Included		Federal No. 65	4.90	Jewel, 0-50 Volts	\$2.25
CHARGERS		Thordarson	3.88	Sterling, 0-50 Volts	1.75
Westinghouse, 2 Amp.	\$15.40	Amertran	4.55	Sterling, 0-35 Amp. 0-50	.89
Westinghouse, 5 Amp.	23.40	Eria	3.95	Sterling, 0-35 Amp. 0-50	3.00
Ward Leonard, D. C.	9.75	Federal No. 226	3.98	Volts, combination	4.50
RHEOSTATS		TRANSFORMERS—RADIO		Sterling, 0-120 Volts	4.50
Fada	\$0.60	Acme R-2, 3, 4	\$3.50	FRESHMAN PRODUCTS	
Amesco (all styles)	.95	Acme 30-K Super-Het.	4.20	We carry a complete line of new Freshman Products. Let us quote you on your wants.	
C. Hammer, 6 Ohm	.79	Tri-Coil	1.90	CRYSTALS	
Patent	.89	Eria Reflex	3.95	Lego Wonder Fixed Crystal	\$0.80
Federal No. 18	.79	Rasla	3.00	Eria Fixed	.79
Arrow Knob	.69	UV 1714	3.60	DeForest Crystal	.59
SOCKETS		RR 1716 (Super-Het)	6.75	Pyrotek Fixed	1.10
Fada	\$0.79	DIALS			
DeForest	.50	Amesco, 2 In	\$0.30		
		Amesco, 3 In	.50		

Ultradyn, Complete, 8-Tube, Parts, \$85.00, with Blue Prints and Connecting Wires
Ultradyn Kit.....\$26.00 Ultradyn Book.....50c

THE BROOKLYN RADIO SERVICE

577 Myrtle Avenue
Brooklyn, N. Y.

20% OFF Manufacturers' Prices

Select most any standard advertised set or part and remit to us the advertised manufacturers' price, LESS ONE-FIFTH, and we will immediately ship you the goods, fully guaranteed, and in most cases in original packages as received from the manufacturer.

Send check or money order, or pay upon delivery. We pay transportation on all orders of \$4.00 or over.

Satisfaction Absolutely
Guaranteed

ALEXANDER RADIO CO.

640 Broadway New York City

8 Weeks' Trial Subscription, \$1.00

KEEP ABREAST OF THE LATEST
RADIO DEVELOPMENTS
RADIO WORLD
1493 BROADWAY NEW YORK CITY

The Rebus Honor Roll

THE names of RADIO WORLD readers who correctly solved Rebus 1 to 12, inclusive, and who thereby became entitled to a place on the Rebus Honor Roll, are published herewith. This list is complete up to the day of going to press, but any additional correct replies received will be credited and the extra names published later. The publication of rebuses will be resumed next week.

- G. W. Ratliff, 3214 Forest Ave., Dallas, Tex.
- Howard Ault, Arcanum, O.
- Alfred E. Ritter, 250 Crocus Ave., Floral Park, L. I., N. Y.
- Leslie Cortright, Wilcox, Pa.
- Charles Blakemore, 6235 Market St., Philadelphia, Pa.
- George Kenney, 383 Chauncey St., Brooklyn, N. Y.
- Edwin Blalock, Box 315, Montgomery, Ala.
- C. Homewood, 7025 Glenoch St., Philadelphia, Pa.
- Ernest Rollins, 211 South Huntington St., Medina, O.
- Chas. F. Kunkle, Box 194, Flemington, Pa.
- Edward J. Frick, 121 W. 96th St., N. Y. C.
- Frank Fitzharris, 425 E. 5th St., Cincinnati, O.
- A. E. Ritter, 250 Crocus Ave., Floral Park, N. Y.
- Arthur Quatlander, 1420 Ash St., Detroit, Mich.
- Earl Ingalls, 369 Walnut St., Springfield, Mich.
- B. J. Killeen, 34 Indiana St., Wheeling, W. Va.
- Guy C. Latimer, 709 Monroe Ave., Kansas City, Mo.
- Maurice Plata, 4644 N. Racine Ave., Chicago.
- F. S. Haynes, 15 Garden St., W. Englewood, N. J.
- Jos. M. Brown, 1617 11th Ave., Noorth, Birmingham, Ala.
- Thomas J. P. Shannon, The Radio Inn, Bell, Cal.
- T. Swelton, 34 E. Lyndale Ave., Vincennes, Ind.
- Mr. W. Wolfe, 519 W. 4th St., Bloomington, Ind.
- R. J. Norris, 90 Laight St., N. Y. C.
- F. J. Keeney, 548 West Broadway, N. Y. C.
- Clyde T. Jones, 74 S. 19th St., Pittsburgh.
- Al. Jeschke, 1710 E. Main St., Springfield, O.
- Alvin W. Stevenson, 1349 Walnut St., Cincinnati, O.
- Wm. G. Wheat, 2607 Benton Blvd., Kansas City, Mo.
- W. R. King, 408 Erie St., Wheeling, W. Va.

- B. J. Killeen, 34 Indiana St. Wheeling, W. Va.
- Miss Adelaide Noll, Mt. DeChantal, Wheeling, W. Va.
- Wm. D. Lahn, 861 Dumont Ave., Brooklyn, N. Y.
- H. V. Petrie, Box 357, Hazelton, Kas.
- Max H. Hopf, Harper, Tex.
- E. W. Simmons, 141 Central Ave., San Francisco, Cal.
- Joseph Landry, Allerton, Mass.
- E. W. Simmons, 141 Central Ave., San Francisco, Cal.
- Cecil R. McGill, 2508 Grand Ave., Kansas City, Mo.
- Max H. Hopf, Harper, Tex.
- Frank Wessale, Waconia, Minn.
- V. A. Stevens, 95 Mission St., San Francisco, Cal.
- Wm. G. Wheat, 2607 Benton Blvd., Kansas City, Mo.

- Allen Brande, 1091 Payne Ave., St. Paul, Minn.
- F. R. Schwarze, 307 Madison Ave., Elmira, N. Y.
- Joseph De Grosse, 44 Mariner St., Buffalo, N. Y.
- S. R. Patnode, Whiting, Vt.
- G. C. Latimer, 709 Monroe Ave., Kansas City, Mo.
- Fernando Garza Galindo, Avenue Chapultepec 273, Mexico City, Mex.
- Howard Ault, Arcanum, O.
- Alfred E. Ritter, 250 Crocus Ave., Floral Park, L. I., N. Y.
- Frank Fitzharris, 425 E. 5th St., Cincinnati.

SWEEPING THE COUNTRY—Superdyne Circuit in RADIO WORLD July 5, August 23 and 30. Send 45c or start your subscription with any number.

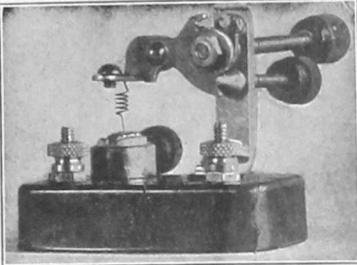
**BEST
BY
TEST**

**CRYSTAL
DETECTOR**

AMBROSE

**VERNIER
FIXED
THREE
ROTATIONS**

Every Detector
Unconditionally
Guaranteed



At Your Dealers
or
Mailed Prepaid

\$2.00

Distributors
Wanted

The Latest Triumph of Radio Science
Gives best results on Crystal or Reflex Sets

OUR TRIAL COMPARISON OFFER—Try the **AMBROSE CRYSTAL DETECTOR** for three days—against any other crystal on the market—if you do not find it absolutely the best, your money back.

Ambrose Radio Company, 220 Vernon Ave., Brooklyn, N. Y.

