

HOW TO MAKE A BUTTERFLY LOUDSPEAKER.

OCT. 30

RADIO WORLD

15 CENTS

REG. U.S. PAT. OFF.

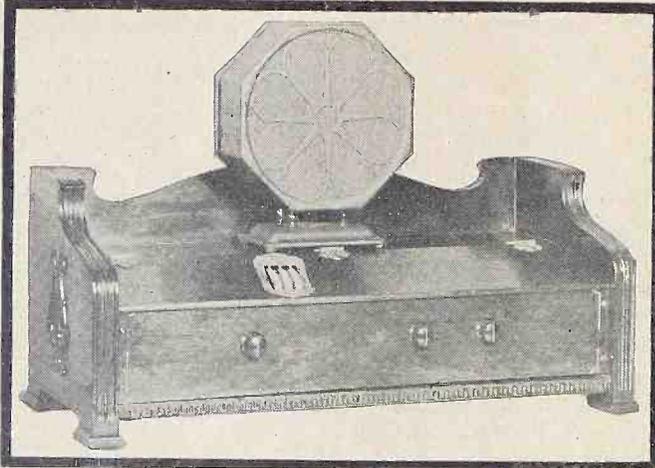


HAYDEN PHOTO.



WELTY UNITS

Take the Guess Out of Set Building—Give You a Tailor Made Job with Its Efficiency—Look Dressy and **SAVE TIME, LABOR AND MONEY**



Build the Welty "Etherway" Like This in an Evening's Time or Buy It Complete as You See It Here

There's nothing better in a five-tube receiver than Welty's "Etherway," whether you buy it ready-made, as you see it above, or whether you build it yourself from Welty Ready-Wired Units.

Welty's "Etherway" steps out and gets distance any night in the week while powerful stations are pounding away. It is selective. It has tone quality. It is easy to operate. It is a real job in looks and performance. There can be none better.

THE "ETHERWAY" DESCRIBED
The illustration below shows the Welty "Etherway" complete with cabinet and speaker. The cabinet is of special design, of our own manufacture. It is of solid, massive walnut (not veneer) and not only is distinctive and a truly handsome piece of furniture, but it makes your radio set convenient to use. The chassis is composed of Welty's Plug-In Shielded RF coils (matched); Welty's Na-Aid Centralized Control Condensers (matched); Welty's Detector-Audio Unit, and Welty's Cone-Drum Speaker. It is completely wired and ready to operate. The illustration below shows the Welty "Etherway" chassis—minus cabinet and speaker. It also is completely wired. No better parts can be purchased anywhere. We guarantee not only the apparatus, but also the workmanship. If

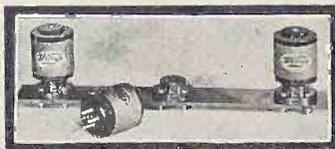
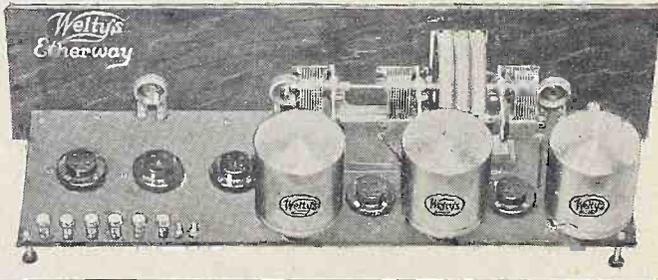
the "Etherway" does not do all we claim for it, bring it back and get your money.

COMPLETE EQUIPMENT
The "Etherway" just as you see illustrated above, with Welty cabinet, Welty cone drum speaker, Ca-Co tubes, storage "A" and dry cell "B" batteries, aerial—nothing else to buy—and fully guaranteed, complete; Five Tubes, \$150; Six Tube, \$165; Seven Tube **\$185.00**

CHASSIS ONLY
The "Etherway" chassis, as you see illustrated below, completely wired, and ready to place in a cabinet, or to work without a cabinet if you prefer. Price, each, Five Tubes, \$58; Six Tube, \$68.50; Seven Tube **\$74.00**

CABINET ONLY
The Welty "Etherway" Cabinet, with slinging panel, made in heavy solid walnut (not veneer or imitation wood or finish), a real piece of furniture. Price, 26-inch, \$21.60; 28-inch, \$23.00; 30-inch **\$25.00**

CONE DRUM SPEAKER
The Welty Cone Drum Speaker, a wonderful and faithful reproducer of music and human voice and of exceptional artistic design. Price **\$19.50**



Shielded type, complete, with mounts, per set of three, \$12.00. Extra coil, mounted on same strip, for four-stage R. F. Shielded, per each coil, extra **\$3.00**

Welty's Plug-In Coils

These coils are of the solenoid type, mounted on plug-in bases which fit into sockets that are mounted on a bakelite strip as shown in illustration. They are usually sold in a set of three for the usual five-tube receiver, but may be had in sets of four and five for Everybody's Radio Lessless 3RP and 4RP receivers. They may be had unshielded as shown at left or shielded as shown at the top of this ad. Unshielded coils, complete, with mounts, per set of three, \$8.50.

Welty's "B" Eliminator

There are two models. Model A delivers four different "B" voltages—135, 90, 67½ and 45, one for power tubes, one for audio tubes and one for detector tube. "C" voltage is variable from 0 to 40 volts. Extra variable detector from 0 to 60 volts. Model B has taps at 90, 67½ and 45 and a variable detector voltage from 0 to 60.

MODEL A, \$42
PRICE

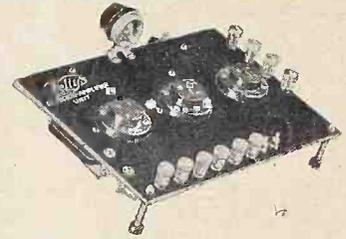
MODEL B, \$35
PRICE

CATALOG FREE
this free, by postpaid mail.

We have a special Radio Catalogue which contains a complete description of all the apparatus we manufacture. We will be pleased to send

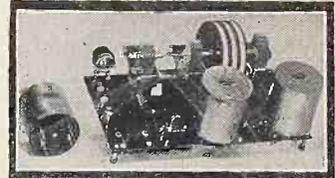
William A. Welty & Co.

36 South State Street, Chicago



Welty's Detector-Amplifier Unit

Can be used in any receiver. Extremely compact. Size, 4¼x9½. All strictly high class parts. Universal sockets. Distortionless transformers. Handles volume of any set. Only 4 connections necessary to hook up to any tuning apparatus. Switch and jack. Whenever a detector and two stages of audio are required you can use it. Saves time in **\$19.50** building. Price for regenerative hookups Price for tuned R. F. and Regenerative hookups \$22.50



Welty's R. F. Amplifier Unit

Newest Welty Unit. With shielded or unshielded coils. Unit shown has shielded coils and one-dial condenser. Only four wire connections to push binding post necessary. All units ready wired. **\$32.50**
Price, shielded coils
Price, unshielded coils \$28.50

Welty's R. F. Amplifier Unit

Same as above, but with Welty's Heath Group One-Dial Control Condensers. **\$34.50**
Price, shielded coils
Price, unshielded coils **\$30.50**

Build the "Etherway" or Any Set with These Units

If you prefer to build your own, the two Welty Units above shown, take the guess out of your work, as all the engineering is done for you—parts properly placed and **WIRED**. All you have to do is to take the units, designed for each circuit, link them together with **FOUR** short wires (no soldering) and you have a receiver that we guarantee will **WORK**. You can't make a mistake and besides having a really efficient receiver you **SAVE MONEY**.

By using Welty's Units you can hookup any of "Radio World's" receivers, or any other published circuit. You can have a three, four, five, six or seven tube receiver and build any of them complete, ready to operate in one evening's time. Your tools are your fingers.

Welty's Tuner

This is the Three-Circuit Tuner used by "Everybody's Radio" in its Jim Welty Link Circuit. It has a fixed tickler tuned by a variable resistance. The primary is variable. **\$5.50**
Price, complete

Welty's Coupler

This is the antenna coupler and R. F. coil with a variable primary that is used in the Link Circuit and other regenerative hookups. It also may be used in tuned R. F. circuits and is a high-powered R. F. coil. Price, each **\$4.00**

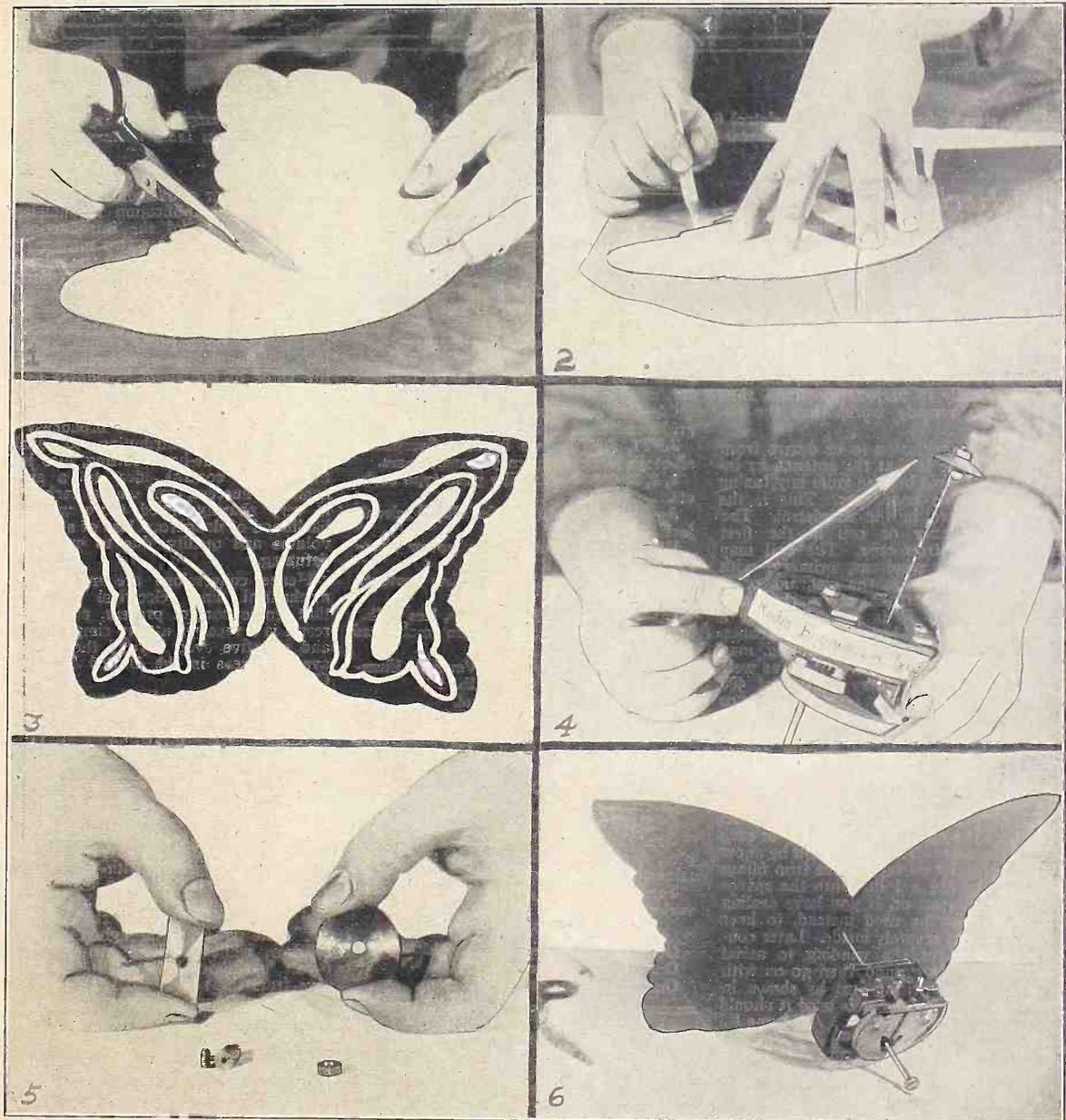


Welty's Super Kit

Kit includes Antenna Coupler, Oscillator Coupler, Special Variable Condenser, Tuned Input Transformer, 3 Matched Intermediate Transformers and hardware. Complete, with booklet, diagrams, assure perfect success. Order now. At our store or by **\$17.50** mails. Price
Super Kit with Welty's New Shielded Oscillator. \$22.50
Complete kit (all parts) **\$73.50**

[Entered as second-class matter, March, 1922, at the post office at New York, N. Y., under Act of March 3, 1897]

The Butterfly Loud Speaker



(Hayden)

HOW TO MAKE a Butterfly Loud Speaker, the one shown on the front cover, is portrayed in the photographs above. Make your own template of a butterfly wing, with 8-inch spread, using stiff cardboard. Cut with shears. (Fig. 1) Lay this template on a sheet of parchment or other material used for cone speaker diaphragms, and trace the outline of the template lightly with a pencil. (Fig. 2) The parchment next is cut as shown in Fig. 3, which also reveals how the wings may be decorated, even with water colors, for brilliant butterfly color scheme. Next get a cone speaker unit (Fig. 4) and remove the apex to which the pencil points. The constituent parts are shown in Fig. 5. There are two metal thimbles and one of these is cut to oblong shape, as shown at left in Fig. 5. The units of the apex are restored to the pin or reed, with oblong at rear. Fig. 6 shows the unit, with adjusting rod extending from the rear and reed thrust into the apex. The completed unit may be placed in a decorative bowl, as shown on the front cover.

The Singletrol Receiver

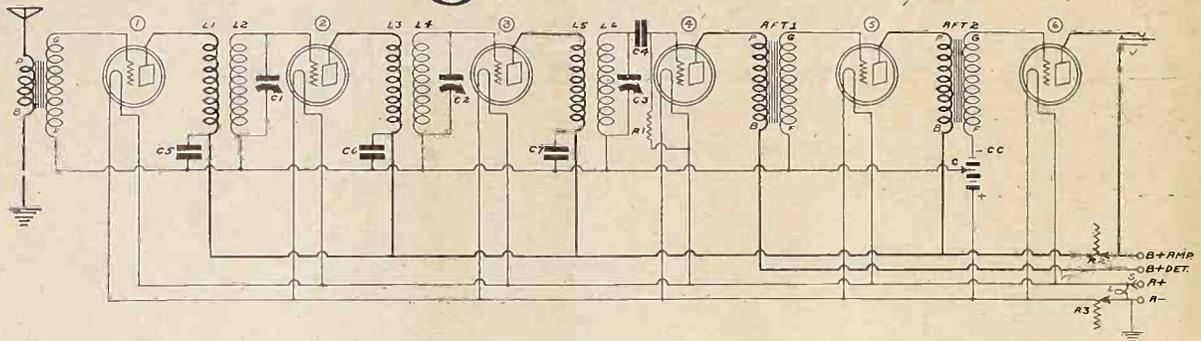


FIG. 1

The circuit diagram of the Singletrol 6-tube one-dial receiver. The first stage of radio frequency amplification is fixed, so that antenna capacity will not throw the unit tuning out of kilter. Connect B minus to A minus from battery post to battery post with bell wire.

By Herbert E. Hayden

THE great attraction of single control, whereby only one dial need be turned to bring in stations near or far, has led to the appearance on the market of many receivers of this type, as well as kits for the construction of such sets at home.

One of the great problems connected with single control is the antenna capacity, as the length and position of the aerial have much to do with this, and they differ radically in various locations, thus making the remedy worse than the ailment.

A natural conclusion to be drawn from this experience is that the antenna or input circuit should be free from any tuning by the variable condenser. This is the method adopted in the Singletrol. The radio transformer or coil in the first stage has an iron core. The coil may consist of two windings, primary, with posts P and B, as in the diagram, or P and plus, as some makes are marked, and secondary, GF. It is not vital that a transformer be used here, for an impedance coil, consisting of a single winding, may be included instead, and will work as well. The impedance coil may consist of 400 turns of No. 28 wire, silk covered or enameled or both, on a 1 in. diameter 3 in. or more in length. The core, or inside of the tubing may be filled with coarse iron filings, purchasable in large hardware stores for 50 cents or less a pound, enough to serve for two or three such coils. The filings are pressed down tightly so that there is a space of about $\frac{1}{8}$ in. at each end of the core. The tubing will be about $3\frac{1}{2}$ in. long, let us say, so the iron filings will take up $2\frac{1}{2}$ x 1 in. Into the spaces pour molten wax, or, if you have sealing wax, that may be used instead, to keep the iron filings securely inside. Later connect one end of the winding to aerial and the other to ground, then go on with the rest of the wiring just as shown in Fig. 1. If a transformer is used it should have a relatively high peak. An Acme R3 will serve the purpose.

The single control is achieved through the use of a 3-section condenser. In the present instance the .00035 mfd. variety was used, this consisting of three separate sections, each of the stated capacity, and each having the same rate of capacity change as the single shaft is turned. The condenser used was the Continental, manufactured by Gardner and Hepburn, Inc., of Philadelphia.

In constructing any single control receiver it is important that the coils be matched. If some slight divergence arises, due either to minor inductance discrepancies or stray capacity or re-

LIST OF PARTS

PBGF—One antenna coil (iron core transformer PBGF or a Singletrol radio impedance coil).

L1L2, L3L4, L5L6—Three matched Singletrol radio frequency transformers.

C1, C2, C3—A single shaft .00035 mfd. Continental variable triple condenser.

C5, C6, C7—Three Aerovox .001 mfd. fixed mica condensers; one extra condenser, same capacity, to bypass R2.

C4—One Aerovox .00025 mfd. mica fixed grid condenser, without clips.

AFT1, AFT2—Two Modern Symphony all-stage audio frequency transformers.

1, 2, 3, 4, 5, 6—Six Eby push type sockets.

J—One Electrad single closed circuit jack.

R3—One Electrad 2-ohm power rheostat.

R2—One Centralab 400-ohm potentiometer, used as B rheostat.

LS—One Bruno light switch, less bulb.

R1—One Lynch 2-megohm metallized fixed resistor.

One National Velvet Vernier illuminated dial, type C, with bulb.

One 7x21-inch front panel.

One $9\frac{1}{2}$ x20-inch subpanel, hard rubber or bakelite.

Two American Radio Hardware Co. aluminum subpanel brackets.

One Lynch single mounting for grid leak R1.

One C battery.

One Birnbach 6-lead battery cable (A plus, A minus and B minus, C minus, CC minus, B plus det. and B. plus amp).

Ten lengths of stiff Acme Celatsite, vari-colored.

ACCESSORIES

One Swan-Haverstick aerial kit.

One Fil-Ko lightning arrester.

One Vitalitone cone speaker.

larger diameter and smaller axial length. The radio amplification is sufficiently great to permit of the introduction of RF resistance by these two means. The per stage selectivity curve is relatively flatter than in the more conventional circuits.