Tested and Approved by RADIO WORLD Laboratories
Mechanically and Electrically Perfect

TOWER'S

Tower's
Scientific

\$2.95

Plus
a few cents postage

Buy a Headset
you'll be proud of



RADIO
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SCIENTIFIC
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OUR \$200,000.00 COMPANY
STANDS SQUARELY BACK OF EVERY HEADSET

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GREATEST
HEADSET
VALUE

now \$2.95, with Notable Improvements

Longer Cord (full 5 feet), Stronger Magnets, Higher Resistance, Increase of Sensitivity, Perfect Tone Mates

EVERY SET TESTED BY LICENSED RADIO OPERATORS

Send no money - Order on a Post-Card

THE TOWER MFG. CO. Dept. D.98 BROOKLINE AVENUE, BOSTON, MASS.

Scientific

AIR-TRON RADIO TUBES

With the new highly developed dielectric moulded Bakelite base, which eliminates all kinds of electrical losses.



AIR-TRON TUBES

speak for quality, volume and all other characteristics demanded of a Radio Tube. Designed and manufactured to give the highest efficiency that a Tube at the present time can possess.

- TYPE 200—6 Volt, 1 Amp. Detector
- TYPE 201A—5 Volt, .25 Amp. Detector and Amplifier
- TYPE 12—1½ Volt, .25 Amp. Detector and Amplifier
- TYPE 199—3-4 Volt, .06 Amp. Detector and Amplifier Standard Base

Every Tube Guaranteed
List Price, \$4.00

Sold by all Dealers, or shipped C. O. D. Direct by parcel post. When ordering mention type.

DISCOUNT TO DEALERS

H. & H. RADIO CO.

P. O. Box 22, CLINTON HILL STA.
Dept. 104

NEWARK, N. J.

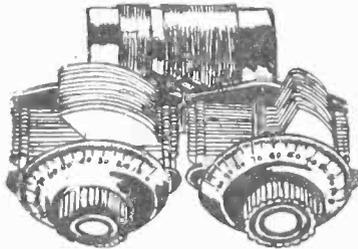
EVER-READY TUNING UNIT

Pat. Pending

HIGHLY
SELECTIVE

REAL
DISTANCE

Clarity



Volume

Will make a complete set with 3 Tubes, Sockets and two Transformers. Will bring Long Distance without interference while local stations are in operation with as much volume as a 5-tube set. Hook up by our Radio Engineer on request.

PRICE.....\$10.00 Postpaid

EVER-READY RADIO CO.

1861 86TH STREET

BROOKLYN, N. Y.

DEALERS AND DISTRIBUTORS! WRITE FOR PARTICULARS!

NEUTRODYNE KIT \$19.75

Complete kit of licensed Neutrodyne parts including panel, tube sockets, rheostats, jack, fixed condensers and grid leak. Neutroformers complete with variable condensers and neutrodions. Every part included even to screws and wire. Easy read plans.

Send No Money Order by postcard

Pay the postman

RADIO SURPLUS STORES

HELENA

MONTANA

FAHNESTOCK CLIPS

"Popular Wherever Radio Is Used"

14 Sizes in Beautiful Display Case

Dealers write for big money-making proposition.

FAHNESTOCK ELECTRIC CO.
Long Island City, L. I.

\$25 FOR \$10

THE FAMOUS BEL-CANTO
Loud Speaker—Price \$10
Direct from Factory to you.
Delivered free C.O.D. to your door.
Coming, "The Bel-Canto Headset," something entirely new.

BEL-CANTO MFG CO.
General Office and Factory Dept. R W
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Stuyvesant 1921

LOWER YOUR COST

Let Us Manufacture Your Parts, Kits, or Radio Sets.

Complete radio factory, expert experienced workmen. We can manufacture radio goods in any quantity, giving quick delivery. Every part inspected and thoroughly tested. Absolute reliability guarantee. Low rent and mechanical mass production enable us to give lowest prices.

Write or send for our estimator to call. Quantity production only.

REPP LABORATORIES
1100 North Avenue Plainfield, N. J.

NEW TUBES

Exchanged or Repaired

FOR OLD

\$2.25

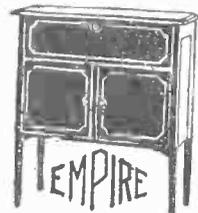
Send any type or make of tube in any condition 199-201A-12-200

We will replace your old Burnt-out or Bad Tube with another of similar type and guarantee it to function as well as any Standard Tube made.

Our Tubes are made in all types—201A, 200, WD 12, WD 11, 199, etc. Any tube that does not oscillate and amplify will be replaced Free of Charge if Filament is not burned out.

CRESENT SALES CO.

985 Third Avenue New York, N. Y.



EMPIRE CABINETS, CONSOLE TABLES—ASSURE SATISFACTION by USING

New Empire Combined Desk Cabinets. Here is a combination cabinet you are all looking for. All your batteries and your Radio Set concealed. No more wires dangling around to spoil the appearance of the room. Several designs and styles are ready for your inspection. Cut illustrates our \$50 Combination Desk Cabinet.

EMPIRE RADIO CABINETS

Manufactured by the

Empire-United Hat Block Co.

Telephone: Caledonia 0322

312-314 EAST 22nd ST., NEW YORK

Mail Orders Promptly Filled

RADIO WORLD ADVERTISING RATES INCREASED ON OCTOBER 1

The following advertising rates will be in force for display advertising in Radio World for space not contracted for before October 1, 1924, and starting with our issue of October 4:

1 Page	\$200.00
½ Page	100.00
¼ Page	50.00
1 Column	66.66
1 Inch	7.00
Per agate line	.50

TIMES DISCOUNTS:

52 Consecutive Issues	20%
26 times consecutively, or E. O. W. one year	15%
4 Consecutive Issues	10%
Classified Advertising: 10c. per word; minimum, ten words.	
Cash with Order.	

Trade Review

(Continued from page 16)

Cleveland, is built like a rheostat, with the exception that the resistance runs from approximate zero to 10 megohms. It is arranged for panel mounting and has insulating shaft and dial, with binding posts spaced to fit Dubilier condensers, although any other condenser may be used with it.

(Tested and approved by RADIO WORLD)

Kester Radio Solder

KESTER Radio Rosin Core Solder is a hollow ribbon of genuine tin and lead having inside a pure rosin flux. This flux is in proportion to the surrounding solder and feeds out as the solder is used. The manufacturers are the Chicago Solder Company. The solder will not cause dangerous fumes nor sputter. Rosin core solder is used in all telephone line work.

(Tested and approved by RADIO WORLD)

Pathe Phusiformer

THE Pathe Phusiformers, made by the Pathe Phonograph and Radio Corporation, 20 Grand Avenue, Brooklyn, N. Y., consists of a compensating coil arrangement within which is placed a variable condenser. The coil is a radio-frequency transformer, the primary and secondary wound in sections and telescoped. Due to its compensating properties, the Phusiformer needs no external means of neutralizing interstage capacity. The Phusiformer does excellent work in tuned RF sets.

(Tested and approved by RADIO WORLD)

Durham Mountings

DURHAM & CO., 1936 Market St., Philadelphia, have placed on the market a series of new grid leak and condenser mountings. They consist of a single grid leak mounting, a condenser and grid leak mounting, and a double resistance mounting for use with resistance coupled amplifiers. This is in addition to their line of resistances and grid leaks.

(Tested and approved by RADIO WORLD)

Bruno Condenser

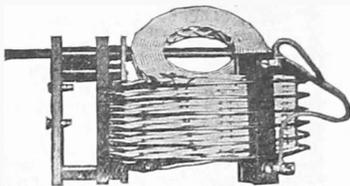
THE Bruno low-loss variable condenser, manufactured by the William A. Bruno Co., 300 Water St., N. Y. C., has some very remarkable constructional features. The cone spring takes up bearing which allows free and smooth movement of the rotor plates, which are divided into two sections, balancing each other. A vernier attachment makes fine adjustment possible. The condenser can tune two coils at once.

(Tested and approved by RADIO WORLD)

Tower Earphones

THE Tower Mfg. Co., of Brookline, Mass., are having good success in the radio market with their Scientific Headset. A feature of the production of these earphones is the individual testing of each ear piece by experienced men. The

LOW-LOSS TUNERS



The Globe Low-Loss Tuner is designed to give maximum efficiency. All metal parts entirely eliminated. Less than 1½ ozs. of insulating material. Anti-capacity windings. Suitable for use in all standard hook-ups. Special unit for the SUPERDYNE circuit.

PRICES:

Standard Tuner (Broadcast Range).....\$7.00
 Short Wave (70-250 Meters).....\$7.00
 For Superdyne Circuit.....\$4.50
 Other types to order.

Circular on request.

Dealers and jobbers write.

Globe Radio Equipment Co.
 217 West 125th St., New York

entire head-set, cord and head band included, is only 8 ounces. The extra strong magnets are wound to a high resistance with wire of the best quality and the phones are very sensitive.

(Tested and approved by RADIO WORLD)

Marshal-Gerken Posts

THE Marshal-Gerken Co., Toledo, Ohio, are making a new engraved binding post with standard screw bases. The connectors come in sets. One set is sufficient for a complete radio receiver.

(Tested and approved by RADIO WORLD)

Reliable Small Condenser

A FINELY adjustable neutralizing condenser for use with tuned RF circuits primarily is made by the Reliable Parts Mfg. Co., Cleveland. A micrometer screw adjustment varies the capacity of the condenser, made of two metal rods enclosed in a glass tube. A slit metal collar which slides over the glass tube is the rough adjustment.

(Tested and approved by RADIO WORLD)

Carter Hold Tight Jack

THE Hold Tight double-circuit jack, manufactured by the Carter Radio Company, 209 South State Street, Chicago, is a sturdy panel instrument made up of heavy phosphor bronze

springs mounted on a cast brass frame. The jack frame is so shaped that a minimum of insulation is used. Large pure silver contacts on all four springs insure perfect contact. The jack will take all standard size plugs and holds them with a firm grip and sure contact. One hole in the panel, 7/16" diameter, is sufficient for the instrument on any panel ¼ to ¾" thick.

(Tested and approved by RADIO WORLD)

(Continued next week)

HARP TUBES

\$1.00

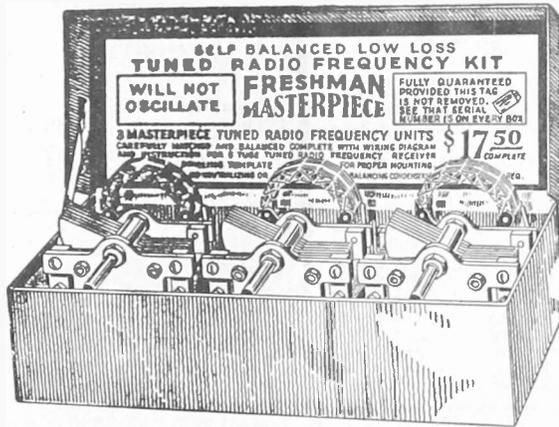
REGULAR PRICE \$3.75
 6 V., ¼ Amp. Det.

Royal Mfg. Co.
 206 BROADWAY
 cor. Fulton St., N. Y.

FRESHMAN MASTERPIECE

It's Easy to Build

a five tube radio frequency receiver when you use the Freshman Masterpiece Kit.



No Neutralizing or Balancing Condensers Required

when you build with this kit to produce a radio frequency receiver that will bring in even the most distant stations with the volume and clarity of locals. So selective that stations can be brought in day after day at the same dial settings. A set that will be the equal, if not the superior, to any 5 tube receiver on the market, and what's more, it's the easiest set in the world to operate.

Kit consists of 3 Masterpiece Tuned Radio Frequency Units carefully matched and balanced. Complete with wiring diagram and instructions for building any 5 tube tuned radio frequency receiver and also drilling template for proper mounting.....

\$17.50

Each and every Freshman Masterpiece Coil bears a serial number and Trademark—our guarantee of electrical and mechanical perfection. Every genuine Freshman Coil is made of specially insulated wire to prevent short-circuiting, so often caused by inferior coils. For your protection demand only the genuine.

At your dealers, otherwise send purchase price and you will be supplied without further charge.

CHAS. FRESHMAN CO., INC., 106 Seventh Avenue, New York

3,000,000 Sets in United States and 10,000,000 Listeners

HERE is a summary which shows how big radio has already grown. At the

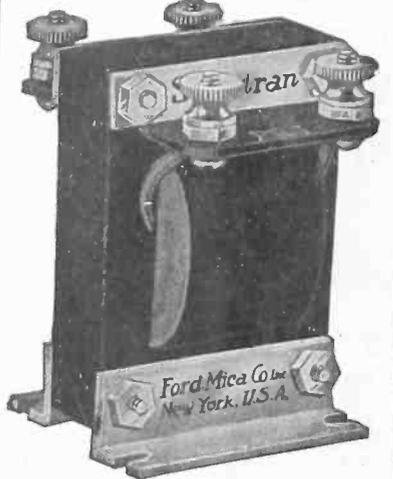
beginning of 1924 there were in this country approximately:

Three million radio receiving sets; ten million listeners; 543 licensed radiocasting stations; 250,000 persons directly and indirectly connected with the industry; 3,000 manufacturers of radio apparatus; 1,000 wholesale dealers in radio sets; 20,000 retail dealers of all kinds who handled radio equipment; 1,000 newspapers carrying radio programs and radio news departments; 2,500 country weeklies which featured radio; fifty exclusively radio periodicals; fifty magazines with radio

sections; 250 popular and technical books written on radio, and seven trade papers devoted exclusively to radio.



Reg. U. S. Patent Office
THE IDEAL AUDIO FOR NEUTRODYNES



Ford Mica Co. Inc. New York, U.S.A.

Every Neutrodyne Receiver requires audio transformers which are especially built for this circuit. Build right by selecting SUPERTRANS first! Greatest volume. Least distortion.

Works equally well with all types of modern tubes.

Price \$6.00

At your dealers or by mail postpaid on receipt of purchase price. Write for our free literature.

Ford Mica Co., Inc.
33 East Eighth Street, New York

New England Distributors:
Wetmore, Savage Co., Boston, Mass.
Western and South-Western Distributors:
Bookley-Ralston Co., Chicago, Ill.



Little Wonder !!!
SOLDERLESS LUG

Holds Bus Wire Like Clip!
Connect or Disconnect Wires
Without Disturbing Terminals!
Price 10 for 5c. Ask your dealer.
Distributors Wanted

Mfd. by PAUL GLAMZO
203 Lafayette Street New York

RESULTS

WHAT Results Did You Obtain from Constructing Sets or Parts Following Data Published in Radio World? Write to Results Editor, Radio World, 1493 Broadway, New York City

RESULTS EDITOR:

IN regard to "A 1-Tube Set You Can Log," described by Herman Bernard in RADIO WORLD issue of July 12, I have had very good results with my set made from specifications. I use a 199-tube. The following stations have been heard: KFKX, Hastings, Neb.; WHB, Kansas City, Mo.; WDAF, Kansas City, Mo.; WOS, Jefferson City, Mo.; WLS, Chicago, Ill.; WEBH, Chicago, Ill.; WSB, Atlanta, Ga. What makes these results more noteworthy is that all the stations were heard while using an electric light socket aerial. The set is very selective although the stations fade after being tuned in perfectly.

A slight change was advisable in my case. I connected condenser C1 in series with coil L1, instead of shunting the condenser across the coil. Trusting you will keep up the good work, I remain

Yours truly,
RUSSELL CHRISTMAN,
1227 N. Topeka Avenue,
Wichita, Kansas.

ROLLS ROYCE" RADIO TUBES



Like their name, significant of quality. Durable and powerful. Bring in distance with a maximum of volume and clearness.

Type 200—5 volts, 1 ampere Detector Tube
Type 201A—5 volts, .25 ampere Amplifier and Detector
Type 199—3-4 volts, .06 ampere Amplifier and Detector
Type 199—3-4 volts, .06 ampere With Standard Base—Amplifier and Detector
Type 12—1 1/2 volts, .35 ampere Platinum Filament—Amplifier and Detector

ALL TYPES of Radio Tubes \$2.50

Type 202 Five (5) Watt Transmitter.....\$3.00

EVERY TUBE GUARANTEED to work in Radio Frequency. Especially adapted for Neutrodyne, Reflex and Super Heterodyne Sets. Shipped Parcel Post C. O. D. When orders mention type.