This slightly broader tuning per stage still affords excellent total selectivity, due to the three tuned stages, and utilizes, although in a different manner, the value of per stage broadness as developed in the most expensive receivers where shielding contributes to this end. As must be obvious, the broadness per stage, besides contributing to quality by avoiding side-band cutting, also helps the single control idea to a simply achieved success, for where each stage is very sharply tuned there would be likelihood of dangerous loss of selectivity, volume and quality, due to unavoidable detuning.

Hence concessions are made to the mechanical and electrical necessities that single control present, and the net result is a receiver utterly simple to tune, and selective even beyond the needs of average areas in the United States and Canada.

With so much radio frequency amplification naturally the problem of stabilizing the receiver must be solved. A variable resistor in the plate circuits of the RF tubes is used to gain this end, in conjunction with negative bias of these grids. The bypass condensers C5, C6 and C7 help maintain this stability.

The single filament rheostat R3 controls all six tubes. It is placed on the front panel, together with the National Velvet Vernier illuminated dial, type C, and the Bruno light switch LS. The dial is illuminated from the rear, and the scale is read through the lighted window, while the light switch, with a 6-volt flashlight bulb in it, casts rays from the switch window. The flashlight bulb is purchasable in any electrical store and many hardware stores.

While the wiring of the flashlight bulb used on the National dial is not shown in Fig. 1, the wiring is the same as that of the light switch LS, in other words, the filament goes to A plus on the receiver side of the switch, and A minus at any point. In other words, do not wire either flashlight bulb so that the current fed to its filament must pass through the rheostat R3.

A vertical line is shown in Fig. 1 connecting from the end of L6 to the C minus lead. This need not confuse it aids the establishment of the low p-conductors, for although not necessary, it aids the establishment of the low po-

How to Gain Unit Control

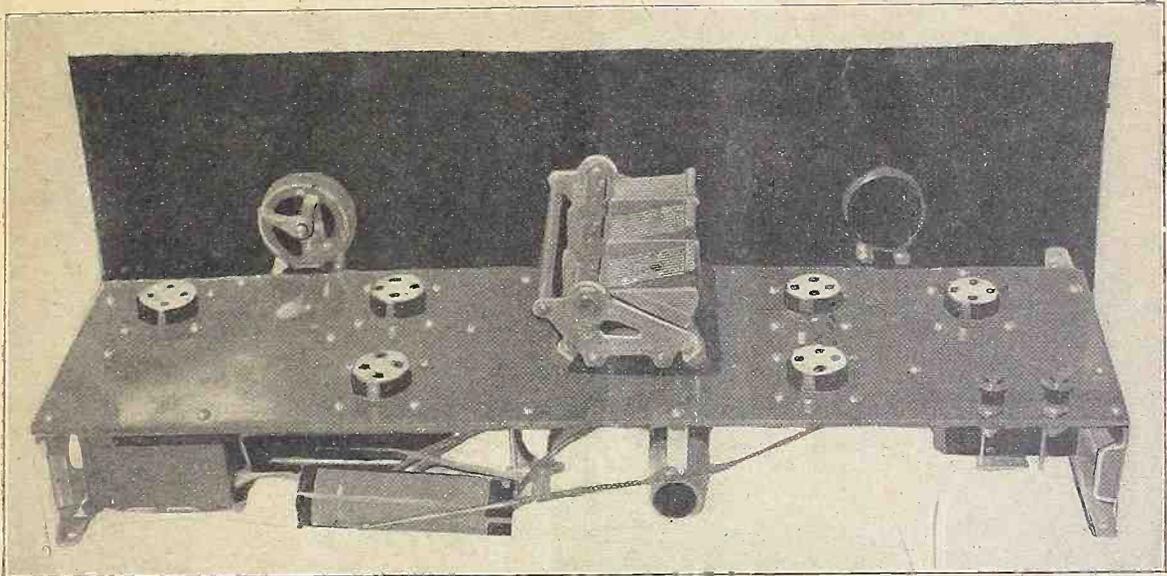


FIG. 2
Rear view of the Singletrol receiver

tential end of the coil at ground potential, the ground return flowing through the A battery. Note that A minus is grounded, the diagrammatic representation of this connection being shown at extreme lower right in Fig. 1.

In constructing the receiver it is well to follow the subpanel plan as shown in the photographs. If this is done an extremely neat appearance results, for one sees only sockets, tubes, the variable condenser and the two variable resistors when one lifts the cabinet lid. All the wiring is done underneath the subpanel.

A good plan is to put the coils into position before doing any wiring. They should be so placed that their fields do not severely interact. This is most readily accomplished by following the right-angle system of placing the coils in respect to one another.

The coils L1L2, L3L4 and L5L6 are wound alike. The primaries have 10 turns each and are wound at one end of one tubing. The length of the tubing is 3/4 in. and the diameter is 1 in. The material may be hard rubber or bakelite. The secondaries consist of 190 turns of No. 28 wire. The separation between primary and secondary in each instance is 1/4 in. These directions are for those fans who prefer to wind their own coils, although they will find the winding of a total of 779 turns of wire quite exacting and may prefer commercially made coils.

With the radio side of the receiver designed so as to afford simplicity combined with quality, it would be poor judgment indeed to tack on a distorting audio amplifying system. The audio transformers, AFT1 and AFT2, are Modern Symphony, and they have a flat characteristic, that is, amplify tones evenly, and with purity that is decidedly pleasing.

After the receiver has been made, following the practice of wirings the filaments first, then the rest, from input to final output, the balancing is achieved by first tuning in stations to determine where self-oscillation occurs, and then adjusting the grid bias and the setting of the variable high resistance R2 until the squeals disappear. If volume declines on other wavelengths, readjust the bias, making it less, but greatly increasing the resist-

ance of R2 that is in the circuit, so the plate voltage will be decreased, while the plate current will not be much less.

A likely bias is 3 volts, represented by C, while the final audio tube takes such bias as the tube requires. Some indication of what this should be will appear on the tube box or the circular enclosed in the box. A power tube is suggested for socket 6.

The tubes throughout, excepting the final audio, may be of the A type (5v., 25 amp.) and the last tube may be a 5-volt 5 amp. power tube of the 12 type. How-

ever, the set works very satisfactorily when smaller tubes are used, such as the 99, but in that instance the rheostat should be somewhere at or between 30 and 50 ohms.

If the set self-oscillates and you seem almost able to get rid of the squeals, but not quite, connect B minus to A minus, and remove the B plus detector lead from its position on the B battery and place it instead at A plus. Also do not be afraid to omit the extra erasing battery, connecting the RF grid returns to A minus for automatic bias.

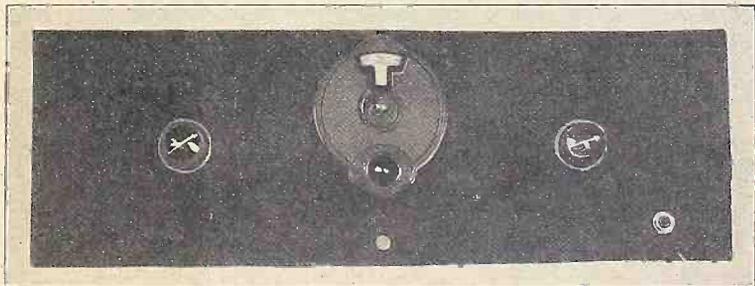


FIG. 3
The panel view of the one control set. The switch is mounted with lamp horizontal.

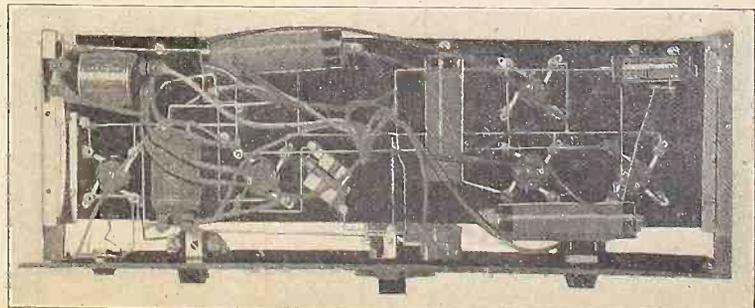


FIG. 4
All the wiring is done underneath the subpanel. Note how bracket at left is cut.

The Alden-Somerbridge Set

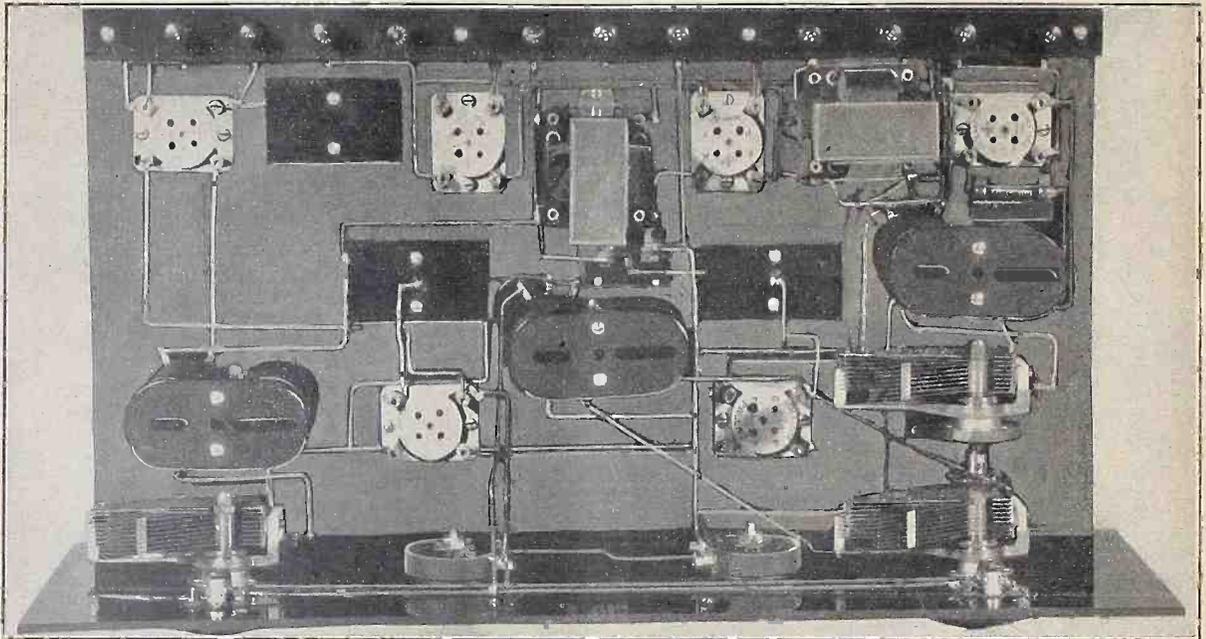


FIG. 1

Looking down upon the interior of the receiver.

By Wendell Buck

IN the earlier days of radio a circuit or a circuit principle was developed as a whole and offered to the radio builder. We had, for example, the regenerative principle, a very startling improvement in efficiency over the crystal. Then came the first radio frequency amplifier circuits, which, placed before the regenerative detector, added miles to the operator's distance range, not to mention a very welcome increase in selectivity. Gradually radio frequency amplification developed and expanded into the many forms and manifestations which we know today, including the ever popular Neutrodyne principle.

Today there is a tendency toward claims that this circuit and that circuit are different and better. This is not true, of course, of all the circuits presented, but it is true of some. There has been a decided tendency, however, toward neglecting the overall efficiency of the complete circuit, due to stressing one particular virtue or strong point.

This has been particularly true of the radio frequency and of receiving circuits.

Maximum selectivity and sensitivity can only be obtained through radio frequency amplification. In attempting to find something really new in the RF side of a circuit many designers are losing sight of the fact that a radio receiver is primarily built to receive broadcast programs. An unstable RF amplifier, which distorts the signal, is hardly suitable for the average radio fan, regardless of its theoretical possibilities or its qualities as a laboratory model.

The Alden-Somerbridge Circuit

The Alden-Somerbridge circuit not only uses an entirely new and original system of RF amplification and stabilization, but co-ordinates with high efficiency and perfect stabilization the component circuits of the completed receiver. The radio frequency amplifier passes on to the detector no noises of its own making. The de-

tor receives an undistorted output from the RF amplifier, which is in turn passed on to the audio amplifier and is delivered through the speaker as a true rendition of the original broadcasting.

At first glance the technical theory in back of the Alden-Somerbridge system may seem a bit complicated to the average radio fan. Before going deeply into the practical angle of building the receiver it will be well to clarify the theory and advantages of the Alden-Somerbridge system so that the builder will understand thoroughly just what the circuit is, how it is different and better, and what he can expect from the completed receiver. A comparison of the leading forms and systems of radio frequency amplification will bring to light the outstanding features of the Alden-Somerbridge system and their advantages as worked out finally in the 6 or 7-tube receiver (depending on the kind of audio used).

Simple Forms of RF Amplification

The simplest form of RF amplification is the regenerative detector. A detector tube, operating in a regenerative circuit, performs two functions: It rectifies the incoming signal and at the same time amplifies tremendously the radio frequency energy present in the circuit. The plate circuit of the vacuum tube is "tuned" or placed in resonance with the incoming signal to obtain maximum regeneration. In the tickler feedback method the plate coil is placed in inductive relation to the secondary and variation of this coupling produces regeneration to the extent desired. It is important to note that if the plate circuit is in exact resonance with the grid circuit that excessive or self-oscillation will occur, which may prevent the reception of signals.

The second method, and the one in which we are most interested, is the tuned plate system, in which a variometer is used to place the plate circuit as closely to resonance with the incoming signal as is desired. A variometer is simply a coil

so constructed that one-half can be placed in a varying inductive relation to the other half. It is perfectly possible to tune any radio circuit by this method, exactly as a coil and condenser tune the circuits with which we are most familiar.

Other Systems

The second step in the development of the radio frequency amplifier was the untuned transformer which transferred the incoming signal from stage to stage exactly as an audio frequency transformer does. If any considerable wavelength band is to be covered, the transformer must have its resonant point broadened out by means of an iron core.

Next the tuned RF amplifier was developed. There are so many variations of this type that it is impossible to cover the field thoroughly aside from the basic circuit, with which all are familiar. (See diagrams on page 8.) The RF transformer in this type of circuit consists of a primary or plate winding and a secondary or grid winding, which is tuned by means of a variable condenser. For balancing purposes often potentiometers, series plate resistances, absorption shields, etc., are used. The point that this circuit could be made free of self-oscillation did more to popularize it and radio generally than any other single radio advance. It was found that the number of turns in the plate coil could be cut down to the point where the oscillation would not occur at even the lowest wavelength. Control, consequently, was simple enough even for the novice.

With the material broadening of the wavelength band for broadcasting stations at about this time, it was found difficult to cover from 200 to 550 meters. The energy transfer from stage to stage became less and less as the circuit was tuned to longer wavelengths. In an attempt to solve this mechanical difficulties were encountered.

The attention of set and circuit designers was then turned toward electrical circuits which would preserve the desir-

A New Neutralization Plan

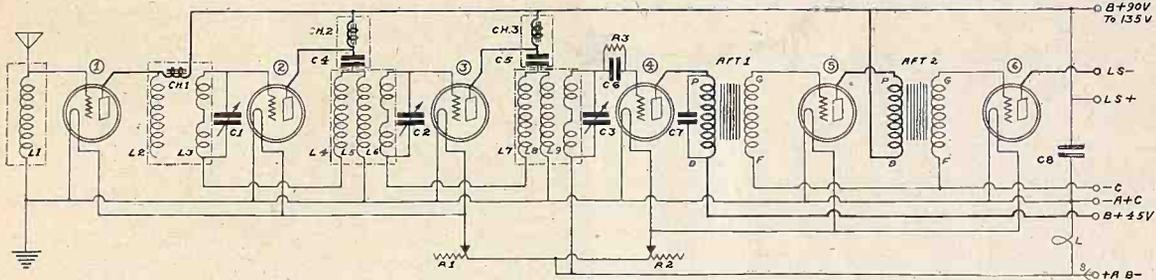


FIG. 2
The circuit diagram of the Alden-Somerbridge balanced receiver.

able characteristics of the tuned RF sets and at the same time give more overall efficiency. Chief among the new circuits was the Neurodyne.

The Neurodyne Principle

With minor variations, the Neurodyne circuit is similar to the ordinary tuned radio frequency receiver. The difference is that energy is passed from the primary to the secondary as in all circuits of this type, but at the same time, energy which is not in phase (or we might say "not in step") with the signal being impressed on the grid is introduced into the circuit to an extent that neutralizes the normal tendency of the circuit to break into oscillation.

The difficulty with the Neurodyne from the experimenter's point of view is that it is difficult to construct a set of this type from parts which are already adjusted at the factory. The apparatus to neutralize correctly this type of set is usually far above the pocketbook of the average fan. The skill required to do it right usually comes only with long practice.

The Alden-Somerbridge circuit offers the experimenter and builder the advantage of the tuned radio frequency and the Neurodyne circuits, with the added advantage that the parts are available with all of the variables properly adjusted and definitely fixed at the factory. The actual receiver, as shown in Fig. 2, contains some points which are radically new and as interesting now as the Super-Heterodyne and the Neurodyne were in their natal stage.

Features of the Circuit

The circuit diagram shows a radio frequency choke coil, in the untuned antenna stage, which permits the reception of stations covering the entire broadcast band. Leaving the antenna stage untuned permits the accurate logging of both the dials of the receiver, regardless of the length of antenna used with the set.

The radio frequency amplifier circuit is the invention of Dr. George A. Somersalo. It represents the result of six years of research and experimentation in his laboratory. A bridge circuit is employed which effectively balance out the undesirable excess energy from the plate circuits of the tubes and allows uniform amplification over the entire wavelength band.

In practice the action of the circuit is this: The broadcast signal is impressed on the grid of the first tube and produces a response in the plate circuit of the same tube. The plate current is supplied for this tube through the radio frequency choke coil CH 1, which prevents the RF energy built up in the plate circuit from being by-passed through the B voltage circuit to the ground. It is seen then that

Inductance Bridge Secret of Balancing

In Fig. 2 we have the circuit diagram of the Alden-Somerbridge receiver, which employs the new system of stabilization, invented by Dr. Somersalo, the medium being a mutual inductance bridge. How the balancing is obtained can be best explained with the aid of Fig. 3. The input circuit is connected between the grid and the plate. In order to prevent the terrific high direct current voltage, which is supplied to the plate, from reaching the grid, a large blocking condenser, say about 1 mfd., is placed in the plate-grid circuit. These are known as C4 and C5 in Fig. 2. In series with the tuned input circuit is a balancing coil, LB. This coil is inductively coupled to the output inductance. The purpose of this coil is to offset the feedback through the inherent capacities of the tube. In

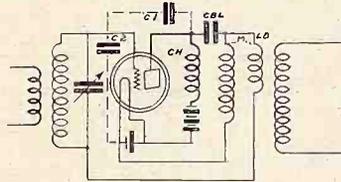


FIG. 3
The diagram showing the method of balancing the circuit.

this arrangement we have a bridge, the character which can be best determined by the balancing condition.

$$\frac{L1}{M} = \frac{C1 \text{ plus } C2}{C2}$$

where L1 is the self-inductance of the output coil, M the mutual inductance between L1 and the balancing coil LB; C1 and C2 the inherent tube capacities.