Rolls Royce Tube Co.
21 Norwood Street Dept. W Newark, N. J.



LEGO WONDER FIXED DETECTOR

For REFLEX & CRYSTAL SETS

Something Entirely New!
100% SENSITIVE

10 IMPORTANT FEATURES READ THEM CAREFULLY

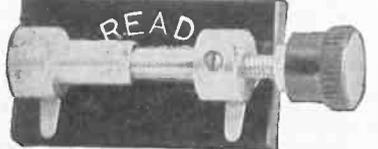
- 1—No parts to replace or wear out.
- 2—The use of a NEW MATERIAL that effectively eliminates distorted and interrupted reception, and substitutes clarity and increased volume.
- 3—Absolutely 100% sensitive. No searching for sensitive spot.
- 4—Glass encased, it is immune from sun and dust.
- 5—Especially designed to withstand high voltage in reflex circuits.
- 6—Solidly constructed throughout, it is practically everlasting.
- 7—It is ALWAYS READY—no adjustments of ANY kind needed.
- 8—As good looking as it is efficient. High nickel-plated throughout, and attractively designed. It enhances the appearance of any set.
- 9—Constructed so that it is thoroughly VIBRATION-PROOF.
- 10—Carefully tested, approved and unconditionally guaranteed by its makers.

For Sale by All Dealers 90c. or Sent Postpaid Insured \$1.00

LEGO CORP., 225 W. 77th St., N. Y. C.

READ MICRODENSER

The perfect equalizing capacity for Radio Frequency circuits.



Micrometer adjustment — sturdy construction. Dust proof. No tools needed for adjustment. Once adjusted it cannot change.

Price 75c.

J. M. READ & CO.
3289 Washington Blvd. Cleveland, O.
Dealers write for prices.

MAKING A LOW-LOSS RF COIL, by Noel Fitzalan. Dispenses with neutralization. Send 15 cents for Sept. 6 issue or start your subscription with that number. Radio World, 1493 Broadway, N. Y. C.

Mail This Coupon NOW for FREE RADIO CATALOG



No set-builder or radio fan should be without this big catalog. It is full of wonderful radio bargains which have not and can not be equalled elsewhere. Our unrivaled buying power means a worth while savings for you.

Chicago Salvage Stock Store,
Dept. W-8, 509 S. State St., Chicago, Ill.

Gentlemen: Please send me a copy of your new radio catalog.

Name.....
Postoffice.....State.....
Rural Route.....Box No.....
Street and No.....

Chicago Salvage Stock Store,
Dept. W-8, 509 S. State St., Chicago, Ill.

The Phenomenon of Induction

BEGINNERS often wonder how the energy is transmitted from the pri-

mary to the secondary circuit of a variocoupler or a loose coupler when there is no electrical connection between. This phenomenon is explained by what is known as induction.

When a coil of wire has a current passing through it it throws out a field of force of the form and nature of that which surrounds a magnet. If another coil of wire is brought near the first coil so that its turns are within the bounds of its field of force, it will be found that a momentary current is produced in the second coil. When this happens the second current is said to be induced, in distinction from being conducted.

However, if the current in the first coil is steady, and the relationship between the two coils remains fixed, the induced current will last but a moment. But if the current is alternating, or oscillatory, such as is found in radio waves, the current in the second coil will be continuous and will follow closely the changes of current in the first coil.



More Money For You in RADIO

The amazing expansion of Radio has opened up hundreds of wonderful new positions on land and sea. Big salaries, fascinating, easy work, short hours, and a wonderful future are offered to ambitious men who get into Radio now.

Take advantage of these wonderful opportunities to step into a big paying position in this great new field. Radio offers you an opportunity to travel and see the world, with all expenses paid, and a fine salary besides. Or you can stay at home and work up to a position paying up to \$10,000 a year. One of our recent graduates secured a position one week after graduating, paying a salary of \$300 per month. Hundreds of others report equal success.

Easy to Learn Radio at Home

Hundreds of men are already earning handsome incomes in this wonder science. If you want to get into a profession where opportunities are unlimited make Radio your career—become a Certified Radiotrician.

Thousands of Certified Radiotricians are wanted to design Radio sets; to make new Radio improvements; to manufacture Radio equipment and to install it; to maintain and operate great broadcasting stations and home Radio sets; to repair and sell Radio apparatus; to go into business for themselves; to operate aboard ship and at land stations.

You can easily and quickly qualify in your spare time at home through the help of the National Radio Institute, first school to teach radio successfully by mail, established 1914. No previous experience or training needed. Prominent Radio experts will help you in every problem, giving you personal attention.

You learn by actually doing, as we furnish free with the course circuits and parts for building latest receiving sets, making the work thoroughly practical. You learn quickly and easily—right at home.

This is the absolutely complete course which qualifies you for the real "big pay jobs" in Radio.

Send for FREE BOOK

No other field today offers such great opportunities as Radio. Take your choice of the many wonderful openings everywhere. Prepare now to step into the most interesting and best paid profession today. Read about the opportunities open now—the different kinds of work—the salaries paid. Write today for the 32-page book that tells how America's first and biggest Radio school (government recognized) can teach you to become a Certified Radiotrician in your spare time and also Special Offer to those who act at once! Mail coupon or write letter now.

National Radio Institute, Dept. 78-JA
Washington, D. C.

National Radio Institute, Dept. 78-JA
Washington, D. C.

Without obligation send me your book, "Rich Rewards in Radio," which tells all about the opportunities in Radio, how spare time study at home will qualify me quickly as a Certified Radiotrician so I can get one of these splendid positions, and how your Employment Service helps me to secure a big pay job.

(Please Write Plainly)

Name..... Age.....
Street.....
City..... State.....

DEALERS

Best by Test

Diamond Plate Batteries

THE BOWER RADIO SHOP
Wholesale Radio
Reading, Michigan
24 Hour Shipping Service

Baldwin Phones Free

For best long distance record on my hook-up. Other prizes too. Particulars free.

LEON LAMBERT

562-K Kaufman Bldg. Wichita, Kansas

RADIO RECORD

Keep a permanently bound record of all stations you have received and how you received them. Radio Record 5 1/2" x 14"—600 lines. All broadcasting stations listed, and indexed with space for new stations—\$1.00 Postpaid.

THE BEADLE PRINTING CO.
MITCHELL SOUTH DAKOTA
Applause Cards 60 for \$1.00 Postpaid

Civil Service

THE United States Civil Service Commission announces the following open competitive examination:

JUNIOR ENGINEER

The examination will be held throughout the country on October 8. It is to fill vacancies in various branches of the Government service at an entrance salary of \$1,860 a year. Advancement in pay may be made without change in assignment up to \$2,400 a year. For appointment outside of Washington, D. C., it is probable that this same rate of pay may be applicable, but if not, the entrance salary will be from \$1,500 to \$2,000 a year. Examination will be given in the optional subjects of electrical engineering and radio engineering.

Applicants must have been graduated with a degree in engineering, preferably along the line of the optional subject selected, from a college of recognized standing, or must be senior students in such course and furnish, within three months from the date of the examination, proof of actual graduation.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the Secretary of the Board of U. S. Civil Service Examiners at the Post Office or Custom House in any city.

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201A Det.-Amp.—1/4 amp., 5 v. } \$3.95
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WD12 Det.-Amp.—1/4 amp., 1.5 v. } Postpaid

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206 Broadway Dept. M New York City

THAT GREAT SUPERDYNE CIRCUIT

That appeared in RADIO WORLD dated May 17, 24, 31, 1924, aroused so great an interest that the entire supply of those issues has been exhausted. The Editors, therefore, decided to bring the articles strictly up-to-date, and the Superdyne Circuit was, therefore, fully covered in descriptive story and diagrams in RADIO WORLD dated Aug. 23 and 30, 1924. These two copies sent on receipt of 30 cents. Also the July 5 issue contained an article about "Trouble Shooting for the Superdyne"; mailed on receipt of 15 cents. RADIO WORLD, 1493 Broadway, New York City.