In the actual neutralizing process we may adjust the balance by slightly altering the position of the balancing coil or changing its number of turns, or by using an external condenser between two of the electrodes. If we wish to have a very small balancing coil we have to add capacity between the plate and the grid; when using a comparatively large balancing coil, the external capacity has to be placed between the grid and the filament.

this radio frequency energy must enter the coil L2 from which it is transferred to the grid coil L3 of the second tube. A similar action takes place in this tube,

except that the direct current voltage of the B supply is kept out of the windings L4 and L5 by the blocking condenser C4. If this condenser were not there, direct current of high voltage would be imposed directly upon the grids of the tubes, preventing their action as amplifiers.

Utilizes Inductance

The radio frequency energy must, of course, pass through these coils, and it is at this point that the most interesting action of the Alden-Somerbridge circuit takes place. Fig. 3 gives the theoretical circuit of one amplifier tube in the hook-up. The problem is to balance out the undesirable capacity effects of the tube and at the same time achieve maximum energy transfer to the grid of the succeeding tube. Going back to the case of the variometer in the plate circuit of the regenerative detector, we can easily see that in effect we have the same thing in the plate circuit here. We have an inductance, one part of which can be varied in inductive relation to the balance of the coil, and we can tune this circuit effectively by this means. Here, of course, the problem is a little different, as we have the effect of the secondary inductance to take into consideration.

Action of All Stages Is Identical

The action which takes place in all succeeding stages is identical. As many of these stages may be used as desired. For all practical purposes the receiver circuit shown in Fig. 2 does nicely. It will get you down to the noise level without any difficulty in any location. Amplification can be maintained at a high level for reception of distant stations, and stations nearby may be tuned in without the slightest danger of tubes "spilling over." Those familiar with the action of tuned radio frequency receivers under these conditions will recognize this as a very strong point in favor of the Alden-Somerbridge system.

The detector circuit is non-regenerative for quality, and the audio frequency parts should be chosen with the end in view of delivering to the speaker a signal which is truly enjoyable to hear. If power tubes of the 171 to 210 type are to be used in the last stage, either an output transformer or the convenient choke coil and condenser may be used to keep the plate circuit of the last tube from the speaker windings.

[Constructional data on the Alden-Somerbridge receiver will be completed next week, issue of November 6.]

OFFICIAL LIST OF STATIONS, giving call letters, owner, location, wavelength in meters, even unto decimal fractions, and the frequency in kilocycles, was published in the October 23 issue of RADIO WORLD. Send 15c for copy. RADIO WORLD, 145 West 45th St., N. Y. City.

How to Get Rid of Squeals

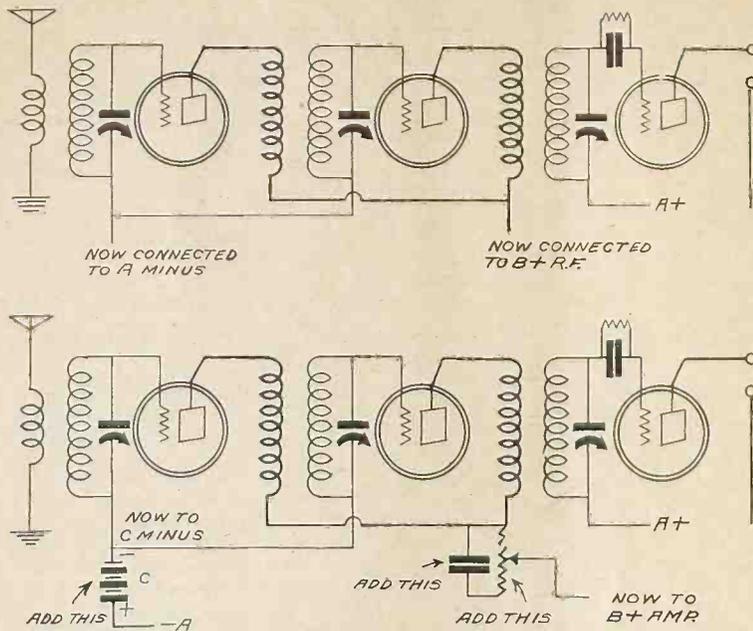


FIG. 1

The essential details of the wiring of a tuned radio frequency receiver, up to and including the detector, as shown is the top diagram, to illustrate leads that will be changed so as to embody the Bernard system of neutralization. The changes to be made are illustrated in the lower diagram. In most sets the audio C battery will be used, so that only the variable high resistance and the bypass condenser need be added to the set.

By Herman Bernard

Associate, Institute of Radio Engineers

ANY one possessing a tuned radio frequency receiver, particularly of the popular 5-tube variety, may be considerably annoyed because the set squeals when low wavelength stations are being tuned in. On the other hand, the set may squeal on the high waves and not on the low ones, because of attempted stabilization by high frequency resistance, which is great at the low waves, and effective there, but rapidly declines as the wavelength increases.

Several appropriate methods exist whereby the squealing tendency of the set may be overcome, and while some ways may be a little bit more effective than others, complete reconstruction of the receiver might have to be embodied in the solution. The method now under consideration does not require reconstruction, but only a few slight changes and the addition of three inexpensive elements. It adds no control to the existing set in the sense of requiring any constantly adjusted part.

The balancing or neutralizing system is the same one that was first used in the Bernard receiver (October 16 issue), and it consists of introducing a negative bias on the grids of the radio frequency amplifying tubes, in conjunction with a variable high resistance in the B plus lead that feeds the direct current to the plates of these bulbs. The resistance may be 2,000 ohms, either an Electrad Royalty Type F or a Centralab, or may be as low as 400 ohms, depending on the B plus amplifier voltage. For 90 to 135 volts use 400 ohms.

The three items to be added are the C battery, the variable high resistance and a fixed condenser across this resistance to bypass the radio frequency currents,

preventing them from passing through the resistance element.

As most receivers now have C batteries in the audio channel, and all sets using power tubes certainly must have them, in only infrequent instances will it be necessary to buy a C battery. If one is to be purchased it should be of the 4½-volt type (Eveready No. 771).

Fig. 1 shows the pertinent wiring connections of an existing 5-tube tuned radio frequency set, up to and including the detector, but not showing the conventional pair of transformer coupled audio stages, as these have nothing especial to do with the squeal killing.

Usually the grid returns of the two radio frequency amplifying tubes are connected to A minus. We desire to connect instead to C minus. The C battery therefore is connected with positive post to A minus. The return of the two RF grids to A minus is broken and a common lead made of the two buses, preferably with a flexible lead going to the C battery. We may desire a negative bias of only 1½ volts or perhaps 3 or 4½ volts, so the flexible lead comes in handy.

Two Important Factors

What the negative bias shall be will depend on a few factors, principally the plate voltage and hence plate current, and the nature of the tubes.

If the receiver has a separate B plus RF lead it is a simple matter to connect this to one side of the variable high resistance and join the other terminal of this resistance not to B plus RF, but to B plus amplifier, the highest B voltage you use in the set, right at the battery. The resistor will drop the voltage to the required amount. Do not forget to connect a fixed condenser across the resistor, the capacity of this condenser being

.00025 mfd. or more, up to say 1 mfd. Select whatever value you have on hand. If you have no such condenser it might be advisable, in purchasing one, to favor the higher capacities.

Should the set not have a separate B plus RF lead, but a common B plus amplifier lead, say of 90 volts, this being used for the two RF tubes and the two audio tubes, then it will be necessary to disjoin the B plus lead from the ends of the two RF primaries to which it goes (second and third primaries from left in the diagrams), and make the B battery connection through the variable resistance, as described. In such a case some place on the baseboard or subpanel of the set should be found for the resistor, since it requires only a ¼-inch hole for mounting, and once the resistor is properly set it need not be touched again.

The Neutralization

To balance the receiver, select the particular station that gives you the most trouble. Start with a negative bias of 1½. This is easily obtained by using the 3-volt post of the C battery as C plus and joining the C minus lead of the set to the C minus 4½-volt post of the battery. The actual bias is 1½ because it is merely the difference between 3 and 4½. The lowest negative in any connected battery system is always equivalent to zero.

Now set the variable resistance so that minimum resistance or zero resistance is in the circuit. If the set squealed previously it should do so now, by all means, because the extra bias aids this, and the B voltage is as high as before, or most likely higher. Now very gradually and carefully turn the resistance knob until the squeal disappears. It may so happen that as the squeal disappears the volume falls off considerably. This would be due to the inadvertent inclusion of too much resistance, so go back just the tiniest fraction of a degree until the volume is strong again, but without squeals.

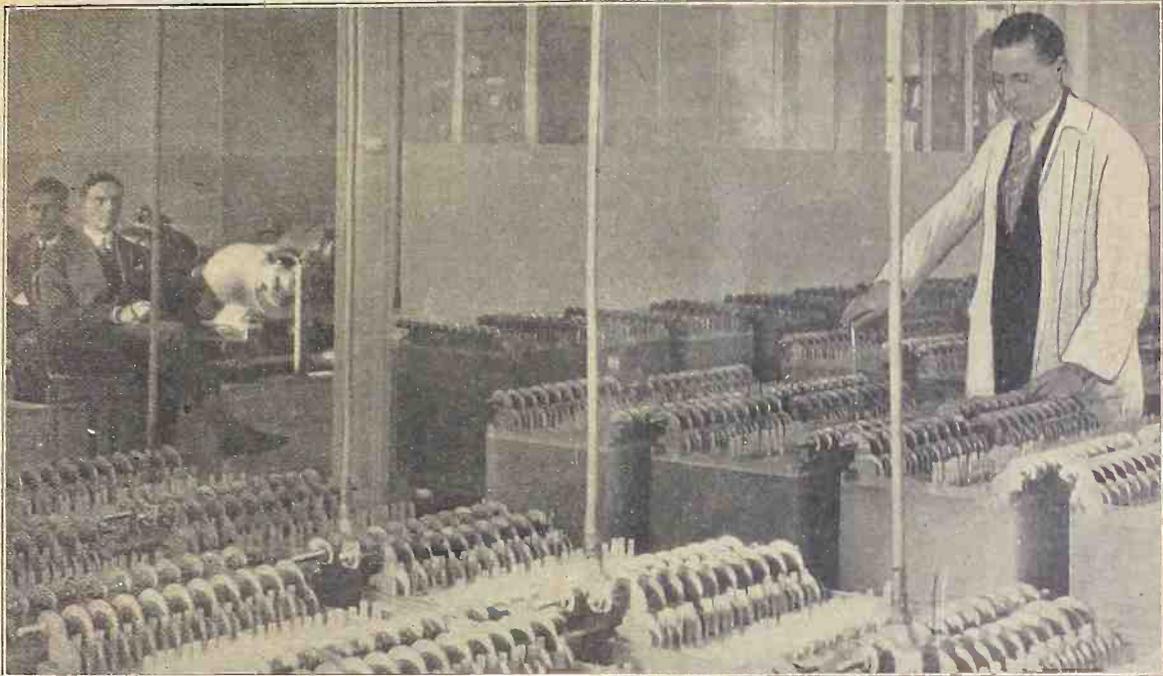
Now tune in stations at other wavelengths, both higher and lower, and notice whether any squeals are heard. On some very critical wavelength for your location and receiver just the faintest trace of a gurgle may be heard when tuning in, but this may be dismissed as unimportant or insoluble, since it may be due to the wave of that station beating against the wave of another, or to atmospheric or the antenna or primary circuits having a fundamental wavelength the same as that of the particular station under discussion, or a harmonic of that station's fundamental. In all neutralized sets this very faint audible sound may be tolerated and it is not a bit annoying, since signals drown it out.

Straightening Out Difficulty

In certain locations greater energy is required for one or two stations to make them decently receivable than for bringing in any other local, so it is often a good plan to use one of these as your guide, getting the desired volume by adjusting the resistor. If it is found that squealing results on other wavelengths when the weak stations are made properly audible, then it is well to increase the negative bias to 3 volts, instead of the previously tried 1½, and increase the RF plate voltage, very slowly. This introduces high negative bias so as to permit much higher plate voltage with little change in current.

The set that never was intended to squeal, yet does squeal, is a nuisance not only to your neighbors who have sets, because when they listen in their programs

EDOUARD BELIN MAKING STRIDES IN TELEVISION



(Underwood & Underwood)

EDOUARD BELIN, the famous television inventor, in his laboratory in Malmaison, France. With his system, the photo or scene is transmitted in a slit of narrow bands of light variation. This with the aid of a patented system, is impressed upon a batch of revolving mirrors, and then on a photo electric cell. They are then changed to a varying current. The current is then carried over a land wire, where an oscillograph changes the current into light again.

often are spoilt by your set's heterodyning, but causes distortion in the offending set, besides difficulty of operation. If you take the squeals out of your set you will have more enjoyable reception and be a better citizen.

Of course, where regeneration is used, squealing is inevitable if one hunts for distance, because it is often impossible to get a distant station with desired signal strength without resorting to the beat method of tuning in.

Squeals Blocked

If radio frequency amplification is used ahead of the regenerative tube, the squealing can be minimized by neutralization, either by the method herein presented, or some other, but the detector stage coil will itself transmit, and no cure-all can be given for unshielded regenerative sets.

A regenerative set may cause audible squeals in its speaker, but these may be fairly well blocked so far as transmission to neighbors' sets is concerned. DX hounds with regenerative fingers will cause squeals no matter what preventatives are recommended, but if they will reserve their DX hunting until after the locals have signed off, perhaps there will be so little annoyance in their operations that no one can seriously complain.

LIST OF PARTS FOR BERNARD

- C2, C4—Two Bruno .00035 mfd. straight line frequently variable condensers, which, with two drums, mounting frame, bronze panel plate and screws constitute the Bruno Unitune, Model 2CB.
- L1, L2—One Aero fixed primary radio frequency transformer, stock No. WT-40.
- L3, L4—One Aero adjustable primary radio frequency transformer, stock No. AX-45.
- GFPB—One Acme R3 radio frequency transformer.

R2, C5—One Bretwood Variable Grid Leak with attached grid condenser, .00025 mfd.

R3, R5, R7—Three Lynch metallized fixed resistors, 0.1 meg. each.

R4, R6, R8—Three Lynch metallized fixed resistors, respectively 1.0 meg., 0.5 mfg. and 0.25 meg.

1, 2, 3, 4, 5, 6—Six Air Gap push type Sockets.

R1—One Electrad Royalty variable high resistance, Type F, range 0 to 2,000 ohms.

C7, C8, C9—Three Electrad 0.25 mfd. fixed condensers.

R9—One Electrad 2-ohm semi-power rheostat.

J—One Electrad single closed circuit jack.

C1, C3, C6—Three Aerovox .00025 mfd. mica fixed condensers.

One 7x21-inch Lignole standard "inlaid" panel No. 1-D (rotary cut walnut).

One 4x20-inch subpanel.

One Birnbach 6-lead battery cable, with forked terminals.

Nine American Radio Hardware Co. cable tags (one A plus, one A minus, one C plus, one B minus, three C minus, one B plus amp. and one B plus det.).

Two American Hardware Co. binding posts (Ant. and Grd.).

Three Lynch double mountings.

One pair of Bruno adjustable brackets.

Ten lengths of stiff Acme Celasite (varicolored).

ACCESSORIES

- One 7x21-inch Polly cabinet, genuine walnut, with 2 inch slope for panel.
- One Electrad lamp socket antenna.
- One R. F. I. Balanced Oval cone speaker.
- Five CeCo tubes, consisting of two Type F power tubes, two type A tubes and two Type G tubes.
- One Centralab modulator plug.

RHEOSTATS TABULATED

By E. R. Stoekle

Chairman, Committee on Standards,
Radio Manufacturers Association

The following table gives the maximum resistance of the rheostat required to give proper control for various numbers of 201A type tubes operated in parallel on a 6-volt storage battery:

Number of tubes, 201A.....	1	2	3	4	5	6	7	8
Rheostat resistance (ohms).....	20	10	6	6	3	3	2	2

Each 200 type tube is equivalent to four 201A tubes. Each 112 or 171 type tube is equivalent to two 201A tubes.

The following maximum resistances are recommended for various numbers of 199 type tubes operated in parallel on 4.5 volts or 3 dry cells.

Rheostat resistance (ohms.)	75	50	30	20	20	10	10	6	6
No. of tubes									
No. 199.....	1	2	3	4	5	6	7	8	9

When six volts are used to supply a single 199 type tube a 50-ohm fixed resistance should be connected in series with a 75 ohm rheostat. When two No. 199 type tubes are supplied by 6 volts a 25 ohm fixed resistance should be connected in series with a 50 ohm rheostat. The use of a fixed resistance in series with the rheostat in these cases is recommended in order to avoid "paralyzing" the tubes by an excess current which might otherwise be obtained by cutting out the rheostat entirely.

NOVICES GET AID OF LABORATORY

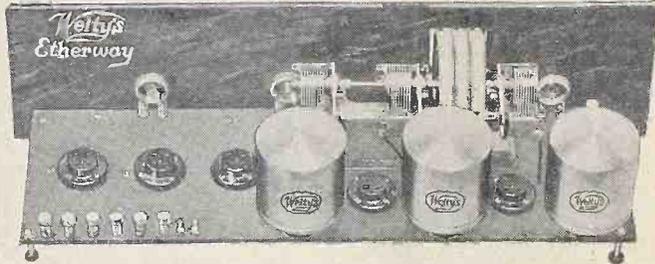


FIG. 1
Rear view of the Welty Etherway, chassis model. This is a 5-tube laboratory-constructed receiver.

Almost Completely Assembled Tuned RF Receivers Win Popularity—Finished Sets of Same Models Attractive

Quite a large number of persons know just enough about radio to be interested in reading more or less technical articles concerning practice and theory, and to desire to do only enough wiring to enable them to have a finished receiver by applying a few simple strokes of work. In some instances, of course, they do not possess confidence that they know or can conform to the rules of layout and connections as applied to radio, so anything in an assembled state, or semi-assembled, appeals to them greatly.

The existence of this field has led to some manufacturing efforts being directed along the lines of nearly completed receivers, or correlated units for making them.

Economical considerations often persuade a person to build a receiver, although he may not be equipped with sufficient knowledge to warrant him in undertaking that task. But when the knowledge is furnished to him in the form of an assembly, wired almost to completion, he can carry on the little work needed to constitute the finishing touches, and can't go wrong. And thus he is furnished with an example of expert assembly and is given an excellent introduction into the art of putting a set together.

Tremendous Trifles

Radio set construction is an art of tremendous trifles. Who would suppose that it would make much difference if a certain wire running from the grid of a tube to a variable condenser were twice as long as it need be, or that it is 1 inch closer to some plate lead than it ought to be? Yet the long grid lead may tend to set up oscillations in the receiver that render it virtually uncontrollable in operation anywhere around 300 meters or below that. So, too, the plate lead parallel the grid lead, and only 1 inch away may cause induced current that likewise makes the set riotous.

When these things are safeguarded against there is every reason why a receiver should work perfectly, but when they are ignored, or simply not followed, due to ignorance, the danger is great, and much disappointment may result. This is one reason, and perhaps the principal one, why different fans who build the same receiver, of the same parts, but put the things together in their individual ways, get totally different results, even in the same location. Some times the cir-

cuit is blamed, sometimes the parts manufacturers hear harsh and undeserved criticism, but it is the constructor himself who is at fault, only he does not know it.

To a tuned radio frequency receiver these facts apply as pertinently as to any other set or circuit, and a laboratory-built job is therefore very attractive to the novice. Somebody with expert scientific knowledge has devised a layout and circuit and due regard has been paid to the prevention of losses in the receiver, of any nature. Efficiency rules.

Options Presented

Fig. 1 shows the rear view of a laboratory assembled 5-tube receiver, known as Welty's Etherway. It is composed of standard apparatus—the kind every home-builder of the advanced type would select, naturally. Also, it is presented in three combinations; first, as a set of two ready-wired units that may be placed together in a few minutes by simply fastening four short connecting wires with the fingers; second, as a completed chassis, which may be installed in a cabinet; third, as a completed receiver in a tailor-made cabi-

net with cone-drum speaker, batteries, tubes and aerial system.

In the second plan a Welty Detector-Audio unit and a Welty Tuned RF unit are supplied. All the parts are mounted on a bakelite sub-base panel. Each part is properly located so that all the engineering, from which source most of the grief in home-building comes, has been done for you. Then all the wiring, neatly, efficiently, and carefully soldered and well protected by insulation, is concealed under the sub-base. The terminal connections—four in number, are brought out with colored code wire to X-L push binding posts, which also carry the color scheme.

Two units may be attached to a ready-drilled and engraved panel in less than five minutes by the use of a pair of pliers or a small wrench. Four short connecting wires are inserted into the X-L push binding posts which automatically grip and hold them securely without soldering.

The Chassis Type

In the chassis style, which is illustrated, a one-piece bakelite sub-base panel is used and all the parts of both the audio-detector and the tuned RF circuits are mounted on this with concealed wiring. Where one already has a cabinet, or prefers one of some special design, or who desires, for one reason or another to delay the purchase of the cabinet and all the accessories, this plan has a decided appeal.

In the completed outfit plan, the chassis just described is placed in a handsome solid walnut cabinet of the semi-console type. This is an exclusive design and is one of the handsomest pieces of radio furniture you ever looked upon. There is no skimping, either. All of the wood used is at least one-half inch thick. The two end pieces are twice as heavy. The size of the cabinet, its massive design and the sloping wooden panels, also of walnut, give that solidity that is so much desired by the housewife in the elements that go to make up a home.

In all of the combinations, Welty's Shielded RF coils are employed, tuned by the Na-Ald localized control, one finger tuning all circuits simultaneously.

Other standard parts, such as Carter, Muter and X-L are employed, all of which have been specified in these columns in the standard hookups.

While these units and combinations pictured are for the five-tube sets, additional stages of radio amplification may be added so that the 3RF or the 4RF may be had by those that want the very last word in radio amplification.

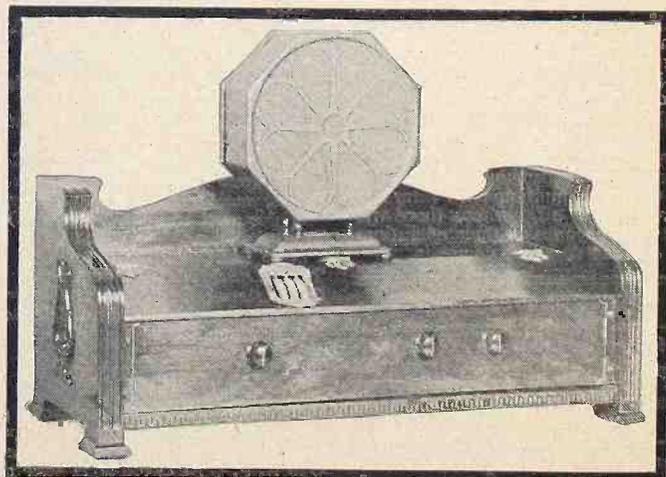


FIG. 2

The Welty Etherway 5-tube set, in completely assembled and operating form, as made in the laboratory. The cabinet, of solid walnut, has an exclusive and attractive design. Na-ald localized control is used for tuning. The speaker shown is an Octacone.

NEW TUBE DOES AMAZING THINGS

One Improved Cathode Ray Bulb, Dr. Coolidge's Invention, Emits More Electrons Than 2,000 Times All the Radium in the World

A vacuum tube which produces as many electrons per second as a ton of radium—and there is only a pound of that rare substance in the world—was announced by Dr. W. D. Coolidge of the research laboratory of the General Electric Company at a meeting of the Franklin Institute of Philadelphia, on the occasion of the award to him of the Howard N. Potts gold medal of the Institute for his outstanding work in the development of x-ray tubes.

Radium is constantly disintegrating, and in so doing is bombarding electrons—indefinitely small particles of matter or electricity—into space at very high velocities. The rate at which radium disintegrates is beyond human control; nothing that man can do seems to affect the rate at which the element breaks down.

The cathode ray tube likewise bombards high-speed electrons into space, but at a rate that can be controlled by man, and in quantities far greater than by all the radium in the world. The electrons given off by radium are of higher average velocity than those so far produced with the cathode ray tube, but otherwise the two are alike.

Rays Are Concentrated

So much more concentrated are the rays from the tube that many startling experiments have been conducted with the new device. Crystals of the mineral calcite apparently become red hot coal when exposed for a moment to the rays, but they are glowing with cold light; ordinary salt is turned brown, and considerable time elapses before it again becomes the colorless substance it usually is; bacteria and small flies are almost instantly killed by exposure to the rays; ordinarily colorless acetylene gas is transformed into a yellow solid which cannot be dissolved; and a rabbit's gray hair has been destroyed, to be replaced later by a profuse growth of longer, snow-white hair.

Cathode rays have been known to some extent for many years. At first, however, they were known only within vacuum tubes, but about thirty years ago a European scientist, Lenard, succeeded in making the electrons pass through a tiny piece of extremely thin aluminum foil cemented to the glass wall of the tube. Improvements have been numerous since then but with previous tubes the metal "windows" were much smaller and the operating voltages much lower than with the new tube.

Tube Construction

Several unusual features have been incorporated in the new tube. There is a "window" three inches in diameter, of nickel foil the thickness of which is measured in thousandths of an inch and which is capable of withstanding a total atmospheric pressure of more than 100 pounds. A heated tungsten filament, originally used by Dr. Coolidge in the x-ray tube and now known to all as an essential part of radio tubes, furnishes the supply of electrons. The glass tube has been shielded with a copper tube so that the stream of electrons cannot strike the glass and cause punctures, thereby permitting

operation of the tube at voltages far higher than any previously attained, and the tube is also the first which it has been possible to seal off from an evacuating system; the tube thereby has been made as portable and as easy to use as an x-ray tube.

Electrons are released by the heated tungsten filament, or cathode, at relatively low velocity—a matter of a mile or two per second. Between the cathode and the anode—the "window" and the copper tube which serves as a shield—there is impressed upwards to 350,000 volts of direct current. This causes the electrons given off by the filament to speed up to an average velocity of 150,000 miles per second or more, depending upon the voltage, within the short space of about one inch

Here are some of the tube's marvelous feats: (1), removes rabbit's hair, then causes it to grow again, only white and much longer; (2), turns crystals into red hot coals; (3), kills bacteria and flies; (4), turns gas into a solid which nothing can dissolve; (5), makes minerals coruscate bewilderingly.

between the cathode and the copper tube shield.

Do a Little Coasting

Having attained this high velocity, the electrons coast the rest of the way through the highly evacuated tube and pass through the anode, or window and into the atmosphere with but slight diminution in velocity.

The nickel window is soldered to a disk of invar, an alloy which expands the same amount as does glass when heated. The invar disk, in turn, is fused to the glass tube, thereby making the seal air tight. The thin piece of nickel itself could not withstand the atmospheric pressure of 100 pounds—the difference between the outside air and the almost perfect vacuum within the tube—so it is reinforced with a honeycomb structure of molybdenum metal, a design that affords a maximum of strength with a minimum of cross-section area.

The Startling Solidifying

If the tube is operated in a darkened room, a hum is heard and the window of the tube is seen to be surrounded by a ball of purplish haze, about two feet in diameter with 350,000 volts and more or less depending upon the voltage. This glow, which shows the penetration of the cathode rays in air, results from the air being ionized or broken up by the rays or electrons. The penetration of the rays depends not only upon the voltage but upon the density of the substance they strike, so that with most solid substances the penetration is slight, and with dense metals almost negligible.

One of the most startling experiments performed with the new tube has been the production of a yellow compound when

the rays are passed through acetylene gas. This compound, similar to that produced in very small amounts by radium treatment of the colorless gas, can be produced in relatively large quantities with the cathode ray tube either as a light, fluffy powder or as a varnish-like film on substances within the gas chamber, depending upon the electrical conditions. The compound has been found to be insoluble in all the many chemicals so far tried. It seems, therefore, that a use may be found for it as a protective coating for metals, to which it adheres tightly. Other substances, such as castor oil, can also be solidified by exposure to the rays.

The Glowing Crystal

In ascertaining the effect of the rays on living tissues, small circular areas of the ear of a gray rabbit were subjected to short exposures to the rays. Exposure of a tenth of a second caused a temporary loss of hair over that area. When the exposure on another area was increased to one second a scab was formed. When this fell away it took the hair with it and weeks later the area became covered with a profuse growth of longer, snow-white hair. Exposure for a minute resulted in the formation of a scab on each side of the ear. A hole was left in the ear when the scabs fell away, and the edge later became fringed with white hair. In other experiments, bacteria and flies were killed almost instantly by the rays.

A crystal of calcite, a colorless and transparent mineral, glows with a bright orange light if subjected to the rays, and the glow of cold light continues for hours. The glow comes from an area very near the surface of the crystal since the rays penetrate but little into the substance. Immediately after the crystal has been rayed, numerous bluish-white sparks or scintillations can be noticed beneath the surface of the crystal; these are electrical explosions, the result of the bombardment of the atoms in the crystal by the high-speed electrons.

Granite, a mixture of several minerals, glows with several brilliant colors, some of the colors fading away immediately and others remaining for some time. Numerous other substances can be made to change in color, some permanently and others for a short time.

The commercial possibilities of the tube, still a laboratory development, are unknown but it is expected that the tube will be invaluable in scientific investigations regarding electronic phenomena, including radio.

Pacific Coast Chain Planned

Extensive plans for chain broadcasting from five high-powered Pacific Coast stations are now being made, according to an announcement by Vincent I. Kraft of Seattle. It is estimated that the construction will cost about \$500,000. The first unit is nearing completion; this being situated north of Seattle. Others are planned in Spokane, Portland, San Francisco and Los Angeles.

should also be the same capacity as that used in the secondary circuit of the tuner. The stationary plates of this condenser is brought to the high potential point of the crystal. The other terminal of the crystal is brought to the P post on the AFT. The B post on this transformer is brought to the rotary plate post of the new condenser, also. If you will get a copy of the July 24 issue of RADIO WORLD on page 10 you will find a diagram of a receiver using this system, just described. C4, in the Aug. 21 diagram, should be left connected as is, and not changed as per July 24 issue. The grid leak and condenser combination should be shorted, so that the stationary plates of C1 go direct to the grid post of the socket.

CAN ANY standard tuned radio frequency transformers be used in the 5-tube receiver shown on page 15 of the Aug 28 issue of RADIO WORLD? (2)—What ratio AFT should be employed?—Thomas McGowen, New Brunswick, N. J.

(1)—Yes. Be sure to use the proper capacity variable condensers. (2)—Low ratio, 3 to 1, audio frequency transformers.

CAN A loop be used in the 6-tube receiver, shown on page 13 of the Oct. 16 issue of RADIO WORLD? If so, how should it be connected?—Bob Girshwin, Long Island City, N. Y.

Yes. The radio frequency coil is cut out of the circuit. A system such as out of the circuit. A double circuit jack, anti-capacity, can be used or direct connections to the condenser can be made, e.g., tone terminal of the loop to the stationary plates of C1, while the other terminal of the loop is connected to the rotary plates of C1.

PLEASE GIVE a detailed explanation of the term "Specific Inductive Capacity."—Guy Mans, Portland, Ore.

The capacity of a static battery (often called accumulator or condenser), which is made up of two conducting surfaces separated by an insulator, for an electric charge, this varying with the voltage difference to which the conductors or plates which will be brought about, by a given charge, varies with the type of the insulator or dielectric inserted between the plates. This is proportional to a certain constant, which is characteristic of each substance. This special constant is known as the specific inductive capacity of the dielectric. Various dielectrics have different specific inductive capacities. The constant may then be determined by finding the relative thickness of layers, having the same inductive capacity, and the thicker the layer the higher its specific inductive capacity. Suppose, we find that 5 units thickness of mica has the same inductive capacity as 1 unit thickness of air. That is, if mica is interposed between the two conducting surfaces, they may be separated to more than 5 times the distance, that would be necessary to keep the same capacity in air. Therefore, mica is the better dielectric. Taking air as the standard, the specific inductive capacity of mica is 5. The specific inductive capacity may then be defined as the ratio of the capacity of a condenser, when the plates are separated by a specific substance, to that capacity of the same condenser, when its plates are separated by air, which is a standard.

I WOULD like to have the circuit diagram of a 3-tube receiver, wherein the first and second tubes act both as a radio frequency and audio frequency amplifiers. The third tube should be the detector, which should be regenerative. I have a 3-circuit tuner, containing a 10 turn primary and a 78 turn secondary,

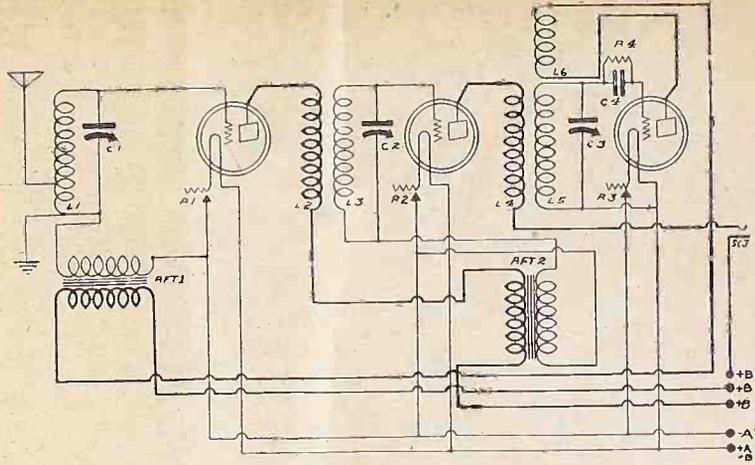


FIG. 451
The schematic diagram of the 3-tube reflex, using a regenerative detector.

wound on a 2½" diameter tubing. The tickler is wound on a 1¾" diameter tubing and contains 40 turns. No. 24 double cotton covered wire is used for the primary-secondary windings. The tickler is wound with No. 26 single silk covered wire. This, three .00037 mfd. variable condensers and three 20 ohm rheostats, I would like to employ in this receiver. I am going to use —01A tubes.—James Cuyler, East Pittsburgh, Pa.

Such a circuit diagram, with the parts you mention, is shown in Fig. 451. L1 is the antenna coupler and contains 80 turns, wound on a 2½" diameter tubing, using No. 24 double cotton covered wire, and tapped at the 10th turn. This is known as L1 on the diagram. L2 and L3 comprise the coupling RFT. The primary, L2, contains 10 turns, while the secondary contains 78 turns. This is wound on a 2½" diameter tubing, using No. 24 double cotton covered wire. A ¼" separation is left between the primary and secondary windings. C1, C2 and C3 are the .00037 mfd. variable condensers. R1, R2 and R3 are the 20 ohm rheostats. AFT1 is a high ratio AFT, about 6 to 1, while AFT2 is a low ratio AFT, about 3 to 1. C4 is a .00025 mfd. grid condenser, while R4 is a 2 megohm grid leak. L4, L5 and L6 indicate the primary, secondary and tickler windings, respectively, of the tuner. SCJ is a single circuit jack. The plates of the RF tubes receive one voltage, 67½, while that of the detector receives a separate voltage, about 45. The three condenser dials should read alike. The tickler control should not be critical. If it is, take off about 3 turns. If uncontrollable oscillations still persist, take off 3 more turns.

Any type of audio frequency amplification may be added to this set, the connections to be made at the jack output terminals.

AS TO the circuit diagram appearing under Fig. 366 in the Radio University columns, of the July 10 issue of RADIO WORLD. The data given is for .0005 mfd. variable condensers. I have .00025 mfd. variable condensers, which I would like to use. Can I have the data for the coils, using these condensers?—Maxwell Lyons, Poughkeepsie, N. Y.

Using the 4" diameter form, the antenna coil consists of 55 turns tapped at the 8th turn. The variable primary, L2, may be wound on a 3" diameter and consists of 10 turns. The secondary, L3, consists of 45 turns, wound on the 4" diameter form. The primary, L2, also may be stationary and in that case, should still consist of 10 turns, and wound on the same tubing as the secondary. A ½" separation between the windings should be made, in this case.

AS TO the circuit diagram of the 2-stage audio frequency amplifier, shown on page 9 of the July 17 issue of RADIO WORLD. What ratio AFT, what value resistors and condensers should be employed?—Catherine Marks, Baltimore, Md.

The AFT should be of the low ratio type, e. g., 3 to 1. The resistor in the plate circuit of the first AF tube should have a resistance of .1 megohm. The resistance in the grid circuit of the second AF tube should be of the 1 megohm type. The condenser should be of the 25 mfd. fixed type.