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Smithsonian Institution Goes On the Air

WASHINGTON.

IN carrying out its motto: "For the Increase and Diffusion of Knowledge Among Men," the Smithsonian Institution at Washington has turned to radiocasting as the most efficient means of disseminating knowledge.

The Englishman, James Smithson, who died in 1829, bequeathing his estate to the United States to found at Washington an establishment for spreading information throughout the country, would no doubt applaud the modern means of accomplishing his ideals, if he knew of the recent action of his executors. Interpreting his purpose as covering practically all the intellectual activities of man, scientific research, and exploration have figured as the principal factors in the Institution's increase of knowledge. Until recently, the chief means of disseminating scientific and general knowledge has been through the publication of reports and the exhibits of the National Museum, a branch of this Institution now known throughout the civilized world.

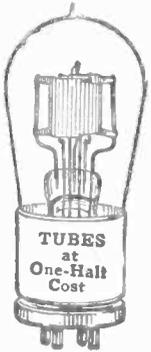
Next month the Institution will undertake a definite program of weekly scientific talks over the radio from Station WRC, covering practically every branch of science, but so spoken as to appeal to lay listeners as well as those better informed. The program is under the direction of Dr. Austin H. Clark of the National Museum, who has also obtained the co-operation of the Carnegie Institution, and several scientific bureaus of the Government. The first broadcast by a member of the Smithsonian staff was that of Dr. Charles G. Abbot, Director of the Astrophysical Observatory.

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THE Wallace Radio Company, Inc., 135 Liberty Street, New York, announces the issuance of its new Fall catalog. This is complete, featuring only the highest class of standard merchandise. This concern also gives an iron-clad guarantee as to quality and service to all its customers. Its coils for the Superdync circuit, covering the radiocast range without taps, are wound in their own laboratories and are effective. The firm is also

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WILL SELL three Fada Neutrodyne 5-tube kits at \$54.50 each. Guaranteed new, in factory package. Send stamps for radio bargain lists. Radio B. J. S., 1074 Redondo Ave., Long Beach, Cal.

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EARN \$110 TO \$250 monthly, expenses paid, as Railway Traffic Inspector. Position guaranteed after completion of 3 months' home study course or money refunded. Excellent opportunities. Write for Free Booklet G-161. Standard Business Training Inst., Buffalo, N. Y.

PATENTS—Write for free Guide Books and Record of Invention Blank before disclosing inventions. Send model or sketch of your invention for our prompt Examination and Instructions. No charge for the above information. Radio, Electrical, Chemical, Mechanical and Trademark experts. Victor J. Evans & Co., 294 Ninth, Washington, D. C.

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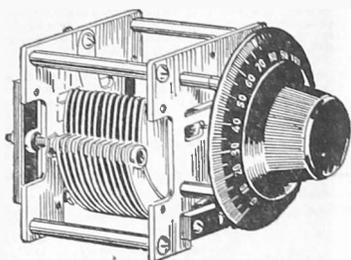
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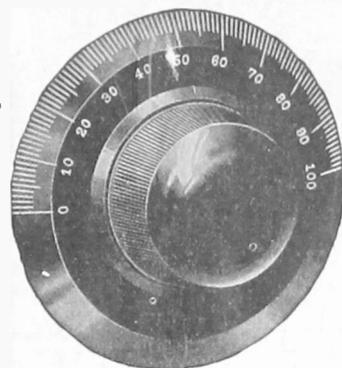
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Perfect Resonance Control

Liquid smoothness and flexibility feature this perfect slow-motion dial. Lustrous finish and graceful lines add beauty and utility to the home-built set. Perfect because of perfection of design and skilled craftsmanship. No grating; no bluster; no backlash, because every part is in perfect accord. Prices: 4-inch, \$2.50; 3-inch, \$2.00.

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Engineers and Manufacturers

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CAMBRIDGE, MASS.

International Tests for Radio Week

PLANS are now being made for an international radiocasting test from Nov. 24 to 31, two hours each night. Stations in the United States, Cuba, Porto Rico, Canada, Hawaii and Australia will transmit special programs on high power. Listeners throughout the world will endeavor to receive the programs. In England the nine stations of the British Broadcasting Com-

pany will transmit special programs to be received in the United States. It is expected that several French broadcasting stations will also try to reach this country during the tests.

Arrangements this year are more extensive, and special efforts are being made to eliminate unnecessary interference from American stations, which was responsible for most of the difficulties last year.

American stations have indicated their desire to cooperate with special programs in the international transmitting hours, and have promised to maintain silence when the foreign stations are sending for American listeners.

Announcement will soon be made of the complete roster of stations taking part in the test. American stations on similar wavelengths are now arranging alternate transmitting periods. The British Broadcasting Company and Hugh S. Pocock, editor of

The Wireless World and Radio Review, are sponsoring the tests in England.

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Hoover Wants Big Stations Linked to End Silent Area

Connecting Radiocasters by Land Wires to Be Discussed at the Big Conference in Washington Next Month.

WASHINGTON.

SECRETARY HOOVER believes it is important, so that all may keep posted

on national affairs, that the whole country be connected by radio and wires. The connecting of radiocasters into chains is apt to be the most important question raised at the Conference on October 6.

Discussing the radio sessions over which he will preside, Secretary Hoover said that the big question was the interconnection of radiocasting stations in every city with better organization. Through the cooperation of the radiocasters with the American Telephone and Telegraph Co., he said the eastern half of the nation was well served when events of importance were radiocast, but added that some parts of the country were not yet reached and that therefore the citizens might be said not to participate in national affairs. "It is important to have the whole country connected for events of general import," he declared. "Real public service," he explained, "lies within the power of local radiocasters in all states."

At present the situation falls considerably short of Secretary Hoover's ideal, due, as he pointed out, to lack of complete cooperation between the transmitting stations and the companies controlling the telephone and telegraph wires, and the necessary expense involved. Today several high-powered stations are spanning the country, with listeners in many cities, but this does not meet the rigid requirements set up by Mr. Hoover. He wants an efficient station in every town so as to insure the owners of crystal sets at least a "silent part" in country-wide activities. Every local station must be efficient, and capable of being linked into a national net for the dissemination of important communications and the diffusion of official pronouncements, before this exponent of the radio communication is satisfied.



The 40 Ft. HERCULES Mast in yard.

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This mast is made in sizes to get 20 ft., 40 ft. or 60 ft. clearance, and is the answer to an efficient aerial system. What is more, this graceful mast is an improvement to any property, whether it is installed on the roof or in the back yard. It can be erected in a few minutes. It is shipped knocked down for convenience in handling. All parts are made of steel and are light and strong.

Long Range Radio Reception

It has been said time and again that the best results are obtained only by the intelligent use of the best apparatus procurable. This is an oft repeated statement but the more it is propounded the truer it becomes and applies not only to the receiving equipment proper, but also to the antenna system. This applies most emphatically to receivers of the crystal detector type and to non-regenerative audio outfits. THE AERIAL MUST BE EFFICIENT if the reception of long distance stations theoretically within range of the receiver is desired.

Proper Aerial Clearance

Very few novices realize the importance of good aerial installation. The feeble currents from long distance stations will never reach the receiving set if the aerial is strung too close to surrounding objects that tend to absorb the energy. It is with this interference that we have experimented for years—and present the answer—THE HERCULES AERIAL MAST.

Have Built Radio Towers for Years

For years we have been building radio towers for important broadcasting stations. Included among the names of our customers is the UNITED STATES GOVERNMENT SIGNAL CORPS. Only after years of experience and development work have we been able to perfect this wonderful steel aerial mast to sell at a price within reach of the amateur.

Give Your Set a Chance

Not only will the proper aerial clearance thus obtained give you the supreme pleasure of long distance radio reception, but the appearance of this beautiful mast on your property will give you a reputation. This reputation will grow as you bring in stations such as you yourself never dared hope for.

20 Ft. Mast \$10
40 Ft. Mast \$25
60 Ft. Mast \$45

Freight Prepaid

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Same panel, same layout, fewer parts than a "Neut"—but, oh how she steps out. Selectivity with deep, resonant volume. If you've been thro the embarrassing vicissitudes of "Neut" making, there's "Welcome" on your door mat for this very circuit. No one else has it. Necessary stabilizer, 22 feet gold sheathed wire, lithographed white print of circuit and complete, simple instructions—prepaid anywhere, cash or stamps—\$5.00. Nothing else to buy. Satisfaction guaranteed. Data about this circuit sent for 10c. New radio catalog, thousands unusual items for stamp.

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Panel Size	Imitation Walnut or Mahogany	Genuine Walnut or Mahogany
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7x28 7	6.05	10.00
7x28 8	7.25	11.50
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7x40x10	11.25	18.00

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The Ultimate in Receivers

The BILTMORE MASTER REFLEX receiver was designed for the person who must have the very finest receiver in every particular.

The range of the Biltmore Master Reflex is extraordinary. The five tube receiver has two stages of tuned R. F. amplification, two stages of transformer E. F. amplification, detector, and three stages of audio amplification. The amplification of an eight tube receiver! The four tube machine is exactly the same as the five tube set, with the exception that there is one less stage of audio amplification. Both receivers have often given 3,000 mile loudspeaker reception with only a short indoor wire as antenna!

Three stages of audio amplification permit reception of stations at not too great a distance, with tremendous volume—enough to fill the largest auditorium.

Reflex receivers are noted for their perfect tone. The BILTMORE MASTER REFLEX gives superb reproduction. Two stages of tuned R. F. amplification, with the finest low-loss condensers and low-loss transformers on the market, make the receiver extremely selective. No trouble is experienced from local interference.

The receiver is a beautiful machine. The panel is of Radion Mahogany, the cabinet is heavy hand rubbed mahogany, the metal parts are nicked, and the dials are of white and mahogany.

We use the very best apparatus which is manufactured, Radion panel, Federal jacks, Dubilier Micadons, Eads rheostats, Acme radio and audio transformers, and American Brand "100 to 1" vernier low loss condensers.

The receiver is convenience itself. A ground, and a short piece of indoor wire is all that is required for the antenna, all connections are made permanently to the rear of the cabinet, and the pulling of a switch prepares the receiver for reception. For any one station, the dial settings are all the same. This gives the receiver the simplicity of a single control machine. The settings may be logged for future reference after bringing in a desired station.

We have spared nothing to make this receiver the very finest machine in every particular, which it is possible to construct. Every detail of convenience, appearance and efficiency has been amply taken care of, that the receiver shall give perfect satisfaction in every respect.

Write us for further particulars.

PRICE { 4 tube receiver, \$100
5 tube receiver, \$125

DEALERS! ASK FOR PRICES.

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Tubeless Transmission on a Straight Line

A NEW portable, directional radio-
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through walls in a straight line, was
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New York City, by its inventor, Bernays
Johnson. The set, which weighs twenty-
five pounds, requires no tubes, generator,
outside aerial or ground. It consists of an
ordinary telephone transmitter and re-
ceiver, a bell-ringing device and derives
its electrical power from twelve dry bat-
teries. A coil attached to the transmitter
and receiver serves as the ground and
aerial. In order to receive the signals it
is necessary for the coil on the receiver
to be parallel to the coil of the trans-
mitter. If it is in any other position the
sound cannot be heard. It is claimed that
the voice can be carried for a distance of
about one mile during the day and further
at night.

It is necessary, in order to talk, to press
a button and speak directly into the
transmitter. It was explained that the
current which is produced goes into the
coil on the transmitter. A carrier wave is
set up on which the voice is impressed,
and by means of the fluctuations of this
carrier wave the sound is transmitted.

The carrier wave goes in a direct line
to the receiver coil, to which a box,
containing crystal, is attached. The crystal
amplifies the received current, after which
it passes to the receiver. It is this crystal
which amplifies the signals without the
use of any dry batteries that permits the
use of the ordinary telephone receiver.

The feature about the new radiophone
is that the voice is carried in a straight
line. The inventor asserts that it is es-
pecially adaptable for police work, as it
enables persons outside a building to com-
municate with those inside, or those in
one part of a building with those in an-
other. If desired, it is possible to trans-
mit in more than one direction by using
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receiving the signals wishes to reply, a
duplicate set must be used. In order to
receive merely place the receiver to the
ear.

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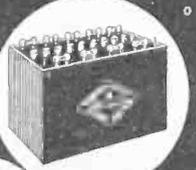
Valuable Recent Numbers of Radio World

Complete your file if you have missed any summer numbers of Radio World while on your vacation. Do not fail to get the following numbers:

- June 7—How to Solve Your Tube Problems. By P. E. Edelman.
- June 14—A Sensitive Double Superdynamo. By Fenimore Keene.
How to Build a Set Like King George's. By Chas. H. M. White.
A Super-Power 4-Tube Reflex. By Byrt C. Caldwell.
- June 28—Nineteen Ways to Erect an Antenna. By P. E. Edelman.
- July 5—Making the Superdynamo Work Right. By Brewster Lee.
- July 12—A 1-Tube Set That You Can Log. By Herman Bernard.
- July 19—Loops. By B. J. Bongart.
- July 26—A New 4-Tube Reflex Heterodyne. By Chas. H. M. White.
1,500 Miles on 2-Tubes. By Herman Bernard.
- Aug. 2—The 3-Circuit Tuner, Think Your Present Varicapour. By Herman Bernard.
- Aug. 9—Dynoflex, a 1-Tube Loud Speaker Set. By N. N. Bernstein.
Crystals as Oscillators and Amplifiers. (Part I.) By Neal Fitzalan.
- Aug. 16—A Low-Loss Neutrodyne (Part I) Using Radio World's Highly Efficient 1-Inch-Made Dynocolls. By N. N. Bernstein.
The Superdynamo Principle in a 3-Tube Set. By Lester Hutter.
How to Build a Unit to Light Your Amplifier Tubes on AC. By Brainard Foote.
Crystals as Oscillators and Amplifiers. (Part II, Conclusion.) By Neal Fitzalan.
- Aug. 23—A Low-Loss, 1-Dial, 1-Tube Set. A Selective Crystal Set. By Herman Bernard.
By Lieut. Peter V. O'Rourke.
Completing the Low-Loss Neutrodyne. (Part II.)
A Low-Loss Superdynamo (1 RF Stage, Detector and 3 Resistance-Coupled AF Stages) (Part I). By N. N. Bernstein.
- Aug. 30—Low-Loss Antenna and Ground. Has the Same Effect as Adding an Extra Tube. By Neal Fitzalan.
How to Make a Wavemeter. By Brainard Foote.
Lacault's Ultradyne (Part I). By Byrt C. Caldwell.
Wiring the Low-Loss Superdynamo (Part II, Conclusion). Two Stages of Transformer—Coupled AF in 4 1/2" x 5 1/2". By Herman Bernard.
- Sept. 6—The Simplified Neutrodyne. By J. E. Anderson.
New Radio Corporation Super Heterodyne. By Walter Scott, Jr.
Use and Care of a Storage Battery. By N. N. Bernstein.
- Sept. 13—Tubeless Set Works Speaker. By the Rev. Henry S. Judge.
The Reflex Magnadyne. By N. N. Bernstein.
Low-Loss 3 Circuit Tuner. By Neil Fitzalan.
- Sept. 20—Tubeless AF Amplifier. By the Rev. Henry S. Judge.
Making a Fixed RF Transformer. By A. F. Lapiere.
A Handy Experimental Layout. By H. Bernard.
- Sept. 27—The Best Set for Your Location. By N. N. Bernstein.
A 1-Tube No-Crystal Reflex. By A. P. Peck.
Condenser Controls Radiation. A 2-Tube Set. By Chas. H. M. White.
A 2-Tube One Control Crystal Reflex. By Byrt C. Caldwell.
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The new battery is built in a one piece, unbreakable, most hard rubber container as illustrated, with vent caps large enough for hydrometer reading. Each battery is called a unit of 2 1/4 volts. Add units for higher voltage.