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

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Enclosed find \$6.00 for RADIO WORLD for one year (52 Nos.) and also enter my name on the list of members of RADIO WORLD'S University Club, which gives me free information in your Radio University Department for 52 ensuing weeks, and send me my number indicating membership.

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U. S. ORDERS WAVE VIGIL

The Federal Radio Supervisors throughout the United States have been instructed by the Department of Commerce to observe and report in detail every two weeks the actual conditions existing in each district, as to wavelength jumping, new stations, increase of power, interference from stations making changes of their own free will, etc.

According to Arthur Batcheller, Federal Supervisor in New York, the fact that twelve new broadcasting stations have come into existence in his district since July, accompanied by the many wavelength changes and increases in power, is crowding the air.

"The hands-off policy will probably be continued," said Mr. Batcheller, "until Congress passes a radio control bill, which will not be earlier than December."

New Sending Plan Creates Dead Spot Between Stations

SAN PEDRO, CAL.

While making short wave tests, Major Francis E. Pierce, radio officer of the United States Marine Corps, discovered that it is possible to transmit waves in such a manner that they can be ricocheted over intervening spaces, between the sender and the receiver. This system, it is said by many authorities of note, will be a great aid to naval communication, since there will be no possibility of enemy interception.

In commercial work it will also prove to be valuable.

In one test made off the Southern California coast, between U. S. Navy vessels, a ship transmitted signals to a sister ship, while a vessel which steamed about between the two, was unable to pick up the signal.

SPREAD HAPPINESS



GOLDY AND DUSTY, the famous radio entertainers, amusing Beverly Mosley, P. O. Box 1296, Columbus O., who certainly appears to be enjoying himself.

AIR CROWDING MORE ALARMING

Nearly 600 Stations Operating, 100 More Under Way, Waves Clash and No One Has Power to End Congestion

By Thomas Stevenson

A radical step must be taken by Congress if legislation is to relieve the situation created by the breakdown of radio regulation. This is the opinion of Government officials at Washington, the broadcasters themselves and the industry generally.

Under the bills pending in Congress—the Dill and White measures which have passed the Senate and House and await adjustment in conference—absolutely no provision is made to take care of the surplus of stations on the air.

Even before the recess of Congress the general opinion was that there were too many stations for satisfactory operation. The last radio conference called by Secretary of Commerce Hoover, favored a limitation of stations well below the 530 in operation at that time.

Nearly Six Hundred Now

At present there are close to 600 stations in operation. To make matters worse, it is definitely known that nearly 100 new stations are in course of construction and will be ready for licenses within the next month or two.

Both the Dill and White bills contain some provision for a limitation of stations. But strictly interpreted, the limitation is not clear enough to authorize the Government to compel some of the present stations to discontinue operation.

Even if authority is conferred on either an independent commission or on the Secretary of Commerce to force some of the present stations off the air, it is not believed they would attempt it without being specifically directed to do so by Congress. No one believes either would "have the nerve to take such a step."

Weather Data Will Be Swapped

WASHINGTON.

An exchange of weather reports between the United States and Europe have been arranged by the U. S. Weather Bureau and is now being accomplished by means of radio. Analysis of the European weather reports, it is believed, will mean more accurate American forecasts.

Heretofore the only daily weather report sent from the United States to European stations by radio was the despatch sent at midnight to the French high power station at Lyons. Under the new arrangement a report is sent out daily by the Bellevue high frequency set for French, British and other European stations.

NEW LEIPZIG STATION

A new broadcast station has been established in Leipzig, according to a report to the Department of Commerce. For general broadcast purposes between 3,000 and 5,000 watts power will be used, although it is possible to use as high as 10,000 watts. The station will operate on 452 meters.

Unless Congress specifically directs that stations be limited to a certain number, the prediction is made that legislation will not help very much in the present situation. And if Congress does incorporate such a provision into the radio law, the agency which attempts to enforce it will have a job on its hands that few would care to tackle.

Of course, Congress could turn to the alternative of increasing the broadcast band wave lengths so as to provide additional channels. But for the present at least there are few of the stations that would care to go below 200 metres because only a small percentage of the sets in use will tune that low.

Fans Are Alert

By limiting power to 500 watts or below it might be possible to cram in all of the present stations. But such a move is recognized as detrimental to the public service and is not likely to be seriously considered in Congress.

Fans throughout the country are beginning to awaken to the condition that has been brought about by the influx of new stations. With cooler weather, coast to coast reception is again possible, and it is being found that a large number of stations are interfering with each other.

Protests reaching radio inspectors throughout the country and the office of the Chief Radio Supervisor at Washington indicate general dissatisfaction with existing conditions. Unless there is an improvement, it is believed this resentment will be fanned into a flame.

Recognition by Congress of dissatisfaction generally results in action of some kind or other. But how Congress will cope with the problem presented in radio is a matter about which time only will tell. (Copyright, 1926, by Stevenson Radio Syndicate)

Hackett Favors Opera in English

Radio is doing more to popularize opera than any other one agency, according to Charles Hackett, popular tenor of the Chicago Civic Opera, who predicts that opera will soon become an American institution, sung in English.

"In many instances the opera, over the air or from the stage, does sound ridiculous in English," said Mr. Hackett, "but not because of the English, but because of stupid translations of foreign operas. I have sung in many languages and I say now that, with the exception of Italian, there is none easier to sing in."

"Most arguments against English are out of the mouths of foreigners," he added, "and I would willingly wager that if both the Metropolitan and the Chicago Civic Opera were to announce all operas must be sung in English, all singers would accede to the demand, and we should get the surprise of our lives."

The fact that Mr. Hackett, a native of Worcester, Mass., is a singer is said to be due to the reading of Marion Crawford's "Roman Singer" and the fact that he was not a great architect.

LUSTY KDKA 6 YEARS OLD

PITTSBURGH

KDKA, established and maintained by the Westinghouse Electric and Manufacturing Company, will enter into its seventh year of existence. The sixth anniversary of the East Pittsburgh Westinghouse station will be celebrated with an elaborate program next week.

During its entire existence, from the time of its inception as the first popular radio-broadcasting station of the world, November 2, 1920, up until the present time, KDKA has been known as a pioneer not only from the viewpoint of time records but also from a record of achievements.

To H. P. Davis, "Father of Radio Broadcasting" and vice president of Westinghouse, must go the major part of the glory and credit for seeing the possibilities and future of radio broadcasting, especially in connection with its benefit to the public.

It was Mr. Davis, who having won the right to establish KDKA as a Westinghouse station, jealously guarded his creation and fought for the good things which it has enjoyed during its years of infancy.

J. C. McQuiston, manager of the department of publicity of Westinghouse Company, and chief of all radio stations of the company, must also be given credit for his work in keeping the KDKA programs in touch with the trend of popular desire. Had it not been for his careful work, radio broadcasting might readily have died the death of any poorly kept fad. Instead, radio has become an almost indispensable institution.

Hoover Won't Hold Conference in 1927

WASHINGTON

Secretary of Commerce Hoover will not call a radio conference this year. Mr. Hoover made this clear in a recent talk with newspaper men and added that it is now up to Congress to take care of the needs of the broadcasters.

A fifth conference of broadcasters, radio manufacturers, radio editors and representative listeners could aid but little in clearing up the situation, it was explained. The view was also expressed that the public, as well as the legislators, is fairly familiar with the broadcasting business, its problems and its scientific aspects. Radio, it was said, is no longer an experiment but a very important factor in American life that has reached the point where future development can be accurately charted.

With the conference eliminated, broadcasters, manufacturers, dealers and would-be broadcasters have but one place to take their troubles, opinions and suggestions—the conference committee of the House and Senate where the Dill and White bills await the verdicts of the six conferees.

NAVY AIDS FARM DATA WASHINGTON.

The Navy Department is cooperating with the Department of Agriculture in the dissemination of weather and market reports for the farmer. The Washington Navy Yard daily sends out for the Bureau of Economics, of the Department of Agriculture, in code, the reports. They are received by various stations throughout the country.

CLOCK AIDS TEST OF FADING



(Underwood & Underwood)

E. B. HUDSON is shown with his clock designed for use in conjunction with the observation tests on static and fading, being held by the U. S. Bureau of Standards in Washington. The clock operates a train of relays, which turn on the many tubes in the receivers, recording the signal. The relay causes a shift from one loop to another, several times an hour, so that it is not necessary to use a large staff of men to obtain accurate results.

AURORA DEFEATS COOLIDGE ON AIR

Deadens Land Wire and Prevents Broadcasting of President's Speech—Also Produces Grinder Static Several Nights in Row

The famous aurora borealis, producer of celestial fireworks that frequently light up the long Arctic night, appeared recently and raised havoc with the telegraph, cable and radio service in Northeastern United States and Canada. The telegraph and cable service was seriously affected in such large cities as Chicago, Dallas, Texas, Denver, Washington and New York. For certain periods, every wire in the New York offices of the Associated Press was "dead."

When the radio operator in charge of broadcasting the speech of President Coolidge from the Washington Auditorium during the oratorical contest took his

post, he found that signals were so weak that he could not send them out. The land line through which the signals were to be re-transmitted was tested an hour before and found to be in perfect order. The engineers looked for the cause but could find no mechanical trouble. After a twenty-minute silence, the signals from the Auditorium increased, until they were loud enough to be broadcast. The failure of this speech to get on the air at the beginning was laid to the aurora, which deadened the line.

Also, the aurora affected radio reception, producing grinder static for several nights in succession.

Australian Call "Coo-ee" Startles Operator

PITTSBURGH

Consternation struck the operator at KDKA early one recent morning. The occasion was the Melbourne "Herald" broadcast from KDKA to the Antipodes. Chief Operator E. B. Landon was at the headphones. He expected to hear an address by David M. Dow, Australian secretary to the United States, who was scheduled officially to open the program.

"Coo-e e, Coo-e e, Coo-e e," a powerful piercing cry, rising to a tidal high C at the final syllable, assailed the ears of the astonished operator. Involuntarily the op-

erator loosened the headphones and looked around the station. Ammeters and modulators were jumping, assistants were rushing about, the circuit breaker—the safety valve of the transmitting apparatus—seemed ready to snap.

A moment later all was normal again, and the operator at the headphones heard Secretary Dow explaining that he had just used the "Australian Bush Call," by way of greeting his countrymen. The bush yell is a national call in Australia. It is used with equal gusto by travelers lost in the bushes and homecoming collegians.

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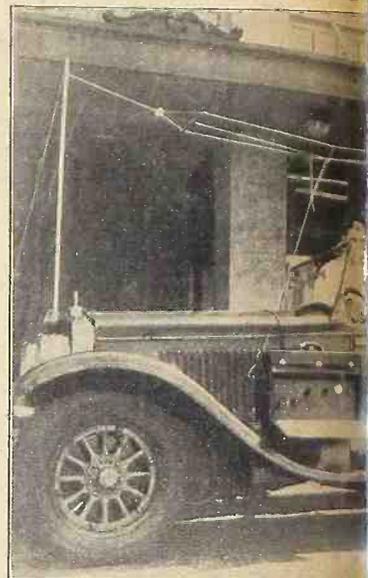
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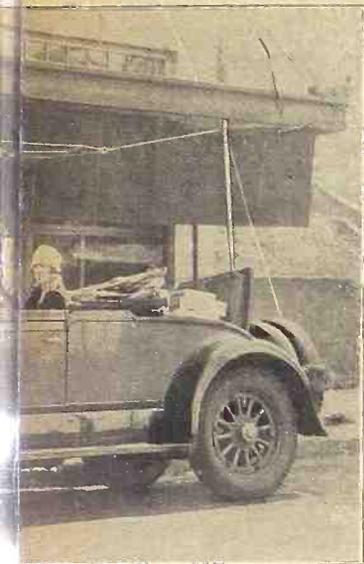
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STATIONS NEAR, USE SAME WAVE

WBZ, Springfield, Finds Boston, Though Not Europe, Out of Reach, So WBZA Sends Identical Program at Same Frequency

Synchronized broadcasting on the same wavelength is the latest step in the advancement of this phase of the radio industry. This contribution to radio transmission, developed by engineers of the Westinghouse Electric & Manufacturing Company at Station WBZ and WBZA, will, from all indications, have an important bearing on the future trend of broadcasting. In many quarters it is already being hailed as the forerunner to the way signals will be sent out through the ether by the powerful stations in the country.

The old adage, "necessity is the mother of invention," may be well applied to the events which led to the development of this dual transmission. Originally, the Westinghouse Company operated but one station in New England, WBZ, which was located in Springfield, Mass. In the search for new and better programs, it was only natural that the station directors looked to Boston for additional talent with the result that a studio was installed more than two years ago in the Hotel Brunswick.

Signals Stopped

A peculiar condition, the reasons for which still remain unknown, existed regarding the signals sent out from the Springfield transmitter. Although WBZ was at that time, as it still is today, one of the most powerful stations in the country with its signals penetrating to all parts of the United States, Canada and even Europe with regularity, Boston and its vicinity could not receive the programs consistently, and with proper clarity. Fading, the great evil of broadcasting, was taking its toll and preventing many of the Hub listeners from hearing the Springfield transmitter.

In order that Boston listeners might hear the concerts, a "booster" station was installed in the Brunswick which was to operate on the same wave length, 333.1 meters, as the main transmitter. The plan to synchronize the waves of the two stations met with many difficulties, however. Heterodyning or "squealing" proved the most serious problem working against the success of the plan. The heterodyning finally caused the temporary abandonment of the plan, and the "booster" was perforce operated on another wave, 242 meters, while the engineers carried on their experimental work.

In the first attempt at synchronization, it was found to be practically impossible with two controlling frequencies to keep the waves of the Boston and Springfield transmitters in step or in phase. Even though the variance in frequencies was minimized to a few cycles, the practical limitation with this abandoned method, the waves of the two stations heterodyned sometimes quite audibly.

It became apparent that one controlling frequency source was necessary in place of the former method and it was decided to have the control at the main transmitter in Springfield. The broadcasting fre-

quency was impractical as a controlling one because, due to its high frequency, it would radiate from the connecting wire line before reaching Boston when applied at Springfield.

A frequency considerably lower than that used for broadcasting was found practical to send over the line. The frequency selected was so sufficiently low as not to radiate from the line, thereby allowing Boston to receive nearly all the power applied at Springfield. Another requirement was that the selected frequency be a multiple of the broadcasting one. This low frequency passes through the same steps of frequency multiplication at Springfield and Boston so that the resulting one is the same and in phase. It is this one controlling frequency that assures the synchronization of the waves of the two stations.

Reduces Fading

Since the operation of the two stations under this plan, fading, the outstanding evil of broadcasting, has been eliminated in many localities where it was formerly very noticeable. Those localities which on account of fading were not reached by the signals from the Springfield transmitter are now serviced by the Boston station and vice versa. To eliminate fading almost completely, it is necessary that the two stations be operated in synchronization while the same power to give the signal sent out from each antenna an equal penetrating force.

Another noteworthy result of the synchronized transmission now successfully operated between stations WBZ and WBZA is the elimination of one wave length, the 242 meter wave. But of greater importance is the general effect this system of transmission will have on the wave length problem. Under this plan, a chain of stations tied in together for the purpose of simultaneously sending out a particular concert or address need use only one wave length, the selected wave being used by each station in the chain. This phase will afford a number of wave lengths formerly used which may be distributed for additional stations as desired.

TRADE SHOW IN MAY

A radio exposition for the radio trade exclusively will be held in Chicago next May, according to A. T. Haugh, president of the Radio Manufacturers Association.

This show will be exclusively an R. M. A. show, with dealers and jobbers from every section of the country in attendance, Mr. Haugh explained.

100-FOOT AERIAL STANDARD

One hundred feet of aerial wire is recommended by practically every radio retailer in the United States, according to A. J. Carter, chairman of the committee on standardization for the Radio Manufacturers Association in a recent committee report.

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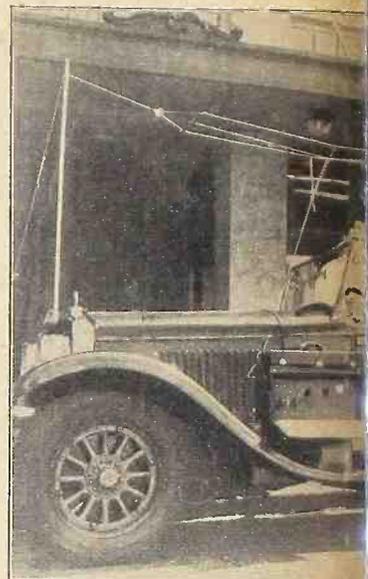
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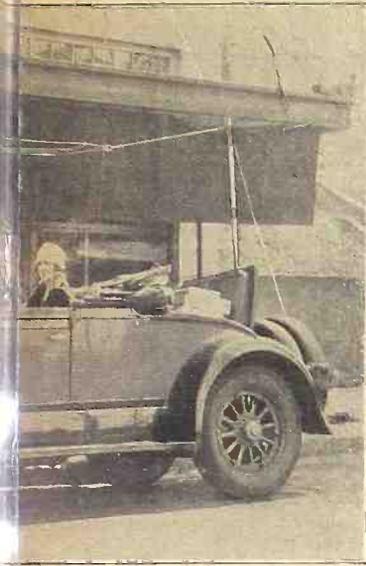
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DELLINGER LIKES UNIT SIDE BAND

Chief of Radio Laboratory Believes Elimination of Carrier and One Modulation Component Will Revolutionize Present Methods

WASHINGTON

Development of a new type of transmitter may provide a solution of the present broadcast problem, according to Dr. J. H. Dellinger, Chief of the Radio Laboratory of the Bureau of Standards.

Dr. Dellinger has been following the experiments of one or two commercial companies with a new transmission system in which the carrier wave is eliminated and one side band suppressed. He believes the experiments will not only be successful but that they will revolutionize present methods.

The usual broadcast signal sent out at present consists of two side bands and a carrier. Under this arrangement it has been found necessary to provide a ten kilocycle separation between broadcast channels in order to avoid interference. The ten kilocycle separation has resulted in a limitation of the number of channels available for broadcast purposes.

With the new system, the signals are sent out on a single side band only. If it works out, it will nearly double the number of available broadcast channels, thereby accommodating twice as many stations.

The new system has three advantages, Dr. Dellinger points out. First, it increases efficiency and enables a greater distance range with less power. The ordinary radio signal consists of the energy at the carrier frequency, energy distributed in the frequency band extending from the carrier upward and energy in

the band extending from the carrier downward. The power of the carrier frequency alone makes up somewhat more than half of the total power even when the modulation is as good as possible.

For this reason twice as much volume may be obtained under the new arrangement as under the old. This means greater distance and better signals.