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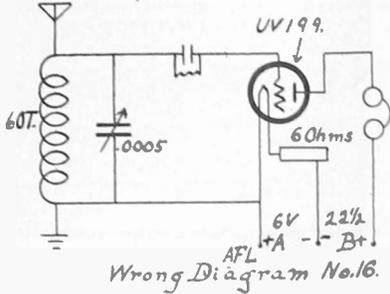
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WHAT'S WRONG HERE?

THE wiring in the accompanying diagram is wrong. If you find what you think is the error, write to Wrong Diagram Editor, RADIO WORLD, 1493 Broadway, New York City.



The names of those sending in the correct answers will be published.

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- Willis Lee, 539 Bainbridge St., Brooklyn, N. Y.
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To ten million homes with Radio Sets—and to countless millions of prospective buyers—this WORLD Storage "B" Battery brings a new conception of battery economy and performance. Here is a battery that pays for itself in a few weeks—will last for years and can be recharged at a negligible cost. And you save \$2.00 by ordering now.

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5,000,000 Pounds of Copper in Sets

Number of Radios In Use Will Increase Until It Equals That of Telephones or Automobiles, Says Report of Researchers

radio sales in the United States will undoubtedly reach the half-billion dollar mark.

A SURVEY of the radio industry recently completed by the Copper and Brass Research Association discloses that, on the basis of an estimated total of 2,500,000 sets in use to-day, radio apparatus in the United States has consumed 5,000,000 pounds of copper.

The survey indicates that the number of radio sets in use will increase to equal the number of automobiles and telephones in the United States (viz., 15,000,000), and that this will likely occur in five years' time. In this event radio manufacturers would use in the next five years 5,000,000 pounds of copper annually.

Copper is an indispensable metal in radio manufacture, either in its basic form or in alloys of brass or bronze. The average radio set requires about two pounds of copper in all forms. It is used as coil windings, antennæ or loops, lead-in wires and connections, switch points, switches, binding posts, terminals and other fittings.

The manufacturing end of radio is carried on by both individuals and corporations, of all degrees of importance and output, from the lone individual "attic manufacturer" to the largest electrical manufacturing corporation. The real radio fan is continually making and re-making his set, which is reflected in the proportion of sales of parts to finished sets. About 75 per cent of radio sales are for parts, and 25 per cent for finished sets, so that, even allowing for replacements to finished sets, the home-made set is numerically much more important.

The radio industry has grown from practically a non-existent status only four years ago to an industry with a sales volume of \$115,000,000 in 1923, and the total sales are expected to be over \$300,000,000 in 1924. In another two or three years

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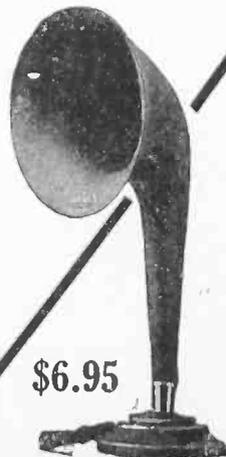
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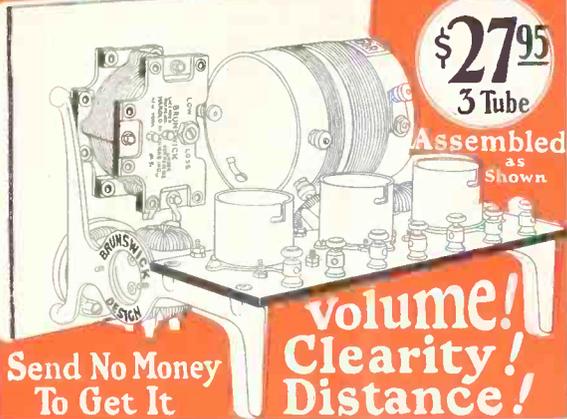
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- 1 6-Ohm Rheostat with gold plated knob to match panel.
- 1 30-Ohm Rheostat with gold plated knob to match panel.
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- 1 Baseboard.
- 20 Feet Tinned Bus-bar.
- 1 .00025 Freshman Grid Condenser.
- 1 Tubular Glass Grid Leak.
- 1 Set Engraved Binding Posts.
- 1 .002 Micon Condenser.
- 1 .006 Micon Condenser.

Exact size special panel-base, blue print and instructions.

BUILDING KIT COMPLETE \$39.49 C.O.D.

OPERATING OUTFIT

- 5 Tested Tubes (Type 201-A) \$17.25
- 2 45-Volt Extra Large Variable "B" Batteries for Neutrodyne 6.50
- 1 60-Ampere Hour Storage Battery, guaranteed 2 years 11.25
- 1 pr. 3000-ohm Head Phones and Cord 3.75
- 1 Phone Plug, double90
- 1 Antenna Equipment 1.50

COMPLETE OUTFIT

\$41.15 C.O.D.

(Parts Also Sold Separately)

FREE

FINE MAHOGANY FINISH CABINET

If you order Building Kit and Operating Outfit both together, we will include Fine Mahogany Finish Cabinet FREE.

The Radio Shack

Largest Radio Dealers in America

Retail Stores at
163 Greenwich St.
338 W. 42nd St.
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Mail Order Dept.
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Mail This Coupon Now—Send No Money

RADIO SHACK—Dept. 927,
55 Vesey St., New York, N. Y.

Please send me the neutrodyne outfit I have marked, when it arrives I will pay postman the amount. If I am not satisfied I will return it in 5 days and you agree to refund my money instantly. Mark choice in square.

- (A) Complete Building Kit \$39.49
- (B) Operating Outfit \$41.15

Name
Address
City State

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- (A) Complete Building Kit \$27.95
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SUPERDYNE SPECIALISTS

WE HELPED AND SATISFIED HUNDREDS OF RADIO FANS IN THE CONSTRUCTION OF THE

S-U-P-E-R-D-Y-N-E

The Circuit So Successfully Featured by RADIO WORLD

LET US HELP YOU

READ OUR GUARANTEE

OUR OWN COILS

Our engineers have developed the coils for this circuit to its highest perfection. Coils for superdyne (complete with diagram).....
 (Note—These Coils have been developed by and are distributed solely through us and should not be confused with inferior coils.)

\$6.50

KITS

Kits consisting of two Flewelling Condensers and complete set of coils (with diagram)

\$19.50

COMPLETE PARTS

Easily recognized as the products of leading manufacturers assembled on engraved Radion front panel, and base panel with necessary bus bar ready to wire (technical and schematic diagram furnished). Schematic diagram drawn to actual size in minutest detail showing wiring above and below base panel. Using this diagram you can build a set equal to the best expert, particularly as to appearance and results.....

\$55.00

GUARANTEE

We guarantee everything you buy from us to be satisfactory to you in every detail. You take no risk whatever in sending us your order, for unless you are completely satisfied with the article you may return anything you buy from us within 10 days and we will promptly refund your money. We want you to know the kind of a house you are trading with. We want you to know our principles of honest dealing and honest merchandise.

Wallace Radio Company for Good Standard Radio Equipment at reasonable prices with service—that means something.

Wallace Radio Company, Inc.

Contrary to usual practice, all parts included in this kit are the very best quality on the market, and workmanship first class.

Now is the time to prepare for a year of wonderful Broadcasting by building the outstanding circuit of the year, the SUPERDYNE. Bring your troubles to us, on the Superdyne or any other circuit.

RESULTS GUARANTEED

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WATCH FOR OUR "VOLADYNE"
 THE SUPERLATIVE RADIO SET

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ALL RADION SPECIALTIES

MAHOGANITE

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DIALS, KNOBS
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"THAT SPECIAL SIZE"

FOR YOUR PHONOGRAPH, PORTABLE OR SUPER

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HARD RUBBER TURNING FOR ELECTRICAL,
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New!

Remember—These parts are new this season! Be Sure to see them at your dealer's.

FIL-KO-STAT

SCIENTIFICALLY CORRECT RADIO RHEOSTAT
with Battery Switch



\$2

FIL-KO-LEAK

SCIENTIFICALLY CORRECT
VARIABLE GRID LEAK

its calibrated



\$2

FIL-KO-LIGHTNING ARRESTER

SCIENTIFICALLY CORRECT
RADIO LIGHTNING ARRESTER

with the \$100⁰⁰ Guarantee



\$1.50

FIL-KO-SWITCH

SCIENTIFICALLY CORRECT
"A" BATTERY SWITCH

Simple - Sturdy - Sure



50¢

Improved Reception

The One Big Thing in Radio That Interests Everyone!

Improved Reception Through "Tube Tuning" with a Scientifically Correct Radio Rheostat.

There have always been plenty of rheostats that served to open and close the "A" battery circuit, but until the Fil-Ko-Stat was made it was impossible to adjust the filament heat to the most efficient operating point, giving maximum audibility in phones or loud speaker. Only the Fil-Ko-Stat designed to give improved reception, allows infinite control of filament current, making possible

louder, clearer signals from distant and local stations in any Radio Receiver using any type of tubes. And now—the NEW model (*insist on the NEW model at your dealer*) gives even finer control than ever before. It's \$2 including the battery switch attachment. And it's unconditionally guaranteed.

Improved Reception Through Maintaining Correct Grid Bias with a Hand Calibrated Grid Leak.

Likewise, there are many forms of grid leaks, some variable, others fixed. The Fil-Ko-Leak, however, is the only grid leak that can be set for a *specified* resistance and adjusted for best results. It's hand calibrated (and double checked) over the operating range for all tubes— $\frac{1}{4}$ to 5 megohms. Markings can be read through a panel peep-hole, and it's also equipped for table mounting

[bracket packed with each instrument]. Guaranteed perfect electrically and mechanically, it gives scientifically correct control of grid potential—for \$2.

Leakage Losses You Never Thought of are Eliminated by this Scientifically Correct Radio Lightning Arrester.

Even were the Fil-Ko-Lightning Arrester no better than the average, it would still be worth far more because it comes to you with a guarantee that is virtually an insurance policy. You get \$100 or we repair or replace your set if damaged through fault of the arrester. But the Fil-Ko-Arrester is better. It eliminates all leakage losses from aerial to ground, all radio impulses reaching

the antenna are sure to pass through your radio set, insuring maximum reception. Hermetically sealed Bakelite insulation is protected by an umbrella-shaped shield that keeps off dust, moisture and other conductive matter. You get positive protection for \$1.50.

There's also the Fil-Ko-Switch, at 50c. It won't improve reception—but it's one of the few battery switches that won't impair it. Made of non-magnetic metal, wipe-action contacts, assuring sharp, clean "make and break", entirely insulated from nickel-plated brass housing and knob. Scientifically correct to avoid current leakage and extra capacity. Carries the usual Fil-Ko-Part for Radio guarantee!



This book will help you get better results from your radio sets; tells all about vacuum tubes and how to control them as to get more DX, greater volume, longer tubes and battery life—maximum regeneration and clearest signals. Write to Dept. RW 927. for free copy.

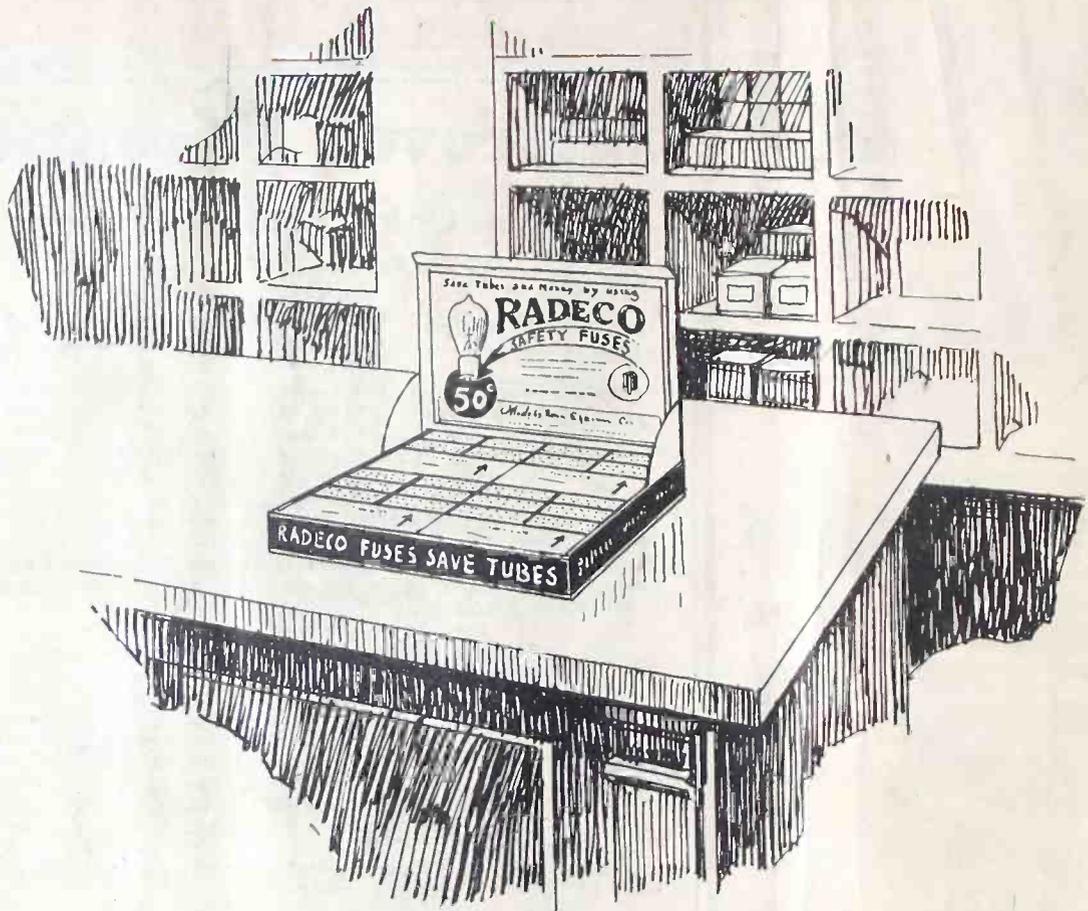
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HARRISBURG — PENNSYLVANIA

If your dealer does not carry these FIL-KO-PARTS for Radio, send his name, with your remittance for parts wanted, direct to the factory.

LITTLE THINGS THAT TELL



This carton of RADECO SAFETY FUSES on your dealer's counter means that he is interested in YOUR welfare, and is trying to help YOU save money by preventing blown-out tubes.

Your dealer will carry RADECO SAFETY FUSES to protect your tubes if YOU ask him. He desires to make Radio more satisfactory to you, and he knows the tremendous amount of loss in needlessly blown-out tubes.

He knows that there is only one fuse that slips on the filament terminal of the tube, and therefore COMPLETELY protects the tube against accidental blow-out from any cause. RADECO SAFETY FUSES have your dealer's confidence. They have been tested and approved by the highest scientific authorities, and thousands of Radio users testify to the protection they offer, and the savings they have made in preventing blown-out tubes.

When you purchase tubes, ask your dealer to put a RADECO SAFETY FUSE on each of them. For a minimum expense you will be securing a guarantee that your tubes are safe from blow-out.

RADECO SAFETY FUSES are fifty cents each

If your dealer is not yet carrying them, fill out the attached coupon, and mail to us.

"RADECO FOR SECURITY"

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RADIO EQUIPMENT COMPANY,
20 Stuart St., Boston, Mass.

Gentlemen:

Please find inclosed for which send me prepaid
..... fuses for tubes. (State type of tube
used).

My dealer's name is.....

NAME

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*New England's Oldest Exclusive
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