The second advantage of the single side band is a decrease in interference. A narrower frequency band from the transmitter permits the use of more selective circuits at the receiving end. This reduces the exposure to noise thus improving the signal to noise ratio.

The third advantage is the smaller frequency band required thus enabling a big increase in the number of channels for broadcasting. If the separation between channels could be reduced from ten to five or six kilocycles, most all of the present stations could be accommodated without their interfering with each other.

"Although there are a number of problems that must be solved before the new transmission system can be put into everyday use," says Dr. Dellinger, "I have no doubt that we are surely coming to it. Nor do I believe that will revolutionize present day receiving sets or that sets in use now will be made useless because of the change. Instead, it will result in better service which, of course, is what must be furnished if the public interest in radio is to be maintained at its present high peak."

DAMROSCH RELIES ON RADIO'S SCOPE

Symphonic Conductor Counts On Broadcasts of Good Music to Help Millions to Understand and Enjoy It—Will Explain Passages

Walter Damrosch, on the eve of opening his series of radio concerts through WEA and associated stations, gave a survey of his plans and what he hopes to accomplish by this new venture.

"What I should like to accomplish by this series," said Mr. Damrosch, "is to draw hundreds of thousands into the magic circle of real music.

"If New York has six million inhabitants, and fifty thousand of them at a generous estimate, attend orchestral concerts, that means that 5,959,000 still live in Egyptian darkness so far as music is concerned. These five millions are human beings with human emotions and aspirations just the same as the fortunate fifty thousand. I can not see any reason why the

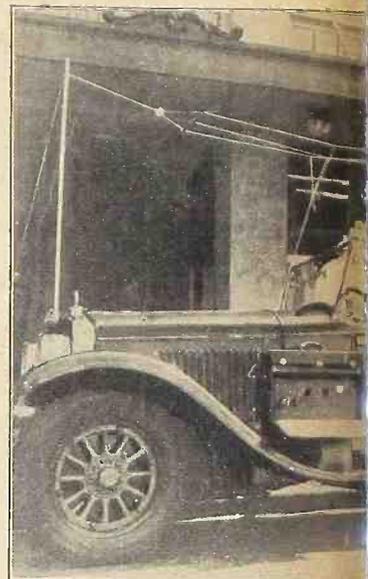
greater part of them should not be made to understand this most beautiful language of the emotions—music. What is true of New York is true of every city, town and village in our country.

"The radio offers such opportunities and can reach so far beyond the limits of the concert hall that I am overcome with its marvelous possibilities.

"My programs will contain nothing but the music of the masters, but I shall select the numbers so that in combination with a few explanatory remarks which I shall make before each composition is played by the orchestra, the audience will be able to grasp its full significance and enjoy its emotional content."

The plan was called promising.

A GIVE-AND-T



HERE is how an automobile may be receiving station of high or low wave

EQUAMA WOMEN

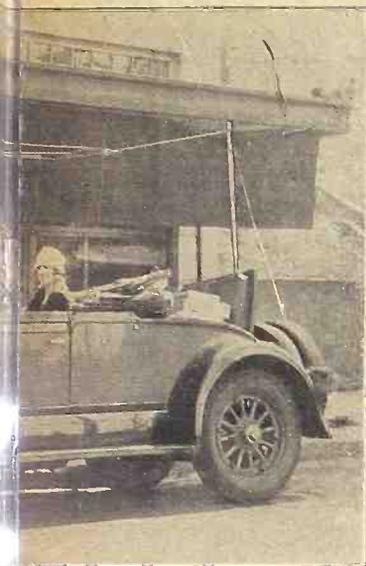
Simple Tuning Without Grandmother (pardon Distant Station)

[Although the construction data on the Karas Equamatic 5-tube receiver was only recently given in the Oct. 9 issue of RADIO WORLD, by Capt. P. V. O'Rourke, it has already gained many friends, according to the flood of mail received. Elsie Schonholz, of 2675 Valentine Ave., N. Y. City, was one of the many fans who constructed this elegant receiver. Her letter is of such unusual interest, that it is herewith printed.—Ed.]

Dear Editor:

I have built the new Karas Equamatic receiver and it is everything that could be desired of a radio set. Due to the well laid out plans and lucid description, I had no difficulty in constructing the set with ease. After I had completed the wiring, mounted the dials, etc., I started to test the set. As I was doing this, my mother, her friends and my grandmother came in the house and incidentally into the dining-room, which serves as the entertaining room as well as my laboratory. I had made many sets before and consequently they were all anxious to hear my latest. But I was certainly nervous. However, to my delight, as soon as I started turning the dials, faint sounds of music were caught and soon I had the music on the speaker. And what volume and sweetness! My face lit up with joy. I then left the room with the speaker going. Upon returning in a few moments, I noticed that the entire group was centered closely around the speaker, listening intently to the snappy dance music. I

MAKE PORTABLE



Equipped for portable radio, both for reception and for sending on short waves.

TELETYPE WINS
S PRAISE

Squealing Enables Even
the "even" to Tune in
With Ease

When I then asked them if they would like to hear another station and they replied, yes. I then turned the dials slowly, so that the numbers on each would read alike, when I hit some more music, this coming from KMOX, St. Louis, Mo. I asked one of the women to try and tune the set, and sure enough, she tuned in about six local stations without any difficulty. Now everyone was interested and here is where the real fun of the evening came in. I again left the room for a short while. But this time when I came back, I heard riotous laughing.

"Hearing a comedy play or some comedy songs?" I queried.

No answer, but as I got nearer the set, who should be at the dials, but my grandmother. She was writing in delight, tuning in station after station.

"Nothing to do here, but turn the dials, and music, talks, jokes all come in," excitedly ejaculated my grandmother.

And to my surprise, she was tuning in DX stations, one after the other. Now when a set is easy enough for my 80-year-old grandmother to tune in DX stations, I think the ideal in radio has been reached.

Incidentally, each of my mother's friends have home-made radio sets of the 5-tube tuned RF type. After hearing my set, though, they all united in saying that neither of their sets could compare with mine and that they would do their utmost to persuade their husbands to build the Equamatic.

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A THOUGHT FOR THE WEEK

DRINK deeply of the amusing and educating draughts that fly the air, for more comes out of a radio set than goes into it!

RADIO WORLD

REG. U.S. PAT. OFF.

The First and Only National Radio Weekly

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

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1/2 Page, 7 1/2" x 5 1/2"	231 lines	150.00
1/4 Page, 8 1/2" D. C.	231 lines	150.00
1/4 Page, 4 1/2" D. C.	115 lines	75.00
1 Column, 2 1/2" x 11"	154 lines	100.00
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 Advertising forms close Tuesday, eleven days in advance of date of issue.

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

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

EDISON HOUR CHANGED

The New York Edison Hour at WRNY, New York, to avoid overlapping 30 minutes with the Eveready Hour, broadcast from WEAJ every Tuesday night from 9 to 10 P. M., has been advanced to 8 P. M.

COMEDY TRIO



BILLY HEAGNEY, Fred Steele and Jack McDermott (left to right), "Klein's Serenading Shoemakers," who appear every Sunday from 5 to 5:30 p. m., from W. M. C. A., the Hotel McAlpin station in N. Y. City.

PEACE REACHED ON MUSIC FEES

Broadcasters and American Society Cease Long Warfare As Rates of Payment Are Established On Basis Ending Conflict

By E. C. Mills

Chairman, Administrative Committee,
 American Society of Composers,
 Authors and Publishers

The musical copyright owners are at practical peace with the broadcasters. Though at the outset of broadcasting the majority of the broadcasters demanded the right to use copyrighted music without the payment of any license fees whatever on the ground that the use was not for purposes of profit, and the further argument that the publicity attendant upon broadcasting was itself a sufficient compensation for the use of copyrighted music, practically all of them are now paying the required fees.

The change in their attitude was brought about by court decisions holding that their use was in fact for "purposes of profit," and the energetic opposition of the copyright owners to the notion that it was sufficient compensation for them to have their works rendered by broadcasters.

At first the broadcasters supported a bill presented to Congress so amending the Copyright act as to deny the rights of musical copyright owners in relation to public performances for profit. This endeavor met with no success, and a bill was next introduced fixing the maximum fee which a copyright owner might charge for the use of his work. That bill is still pending.

It is estimated that in 1926 there will be sold not less than \$250,000,000 worth of radio apparatus. At present rates of license fees charged broadcasting sta-

tion, musical copyright owners will receive about \$200,000.

Composers want only what is fair. The product which they create is the essential foundation of the whole broadcasting operation. It is besides the point that the broadcaster himself may not be selling the apparatus. The irrefutable fact remains that a tremendous business subsists and entertainment is furnished in more than 5,000,000 homes as a result of creative musical genius.

Every instinct of fair dealing and equity supports the argument that these creators should be fairly compensated. Are they unreasonable or extortionate in their demands when they have been willing to sell to the broadcasters the right to use a product absolutely vital to the success of their operations, and as a result of which these tremendous business transactions ensue, for less than 1 cent out of every \$100 of the business done?

Licenses were given the broadcasters during 1922 free of charge. During 1923 nominal fees were charged pending stabilization of broadcasting. In 1924 these were increased in keeping with the increase of the broadcasting operation, and in 1925 there was still again somewhat of an increase. They will continue to be increased until they have reached what is a fair level of compensation for those who create the product vitally essential to the performances of the broadcaster.

It is a pleasure to say that the attitude of the broadcasters has entirely changed, and they now appear willing within their limitations to pay fair and reasonable amounts for the right to use music.

RESULTS

Results Editor:

I have built the 1926 Model Diamond of the Air and it certainly is a wonderful set. The tone is very good, while the volume is tremendous. Some of the DX stations that I hear on the loud speaker were: WJZ, WBBM, WGY, KDKA, WRC, WPG, WOK, WBZ, WOC, CNRO, WTAM, WLW, WSAI and WORD. I am surely indebted to Herman Bernard and Radio World for such a wonderful circuit. Please send a nameplate.

WILLIAM T. GREEN,
 1 Regent Ave., N. D. G.,
 Montreal, Canada.

* * *

Results Editor:

I have a little bit of news which may interest you, concerning the Diamond of the Air. I am now working on a signal gang from the Union Pacific R. R. and living in outfit cars. I have a receiver in the car and of course it is the Diamond. During the past two weeks, we have been doing considerable traveling from Valley, Neb. to Hiawatha, Kan., and the Diamond performed wonderfully. I used one of the packing boxes on the wheels for a ground and had a 100-foot insulated wire running along the ceiling of the car, for an antenna.

On Saturday, Oct. 9, we were returning from Marysville, going to Alexandria and heard the complete sixth game of the world's series from Hastings, Neb. Not once during the entire trip was the station

lost, although the cars were bumped around, at some times to such an extent that the speaker would leave the table. The reception, however, was not interrupted. I don't think this record can be beaten with many receivers, if any. While the train was going at about a 35-mile per hour clip, the following stations were heard: WOAW, WHO, KFKX, KMOX, WDAF, WFAB, KOIL, KHNF, WOK and WJAZ. Of course, when the train stood still many more DX stations came rolling in, all on the loud speaker, with tremendous volume and excellent quality.

I wish to thank you for the wonderful circuit and the clear descriptions. As you may know, radio is a boon to any on the road and I must say that the Diamond has been a life saver to all of us.

ALBERT A. FRANZEN,
 Union Pacific R. R.
 Signal Gang I.,
 Alexandria, Neb.

* * *

Results Editor:

I have had my 1925 Model Diamond of the Air for practically a year now and have been getting wonderful results. I am fully satisfied with this receiver.

C. GOODING,
 32 James St., Rochester, N. Y.

* * *

Results Editor:

I wish to inform you that I have constructed the 1927 Model Diamond of the Air and find the set to do all that is claimed for it.

JAMES PRIMM,
 Wynnewood, Okla.

PARK BOOSTERS



(Foto Topics)

KERMIT ROOSEVELT and Mrs. Daniel Guggenheim, broadcasting an appeal for the beautifying of Central Park, N. Y. City.

**WRIT STOPS
WAVE JUMP**

WGN Gets Injunction Because WGES, Also in Chicago, Moved to Within 13 Meters of It, Causing Interference—Other Stations Plan Same Relief

WASHINGTON

The outcome of the court fight between two broadcasting stations in Chicago—WGN and WGES—is considered by legal experts of the Department of Commerce as of the utmost importance.

The case came about as a result of WGES switching from its old wavelength of 249.9 meters to 315.6 meters. The WGN wavelength is 302.8 meters. Claiming that WGES was interfering with its service, WGN obtained a temporary injunction restraining the former station from interfering.

If WGES decides to fight the case, the court will be compelled to decide whether or not priority of use of a particular wavelength entitles a station to protection from new comers.

If the court decides that WGN or other stations are entitled to protection from interference on the ground of priority, it may go far toward settling the present state of semi-confusion, the legal experts say. At least it will be the first step in the establishment of precedents to govern such matters.

It is understood that a number of the older stations are planning similar action against newcomers and it is believed that if WGN is successful in Chicago, injunctions may be sought against stations in other cities.

**ROAD IS ROUGH
FOR INVENTORS**

Some Reap Riches, But They Are Few—Must Have Useful Device and Be Good Business Man, Too—Some Radio Examples

While hundreds of thousands of dollars are paid in royalties each year to the owners of patents on certain radio devices, the career of the average radio inventor is a course beset with many rocks and shoals.

Investigation discloses that a large majority of radio patents issued by the patent office are worthless to those who have conceived them.

In some instances this is due to the fact that the inventor is not a good enough business man to know how to sell his idea. In a number of cases it is because the invention itself, while an entirely new and novel idea, is not commercially practical.

A well-known Cincinnati radio manufacturer who has several inventions to his personal credit and who is noted for having successfully marketed the ideas of a large number of radio inventors, says that his corporation receives a number of letters from owners of patents which are not commercially practical. This manufacturer says that he takes especial pains to have every new idea suggested to his corporation thoroughly investigated. He has found it easy to popularize inventions of real merit, filling a public need, and has been highly successful in applying methods of quantity production and distribution to such devices.

Those who wish to reap rewards from

radio inventions should make certain first of all that their ideas are new. With hundreds of radio engineers as competitors, and thousands of radio patents already issued, it is difficult even for technical radio experts to discover principles that have not been thought of before. Nevertheless, valuable new devices are being constantly developed. The would-be inventor should not be discouraged by the keen competition with which he is faced, but he should make certain that his idea is new before he offers it to a radio manufacturer.

The inventor should next consider whether or not there is a public need for the device he has in mind. He must realize that the public will not buy an article simply because it is patented. For his device to be commercially successful it must be something that the public actually wants, or something that it may be taught to want.

Those who are successful in marketing their radio inventions often receive rich rewards. Charles W. Peterson, inventor of the Musicone loudspeaker, received over fifty thousand dollars in royalties during the first year that his unit was manufactured. Edwin Armstrong, inventor of the popular regenerative circuit, has made many thousands from his idea, and some few radio inventors have even become millionaires.

**Special Features
In Airgap Socket
Reduce the Losses**

The new socket known as the Airgap Universal in which the principle involved in good socket construction have been cleverly handled has been placed on the market by the Airgap Products Company, 9-11 Campbell St., Newark, N. J.

The socket is of bakelite construction with phosphor bronze double "sidewipe" contact, and has the grid and plate terminals separated by an airgap in place of the common bakelite or hard rubber insulation, the idea being to reduce the capacity between the grid and plate to cut high frequency losses and prevent intercoupling and feedback through and over the socket.

The gap has the same effect as omitting the socket entirely, which many fans do on short wave receivers.

In the Airgap you get air for the dielectric between the leads, creating a much higher resistance path between electrodes, which is not affected by dust, lint or moisture collecting between the terminals.

The high frequency losses are actually decreased, making sharper tuning on both high and low wavelengths.

In place of an arrow denoting the position the tube should be placed in the socket, with this socket you are directed to point the pin to the gap. The socket has side guides which help to guide and

steady the tube into the socket.

The Airgap should help considerably in making a circuit more stable, sharpen tuning and is undoubtedly valuable in any tuned radio frequency or regenerative set, and particularly on the lower wavelengths.

New Clarostat Ready

The new Universal Range Clarostat, the new model of the well-known favorite resistance, is now ready and dealers all over the country are stocked ready for the consumer demand. The new model is half the size of the old and is highly attractive in appearance. A brightly polished brass case permanently and thoroughly seals the patented resistive material and the compressed mechanism. A polished bakelite knob turns the micrometer-threaded steel shaft which governs the pressure determining the resistance. Connections are provided which allow of placement in any position to facilitate wiring by a handily placed binding post at one end of the case and a connecting strip. A single hole only is required for mounting the Clarostat on any panel, subpanel or baseboard for use in receivers or "B" eliminators. This unit meets the need for a satisfactory, smoothly-working and lasting variable high manufacturers of high-class "B" eliminators for this purpose. A booklet containing many useful hook-ups for the Clarostat and the Clarotuner, also a wonderfully efficient device, will be sent for the asking by the American Mechanical Laboratories, 285 North Sixth street, Brooklyn. Mention RADIO WORLD.

SETS 10-FOLD OVER 1923

A steadily increasing interest in radio and a constantly mounting demand for high grade radio equipment is revealed by the U. S. Department of Commerce in a statement just issued. The only decline reported is in the number of crystal sets and headphones, indicating that the demand is for radio equipment of standard manufacture. The mounting ratio of increase in sales of multiple tube receiving sets and speakers indicates clearly the adoption of radio by the public as a permanent investment.

More than ten times the number of tube-type radio receiving sets were manufactured in 1925 than in 1923 (the last preceding census), according to the government figures, which give the production for 1925 as 2,180,622 sets—a 1,045 per cent increase over the 1923 output.

The production of radio speakers, 2,606,866, was more than four times that of 1923, when 623,146 radio speakers were produced, the census figures show. Five times the number of radio tubes were made in 1925, the report giving the value of the 23,934,658 tubes produced at \$20,437,283.

This stupendous increase in production of radio apparatus brought the 1925 figure up to \$170,390,572, more than three times that of 1923 when the total output was valued at \$54,000,470.

The Government's figures are more than confirmed by reports from the industry. For example, A. Atwater Kent, the largest producer of radio receiving sets, planned months ago, under the most expert estimates, that his production for this year should be double that of last year.

The official figures made public by the Department of Commerce show an increase of 215 per cent in the value of radio equipment produced in the country in the past two years, the number of tube type receiving sets having increased 1045 per cent, and the number of speakers 318 per cent.

Aerovox Factory Hive of Activity

The Aerovox factory at 489 Broome street, New York City, is running night and day, in the effort to keep up with orders. The entire line of fixed condensers, resistances and heavy duty "B" blocks has leaped into full favor, and by strenuous effort every demand is being supplied. Aerovox products are recommended in fully thirty favorite radio circuits and in many leading and reliable "B" battery eliminators. Much of the success of this good line is due to the efforts of Mr. Cole, the chief executive who brought brains, skill and faith in his product into good use in the task of putting it over. Aerovox products attracted great interest at all the radio shows.

Plan for Rebates On Cash Business

FOB, NY, 25% money order or check in advance must accompany order, balance COD. Discount is 40%, an additional 5% for cash.

Extra bonuses to be given for following net minimum monthly purchases and payment commencing from date of second order:—2½%, \$400; 5%, \$800; 7½%, \$1,500; 10%, \$2,400; 12½%, \$3,000; 15%, \$3,500; 20%, \$4,000; 25% \$4,500.

ALL SALES C. O. D. HELD BEST PLAN

Manufacturers Get Back 30 Per Cent. of Output for Refund Because Dealers Have No Service Department, Says Company

The argument in favor of radio manufacturers selling C. O. D., is presented by Powerola as follows:

It is estimated that out of about 30,000 radio dealers, only 10 per cent. are worthy of credit. It is also stated that ratings in mercantile agencies are valueless, because failures and changes and losses in ownership and stock are occurring daily. A sale on credit is a sale based on confidence. We frankly admit we are unable to judge to whom to extend credit under these conditions. Until a basis of confidence is established through actual dealings, we consider it very risky to extend credit.

On the average, radio receivers are standard, carefully and properly balanced for normal reception in the laboratories at the factories where made or assembled. Honest and quality parts are used throughout, which, together with the wiring and construction, are tested for almost every conceivable and known condition.

Thousands are made up alike, in parts and circuit, to the nth degree. They are sold throughout the country, in climates and under conditions so complex and variable that it becomes a guess to determine when and whether a sale has been made. Although each receiver has a one year guarantee against mechanical and electrical defects, the sets meet what we term "outside conditions."

Conditions Varied

So many and varied are these outside conditions, for which of course the manufacturer is blameless, that it is well nigh impossible to determine them. The receiver may be perfectly normal, and in a normal neighborhood with normal accessories act normally, but with poor and defective accessories act abnormally, or with good accessories in an abnormal neighborhood also act abnormally. These outside conditions are not known to the manufacturer; nor has he control of them. He should not be blamed for them. These are conditions peculiarly known to dealers from local experience and should be considered the dealer's look-out and service.

Our experience shows that too many dealers, particularly those able to obtain credit, take advantage of these outside conditions and put the blame on the manufacturer or distributor. These dealers, especially those having no service organization, indulge in making returns of perfectly good receivers for credit or refund. It has been estimated that about 30% of all receivers sold by dealers are returned because of outside conditions. Such tactics by the dealers have so tightened the financing or discounting of radio paper, that banks, without adequate guarantees, absolutely refuse to handle radio paper. Manufacturers of parts also are aware of these tactics, know that it is a risky piece of business to extend credit to a set manufacturer, and therefore refuse to sell except on a cash or guaranteed basis.

Fair-Play Sale to Dealers

Study the method of sale under these circumstances, pro and con, and the sub-

ject becomes confusing. Dealers want and are entitled to credit; they also want to minimize risks, and a lot of them have been stung in the past in purchasing on a cash basis lured on by tricky and glaring advertisements.

On the other hand, manufacturers and jobbers want to extend credit, if it can be done without bankruptcy, without personal risk or at not too great a cost. They are, like dealers, mainly interested in turning over their capital as many times a year as possible. This, of course, they cannot do, if there is no basis of confidence to extend credit, if returns of merchandise are indulged in without cause, if they cannot obtain credit on purchases of raw materials or necessary parts, and if banks refuse to budge.

A dealer creates a boomerang for himself if, because of his unfair tactics, he contributes to the downfall of his manufacturer. His end of the boomerang is "orphans," goods of a bankrupt concern, winced retraction of glittering sales talks to customers, and consequent loss of good-will. Once a dealer has attached himself to a reliable manufacturer, he should do everything in his power to increase the sales and reputation of the manufacturer and its products. In the long run a manufacturer will make all available efforts to reward the loyalty and good will of his dealers.

Perpetual Log And Radio Book

A unique 64-page loose leaf log and Radio Information Book is now being published which can be revised as changes in calls, wavelengths, watts, owners, addresses, etc., occur, and as new information and data come out. The publishers furnish corrected sheets, thus keeping the log up-to-date.

In addition to 26 log pages holding 468 stations and showing call letters, watts, city, state, owner, address and 4 dial settings, this automatic book is full of other information every radio owner needs to thoroughly enjoy his radio. Among these other features are "Tuning Suggestions," "Station List Numerical by Wave Lengths," showing meters and kilocycles, "Station List Alphabetical by States and Cities," "Trouble Aids," "Dictionary of Radio Terms," "Repair Helps," "Trouble Preventers," "Questions and Answers," "Care of Battery Advice," etc.

One of the most valuable features is a calibration chart showing dial settings for each wave length in meters. This convenient book has a beautiful flexible cover with gold letters.

To introduce this Revisable Log and Radio Information Book the publishers, Radio Printers, 117 West Street, Marengo, Illinois are, for a limited time, giving them away prepaid to readers of RADIO WORLD who send only \$1 for revision service to April 1, 1927. If preferred, one may pay postman for revision service plus postage on book after the book arrives.

DEVICE CUTS WAVELENGTH

Offering a solution for the present shortage of wave bands for broadcasting stations. Powel Crosley, Jr., Cincinnati radio manufacturer, demonstrated for the first time a device calculated to make any radio receiving set operate either on short or normal broadcasting waves.

Covering a wave band from 28 to 140 meters, this new invention opens more than 300 different channels for broadcasting, or more than three times the number of channels now available.

Considerable discussion has always arisen at radio conferences and gatherings on the possibility of solving the broadcasting problems of the United States by using some of the numerous short waves, but each time this discussion has begun the idea has been abandoned because nobody in the radio industry would consider any plan that endangered the present radio receivers which are designed to cover only the present normal broadcast band of from 200 to 550 meters. "This new device," Mr. Crosley says, "can be used in connection with any radio receiving set, making the receiver either a long wave or a short wave set, merely by pushing a button.

"With short waves available without making present day sets obsolete there is every possibility that broadcasters and others will give a great deal more attention to short waves than ever before with every possibility that a sharp increase in broadcasting on short waves will be seen as these devices are better known to the radio public."

Ferbend "Maxmin" B Eliminator

The Ferbend "Maxmin" B battery eliminator, operating on 110 to 120 volts, A. C., enables the supply of constant B power from the alternating current lamp socket. It passes 40 milliamperes at 90 volts in general use, which is all-sufficient for the popular receivers. An electrolytic rectifier is used, affording full-wave rectification. There are four cells and in these is an alkali solution, hence there is no acid to worry about. The electrolytic system of rectification uses no tube.

The electrodes are of special non-corrosive alloy. The efficiency of the Ferbend eliminator is high and the cost of operation is very low. The current required from the drawn from the lamp socket is small as compared with some other types of B eliminators. The voltage taps are fixed, hence no adjustment is necessary.

A test conducted for 1,000 hours showed that 38 milliamperes were passed at 90 volts. This test, of course, is much more severe than any demand that would be put on a eliminator in actual use in the home.

The case of the eliminator is of velvet black Duco finish, with no exposed parts or connections.

The eliminator is shipped dry, hence there is no liquid to spill.

The eliminator was tested thoroughly in RADIO WORLD's laboratories and found to be par excellence. It was operated in conjunction with a 5-tube receiver. More than ample volume was obtained, so that even those fans who are bears for volume will find that this eliminator caters fully to their needs. There was no discernible hum. No extraneous noises of any kind were heard.

DIAGRAM NEW FOOTBALL HELP

Phillips Carlin Uses Zoning Plan and Radio Listeners Are Better Able to Follow Report of Game by Referring to Prearranged Chart

With the broadcasting of the first play-by-play description of a football game this season by WEAJ, Phillips Carlin in reporting the Yale-Dartmouth game from New Haven inaugurated a new method of announcing which, together with the use of a diagram by those listeners interested in keeping the movements of each team on paper, proved of decided interest.

Prior to the opening of the game, Mr. Carlin gave a detailed description of his method. He said:

"Repeatedly football enthusiasts have complained that it is hard to visualize from radio description the exact position of the ball in its relation to the side-lines. So in order to let you know the ball's distance from the side-lines we have thought to divide the field into four zones, oblong in shape and running the long way of the field. Now take your piece of paper and lay it lengthwise in front of you. Mark the top, North, the bottom, South, the right side, East, and the left side, West.

"Draw an oblong representing a field 100 x 50 yards (approximately) and running the long way of East to West on your paper. In the center of the East and West ends place goal posts. Then divide the oblong into ten parts with lines parallel to the goal lines. This gives you yardage markings. Mark the end or goal lines zero and then, working towards the center of the field, mark the lines 10, 20, 30, etc., calling the middle line 50 yards.

"Now, in addition, draw a line from the

center of one goal to the center of the other goal at right angles to the goal lines. The result is two oblongs 100 x 25 yards. Divide these two oblongs equally, the result being four oblongs 100 x 12½ yards. These are your zones.

"I am sitting on the South side of the field (at the bottom of your paper). Therefore, the zone lines run from East to West. Call the zone nearest me, A, the next, B, the next, C, and the one farthest from me, D. The Dartmouth team defends the East goal (this is assumed but the position of each team will be announced Saturday) and the Yale team the West goal. Now when the ball goes into play I shall give you its position as follows: 'the ball is on Yale's 10 yard line, Zone B.' You will then know that it is 10 yards from Yale's goal line and about 12½ to 25 yards from the South side-lines, where I sit. Or, if I say: 'the ball is on the 25 yard Dartmouth line, zone D,' you will visualize it as being 25 yards from the Dartmouth goal posts and somewhere within 12½ yards from the North side-lines.

"If you intend keeping a diagram showing the ball's movements throughout the entire game, I suggest using four separate charts, one for each quarter, otherwise you will find the ball's path overlapping, particularly if the play remains in one zone for several minutes. This chart will also help you to follow the ball even without the use of a pencil."

The scheme is proving popular.

De-Luxe Loop New Bodine Part

The new Bodine de-luxe loop is now ready for immediate shipment, the factory now having caught up with orders. It comes in tow styles, L500 for .0005 condensers and L350 for .00035. Both models are handsome, made in walnut finish and will harmonize with any set in any surroundings. This model rotates in a six-inch radius and will fit close to the wall or in a small space. It is a new modified box type, wound with the best quality phosphor bronze wire that will not stretch or break. A jack arrangement permits mounting directly on cabinet if desired, and is unique in this loop. A center tap is provided for regenerative supers. These models possess every feature of compactness, neatness and efficiency. They will also work on TRF sets for local reception. Wesley Scharp and George W. Hoehn are the local representatives, and have done such good work in handling all the Bodine products that they have been given the Philadelphia, Baltimore and Washington territory. The loops and Bodine products may be seen at their showrooms, Stoner & Heath, Inc., 122 Greenwich street, New York City. Literature and full information on these loops may be had from the Bodine Electric Company, 2245 West Ohio street, Chicago, Ill. Mention RADIO WORLD.

SOME TUBES SOFT

Tubes sometimes prove rather soft, though meant to be highly evacuated.

Freshman Sales Increase 50 Per Cent.

Chas. Freshman Co. Inc., reports net sales for September of \$1,007,575, an increase of 49 per cent as compared with the \$676,442 net sales reported for September a year ago. Total sales from January 1 to September 30, 1926, are 50 per cent above the sales for the corresponding period of 1925. President Freshman, in a statement to stockholders, says unfilled orders on hand are far in excess of any volume previously on the books and estimates that net profits during 1926 should show approximately the same proportionate increase as net sales.

\$100,000 Robbery In Kellogg Plant

CHICAGO

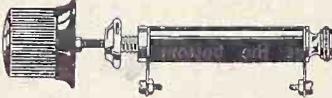
The \$2,000,000 plant of the Kellogg Switchboard and Supply Company, manufacturers of switchboards, radio parts and receivers, was entered by sixteen thieves, who subdued five employes, set off blasts which wrecked many of the large safes and escaped with loot, said to total about \$100,000.

The exact materials stolen are not yet known, but it is thought that platinum and "premier" diamonds, used for the switchboards, were the materials specifically sought.

TREAT YOURSELF

To the Greatest Single Item or Part for Improving the Operation of a Radio Receiver.

INSTALL A



Precision Range, $\frac{1}{4}$ to 10 Megohms

BRETWOOD

Variable Grid Leak and Be Assured of

**RICHER TONE
MORE DX AND
SELECTIVITY!**

**Let the Best Be None
Too Good for You!**

Connect a BRETWOOD Variable Grid Leak in the detector circuit of your set and turn the knob until the signals clear up beautifully.

Use a BRETWOOD Variable Grid Leak across your last stage audio transformer, or put one in place of the fixed leak in the final grid of impedance or resistance coupled audio. Turn the knob and note the amazing improvement in quality.

In any circuit where a grid leak has to be used its value in ohms is important. Conditions differ in individual circuits and with different equipment. Experts cannot specify definite values that are applicable to all cases. The variable leak takes the guesswork out of the grid circuit, and the BRETWOOD is the best for the purpose. "It Does the Trick!"

NORTH AMERICAN BRETWOOD CO.,
143 West 45th Street, N. Y. City

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

NAME

STREET ADDRESS

CITY AND STATE

(Inquiries Invited from the Trade)

Tariff Proposals Interest the Trade

President Coolidge has gone on record as disfavoring a reduction in America's tariff wall of protection against a foreign invasion of our markets of the surplus commodities of other countries produced under labor conditions not alone below our standards but at much cheaper prices. The President's view is contrary to that of J. P. Morgan; Gates W. McGarragh, chairman of Chase National Bank; J. J. Mitchell, president of Illinois Merchants Trust Company, of Chicago, one of the largest financial institutions in the Middle West; Thomas N. Perkins, a Boston lawyer, member of the Reparations Commission of 1924; A. Traylor, president of First National Bank of Chicago, and Albert H. Wiggen, president of the Chase National Bank. American signers in conjunction with the foremost financial representatives of Great Britain, France, Italy, Germany and Austria, have put their name to a petition suggesting that we let down our "bars of American protection, the tariff."

As President Coolidge's spokesman put it in the interview given to the press, "Bankers and importers desire lower tariff rates but manufacturers and wage earners, who are in the majority must have the protective tariff."

The tariff question interests the American radio manufacturer because his products must compete with foreign-made radio apparatus. At present there is no considerable importation, although British goods lately showed signs of increased importation, and the German imports have been rather considerable, particularly in the fixed condenser line. Present foreign laws often all but close the countries against American radio business.

RADIO CATALOG AND HOOK-UPS FREE

Our great new 1927 catalog, fresh from the press, contains the very newest in complete sets, parts and accessories—hundreds of amazing bargains. 250,000 customers testify to our wonderful values and reliability. Complete information, 164 pages on the newest circuits and most practical popular sets FREE. SEND QUICK for your copy. (Please include name of friend who is interested in Radio.)

THE BARAWIK CO., 560 Monroe Street, CHICAGO

MAKE MONEY EVENINGS

Let me show you how 4364 men without experience are adding from \$25 to \$75 to their income each week without giving up their present position. Sell the fastest selling article today—radio. Demonstrate evenings. Five tube instruments as low as \$25 and big commission to you. Exclusive territory to right men. Write today for 96-page book which tells how 4364 men have done it. Don't delay—territory going fast.

C. K. FISCHER

122 W. Austin Avenue Chicago, Ill.

SINGLETRON COILS

Singletron R.F. Impedance Coil, \$1.00

Singletron R.F. matched Transformers for .00035 mfd., each \$1.00

Set of 4 Coils (one impedance, 3 transformers, as specified by Capt. O'Rourke)\$3.50

M. LERNER

143 W. 45th St. N. Y. City

The argument used by tariff reduction advocates is that reciprocity will permit large outlets for American goods. O. C. Kyle, radio financial expert and editor, said:

"While of course the powers that be are every ready to offer in their defense the idea that America must have an outlet for its vast exports, and requires certain imports, under what law could the stretch of economical imagination be extended to prove the benefits to be derived from our exports? The legal barriers lowered and the competition occasioned thereby from foreign countries producing under a lower wage scale would raise a problem. Of course letting down our tariff under which even the American signers will have to admit that they have lived and prospered, would be a great thing for our friends across the seas. It would insure a new field for the exploitation of their surplus commodities, as under such conditions they could and would produce much more cheaply. That would mean the stagnation of our vast industrial resources. Throttled by a cheaper standard of wage and other living conditions that we could not overcome our business would face idleness.

"I fail to see where the plan of wanting us to become the financial wet nurse for the entire industrial world is based on eleemosynary economical principles. Of course if money is so plentiful in this country, it is almost impossible to net a return in keeping with that for funds needed abroad it would be but natural for banking interests to seek those fields for investing or loaning surplus funds. It would, be but human to expect them to require every standard of safety for their loans.

"The radio industry would be one of the first to feel the bad effects of a reduced tariff as we can not and do not want to try to compete with cheap output from abroad.

"President Coolidge is right in his attitude on this matter."

HARD RUBBER

SHEET-ROD-TUBING

Special Hard Rubber Parts Made to Order

RADION HARD RUBBER

PANELS

ANY SIZE

Send for Price List

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LOOK UP & DOWN

SUPERHETERODYNE SPECIALIST
Complete parts for Infra-dyne—Fenway Four, etc.
FREE Handsome Leatherette Log and Data Book.
Send Ten Cents to Cover Mailing Cost.
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New and Improved FRESHMAN MASTERPIECE

AT AUTHORIZED
FRESHMAN DEALERS ONLY

S. HAMMER RADIO CO.

303 Atkins Avenue, Brooklyn, N. Y.

Please send me FREE, Your NEW

RADIO CATALOG

Name

Address

City State

FILL OUT AND MAIL

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

Spartan Named As Dayton Jobber

Distribution for A-C Dayton radio receivers has been arranged for by the Spartan Electric Corporation whose new offices and warerooms are located at 348-52 West 34th street. Charles Ollsten, sales manager of the distributing division, states that his sales force is now at work closing up exclusive dealers in every section of the territory in preparation for an early and big demand for the new radio line which, he claims, offers one of the best values in radio sets on the market today.

A-C Dayton radio is nationally known by its already famous slogan: "For The Man Who Believes His Own Ears," which has been used in all A-C Dayton advertising for the past two years. This slogan is especially adaptable, since the manufacturer invites a prospective purchaser to make a rigid test of the set before buying, thus making sure, by his own ears, that he is fully satisfied with the set's performance. The line is made up of six sets, including three standard table models and three consoles. Five and six tube standard circuits are used.

Brooklyn Show Opens Saturday

Brooklyn and Long Island radio fans will come into their own with the opening of the third annual Brooklyn Radio

Exposition on Saturday, October 30, at the Twenty-third Regiment Armory, Bedford and Atlantic avenues. The show will run a full week, up to and inclusive of Saturday, November 6, and will have on exhibition the most extensive and elaborate display of radio sets, parts, speakers and power units, ever shown under one roof. Manufacturers from all over the United States and from the West in particular will display apparatus of the newest design, covering all branches of radio. This year, a great feature that will appeal to all, is the fact that every set manufacturer may demonstrate his set direct from his booth in the auditorium, thus enabling the showing of operation and the hearing of tone quality. Broadcasting will be done by several prominent stations, prominent among them will be WAHG, A. H. Grebe's well known station. Every phase of broadcasting and microphone technique will be shown. The exposition will be opened Saturday afternoon, October 30, at 2 o'clock, by Borough President James J. Byrne, and from that time to the closing date, there will be a continuous gala program of radio events to keep the fans and their friends entertained. The exposition is under the management of Stephen T. Rogers with headquarters in the Albee Theatre Building.

FREE BOOKLET FOR INVENTORS
 IF YOUR INVENTION is new and useful it is patentable. Send me your sketch.
 Z. H. POLACHEK, 70 Wall St., New York
 Reg. Patent Attorney-Engineer

CARTER New "Midget" Rheostat



50¢ Smallest made. Self-cooling all metal frame absorbs and radiates heat. No moulded parts to crack or break. Smooth, silent positive contact. Made in all resistances, including half new R.M.A. Standards. Size Specified in better popular circuits.

In Canada—Carter Radio Co., Limited, Toronto

Carter Radio Co.
 300 S. MICHIGAN AVENUE
 CHICAGO, ILL., U.S.A.



Maybe It's Time to Change Your Aerial!

Regardless of the type, price or make of your radio receiver its performance depends upon the efficiency of your aerial. Soot-covered wire and insulators, a leaky lead-in wire, an improperly designed lightning arrester or a defective ground connection may be affecting your reception. Failure to tune in stations sharply and clearly, inability to get distance and noisy disturbances are warnings that it's time to change your aerial.

Replace it with AERO, the aerial kit that is complete with everything you need, including a S-H Bakelite Lightning Arrester, for good reception.

The price of this special AERO Complete Aerial Kit is

\$3.50

S-H SAFE-GUARD

Lightning Arrester



A lightning arrester of improved design made of Bakelite and brass parts and approved by the Underwriters. Included in the AERO Kit or sold separately.

Price \$1.00

If your dealer can't supply you write direct to us mentioning his name.

SWAN-HAVERSTICK, Inc.
 TRENTON, N. J.

THE 'DX' MARVEL ANTENNA

Patent Pending

The only 100% Antenna made or sold. It solves all problems.

DISTANCE, VOLUME, SELECTIVITY
 THEY ARE ALL YOURS WITH A
 "DX" MARVEL ANTENNA

Easy to erect. Marvelous of operation with your receiver. Connect your receiver to one and get your first real reception.

Shipped direct from factory **\$10.00** POST-PAID

WEST OF ROCKIES \$10.50
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THE DX LABORATORIES

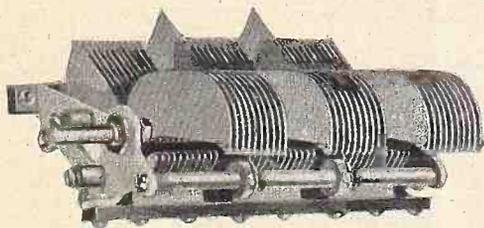
39 Soper Avenue, Oceanside.
 Rockville Center New York

I GUARANTEE

to permanently stop squealing in any 5-tube radio frequency receiver for \$7.50, or any 6-tube RF set for \$10. Patent pending on device used. 24-hour service. Sets can be left at Enter City Radio, 223 Fulton St., N. Y., or sent to me at 40 Paynter Ave., L. I. City (phone Stillwell 5370).

JOHN F. RIDER

Contributing Editor, Radio World; author of Laboratory Scrap Book, N. Y. Sun.



CONTINENTAL NO LOSS

The Special Triple Condenser Specified Exclusively by E. M. Sargent for the Intra-Dyne Circuit Continental special triple condenser, although designed by Mr. E. M. Sargent especially for the Intra-Dyne Circuit, is being adapted to other circuits, such as the "SINGLETRIOL," by Mr. Herbert E. Hayden, with remarkable results.

The low dielectric losses, exact capacitance and mechanical perfection of these condensers make them the logical choice of those who appreciate really fine reception.

It is a straight line wave length and frequency condenser with special compensating plates.

Price \$9.50 Capacity .00035

Licensed under Hogan Patents 1014002

If your dealer can't supply you, write direct to Condenser Headquarters.

GARDINER & HEPBURN, Inc., 611 Widener Bldg., Philadelphia, Pa.

Two-Station Chain Instituted in Canada

MONTREAL

To broaden the scope of the stations and add to the artistic diversity of the programs, there will be one broadcast each week by simultaneous transmission from CNRM, Montreal, and CNRO, Ottawa, stations operated by the Radio Department of the Canadian National Railways.

To allow the necessary synchronization permission has been granted by the Radio Branch of the Canadian Government to change the broadcasting periods of CNRO, Ottawa, and that station is to be on the air Monday and Thursday nights of each week effective November 1.

It is hoped to further extend the scope of simultaneous broadcasting, the next probable step being to include CNRT, Toronto, in the circle by means of which a vast audience may be served in Canada and the United States.

Air University Gives Certificates

CHICAGO

College instruction by radio from October to June is now possible. WMAQ announced a plan of cooperative education whereby a certificate is given the radio-university student on receipt of a passing grade.

Clarence Darrow, lawyer and philosopher, who defended the Tennessee school teacher in the famous Dayton evolution trial, began the "Modern Thought" lectures at 8:10 o'clock (Central Standard) October 20.

WMAQ and WLS Join for Opera

CHICAGO

Judith C. Waller, director of WMAQ, announced the formation of WMAQ-WLS Light Opera Company. Radio fans will have the opportunity of listening to light opera from a radio studio exactly as produced for the stage.

The two stations jointly presented four light operas, beginning with "Chimes of Normandy" Friday, October 22. Two hours were required for the complete production. "Iolanthe," "Pirates of Penzance" and "The Mikado" will be presented on Fridays at 8 P. M.

A company of thirty-three is required to stage the operas. There are eight pieces and a musical director, Pierre de Reeder, formerly musical director of "The Student Prince."

Four New Stations

WASHINGTON

Four new stations have been licensed by the Department of Commerce while three stations have changed their wavelengths.

NEW STATIONS

WKBR—Chas. J. Heiser, Auburn, N. Y., 225 m.; 1,333 kc.

WOBB—Longacre Engrg. Const'n Co., Chicago, 555.2 m.; 540 kc.

WKBS—P. N. Nelson, Galesburg, Ill., 361.2 m.; 830 kc.

WOCB—Orlando Broadcasting Co., Orlando, Fla., 293.7 m.; 1,021 kc.

WAVELENGTH CHANGES—KFVM, Oakland, Calif., from 206.8 meters to 315.6; KFWI, San Francisco, Calif., from 226 to 249.9, and WCSH, Portland, Maine, from 256 to 499.7 meters.



UX POWER TUBES installed in any set without rewiring by Na-Ald Adapters and Connectorals. For full information write Alden Manufacturing Co., Dept. S-20, Springfield, Mass.

FREE

NEW RADIO CATALOG

Write Today to

Chicago Salvage Stock Store
509 S. State St., Dept. R.W., CHICAGO, U.S.A.

MORE THAN a score of new kits—all the latest and best—with specified parts to build them—at prices that mean big savings for you. And all the latest parts and accessories as advertised in the latest parts and accessories current radio magazines. The largest, most complete and up-to-date radio stock in the world. Yours to choose from in this new catalog. Write for your copy.



WIRELESS IN THE HOME, by Lee deForest, sent on receipt of 15c. Guaranty Radio Goods Co., 145 West 45th Street, New York City.

An Everlasting "B"

PROVED

Port Riley, Kan.
"Am getting wonderful results with my Eliminator and good reports from those I have sold."
Floyd M. Farwell,
Wire Chief, Sig. Det.

Amsterdam, N. Y.
The Eliminator is great. Have advised all my friends to get it, for I know none could work any better or give more satisfaction.
Reg. Firth.

Montreal, Quebec, Can.
I have sold all six of your "B" Eliminators and every one is pleased with it. It is one of the best on the market, regardless of price.
Alfred A. Michand.

Mt. Morris, N. Y.
The "B" Eliminator purchased months ago has given more than best results. Would not part with it for anything.
Frank J. Huver.

40,000 Radio Users Demonstrate Reliability and Wonderful Performance

Until you have used the good, everlasting Ferbend "B" Eliminator you have not known the ultimate in radio enjoyment. Second successful year—40,000 in use. Constant flow of unsolicited testimonials prove beyond a doubt its splendid, enduring performance. Amazingly low in price—amazingly high in value. Equal or superior to any "B" Eliminator, regardless of price. We made this statement over a year ago. Today it is proved by overwhelming evidence. The FERBEND "B" ELIMINATOR is approved and passed by the rigid laboratory tests of Radio News, Popular Radio and Radio Broadcast.



only

\$12.50

Complete!

Replaces "B" Batteries. Operates direct from Electric Light Socket on 110-120 volt A.C. lighting circuit. Delivers up to 100 volts.

FERBEND "B" ELIMINATOR

Ask Your Dealer—Or Send Direct

Shipment made direct on receipt of price, or C.O.D. if preferred. Use for 10 days to convince yourself—if unsatisfactory write us within that time and purchase price will be refunded. Send order today.

Ferbend Electric Co.
424 West Superior St.
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BERNARD'S TWO ACES

The Bernard **Circuit**



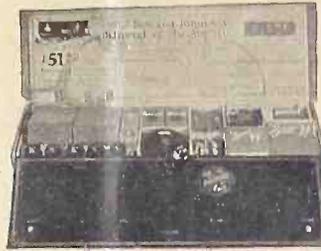
6 TUBES—WONDERFUL TONE.
Quality plus Selectivity, Sensitivity and all the good features desired by every fan. Tuned with your thumb. Beautiful enough to grace the finest home.

HERMAN BERNARD'S
Newest Achievement
The official kit of parts, exactly as specified by Herman Bernard, makes it possible to build a set unsurpassed for tonal and visual beauty.

Kit
\$40

"NEW IMPROVED DIAMOND OF THE AIR"

THE GREATEST CIRCUIT OF ITS KIND
WORKS ON LOOP, INDOOR OR OUTDOOR AERIAL.



Manufactured by the Clapp-Guthman Co. Licensed under **ARMSTRONG PATENT No. 1,113,149** exclusively for **BRUNO RADIO CORP.**

Complete Kit of Parts, with Blueprint, Ready to Wire, as Specified by Herman Bernard

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BRUNO
BRACKETS—Well made of die-cast aluminum. Substantial supports. Simplify wiring. Used in the **DIAMOND OF THE AIR** and the **BERNARD**.

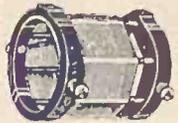
Adjustable for sloping panels,
\$1.25
Straight, **\$1.00**



"BRUNO 99"—3-circuit Tuner, wound on Quartzite glass and specified in the Diamond of the Air. Covers Broadcast band and brings efficiency to any circuit. It mounts with single hole.

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"BRUNO 99"—Matched R.F. Coil for the 99 Tuner. Used in the Diamond of the Air and will improve any good circuit. All bolts and screws furnished.



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By **RADIO WORLD Laboratories**



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Outstanding Features of Set: (1) Fans, charmed by tone quality, sensitivity and selectivity, report speaker reception of far-distant stations with great volume. (2) A 2-tube earphone set, a 5-tube speaker set, and a separate 3-stage audio-amplifier for immediate use with any tuner, are combined in one. (3) No rheostats are used. (4) The set is inexpensive to construct and maintain. (5) The set works from outdoor aerial or loop; hence no aerial problems present themselves, in city or country.

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Eliminates hand rheostats. Simplifies wiring.

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The "SELF-ADJUSTING" Rheostat

The Diamond of the Air Owes Some of Its Efficiency to This Leak

The BRETWOOD

Variable Grid Leak

Certified for The Diamond

The BRETWOOD

Improves Any Set!

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RADIO PANELS
In Quantities for Manufacturers
Century Panels Beautify the Diamond of the Air
Special Department for Individual Orders
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Use the Genuine

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BROWNING - DRAKE**

Coils and R. F. Transformers

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NATIONAL CO., INC.
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An entirely new and original system of R. F. amplification and stabilization.

THE KIT CONSISTS OF

- 3 Alden Somerbridge Twin Inductances
- 3 Alden Somerbridge Fixed Balancers
- 1 By-pass Condenser
- 1 Set of Working Drawings

List Price, \$18

ALDEN ELECTRIC CO.
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**A 6-TUBE CIRCUIT
BEAUTIFUL
TO EAR AND EYE**



How to Build the

Bernard

This Nameplate Free to All!

Fully described in the October 16 issue of RADIO WORLD by Herman Bernard. Schematic and picture diagrams of the wiring, textual wiring directions, step by step; striking photographs of the completed receiver, all treated so that the veriest novice in radio can build the Bernard.

**THE SET YOU TUNE
WITH ONE FINGER!**

Send 15c for October 16 issue *Blueprint of panel, subpanel and wiring (complete)* \$2.00

Or send \$6 NOW for one year's subscription to Radio World (52 numbers) and get the blueprint FREE and also the October 16 issue FREE! Keep informed on this fine circuit by reading Radio World

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145 West 45th St. N. Y. City

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A good, durable, long-lived battery is a prime necessity to any radio fan, no matter what his receiving outfit. The life and power of any battery depends on the quality of its plates regardless of the outside

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LITERATURE

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PARTS**

Specified in the

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- 1 Electrad Royalty Variable Resistance—Type F.
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- 1 Electrad Single-Circuit Closed Jack.
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Nonoise Variable Grid Leak



Pat'd June 15, 1925

Operates on a New Principle. Noiseless.

Range ½ to 7 megohms. Retains Adjustment.

Set Manufacturers who do not skimp on equipment use it in their sets. If your dealer does not stock them send us 85c and we will send you one.

RADIO FOUNDATION, Inc.

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NEW YORK, N. Y.

LIGNOLE Chosen by *Bernard*
for His 6-Tube Set

After thoroughly canvassing the field for a front panel that combined the highest electrical efficiency with beauty unsurpassed, Herman Bernard selected Inlaid without Lignole for the Bernard set. The most discriminating radio engineers and designers regularly choose Lignole, the NEW specially treated wood that meets all panel requirements.



LIGNOLE CORPORATION OF AMERICA
508 South Dearborn Street CHICAGO, ILL.

Mayolian Moves Into Larger Plant

Due to the tremendous increase in its business the Mayolian Radio Corporation, pioneers in battery elimination, have moved into new quarters at 1668 Webster Avenue, New York. The new factory has four times the floor space of the old one, which was situated on Broadway near 68th Street. The "laboratory-built" standard of Mayolian will be rigidly maintained with the increased production at the new plant.

There is now a Mayolian B Supply Unit for every receiver and purse. In addition to the direct current model, there are now four alternating current Mayolians of the Raytheon tube type. Model 612, delivers 180 volts, while the powerful Model 611 delivers 85 milliamperes at 200 volts. This "B without a Buzz" will operate any receiver and any power tube.

Mayolian now makes a Tone Filter that improves tone quality and is said to be

absolutely necessary with the new type power tube.

The Mayolian parts business continues to increase also. There are complete sets of chokes, transformers and condenser blocks for home builders at popular prices.

NEW CORPORATIONS

Nazeley Radio Corp., N. Y. C., 150 shares, \$100 each, 90 common, no par; R. F. Goodwin, J. R. Thomas, R. J. Jones. (Atty., L. C. Burdett, 233 Broadway, N. Y. City).

Sandar Corp., N. Y. City, electrical and radio instruments, 1,000 common, no par; C. L. Farland, G. H. Kiley, J. A. Dunn. (Atty., Cotton & Franklin, 43 Exchange Place, N. Y. City).

Make any Good Receiver

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 **ECC TUBES**
 C. E. MFG. CO.
 Providence R. I.



Goodby Sockets!

Out go the big, clumsy sockets on your sub-panel in place of the neat AMERICAN U. X. PING CONTACTS. They are attached directly below the sub-panel. Price, 15c each. Sold with the STEEL TEMPLATE, which furnishes the strongest contact a tube can have. All approved by "Radio World." Price, 15c each. AMERICAN RADIO HARDWARE CO. Dept. W, 203 Lafayette Street New York City

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20 Worth St., Stamford, Conn.
 SERVICE FOR SET BUILDERS

KIT OF COMPLETE PARTS FOR

The *Bernard Six*

\$40.00 POSTPAID

THE ONLY AUTHORIZED

Bernard SERVICE STATION

Questions Answered, Wiring Problems Solved. COMPLETE KITS as specified by HERMAN BERNARD.....

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The *AIRGAP* SOCKET

It gets that last mile!

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Kit Complete with Blueprint and Herman Bernard's construction article

\$40

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CONDENSERS

and

VACUUM TIPON LEAKS

Play their necessary part in the perfection of the

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Send for full descriptive matter

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Greater Distance
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with

AERO COIL
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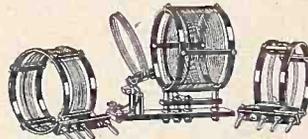


Tuned Radio Frequency Kit

\$12.00

The Aero Coil Tuned Radio Frequency Kit illustrated above will positively improve the performance of any receiver. Patented Aero Coil construction eliminates radio frequency losses and brings tremendous improvement in volume, tone and selectivity.

Kit consists of three matched units. The antenna coupler has variable primary. Uses .00005 condenser. 8-page color circuit, layout and instruction sheet for building the super-sensitive 5-tube Aero-Dyne receiver packed free with each kit. Extra copies, 76c. each.



Low Wave Tuner Kit

\$12.50

Completely interchangeable. Adapted by experts and amateurs. Range 15 to 130 meters. Includes three coils and base mounting, covering U. S. bands, 20, 40 and 80 meters. You can increase the range of this short wave tuner by securing coils No. 4 and 5. Combined range of 25 to 150 meters. Both interchangeable coils fit same base supplied with short wave kit and use the same condensers. Coil No. 4, price \$4.00; Coil No. 5, price \$4.00.

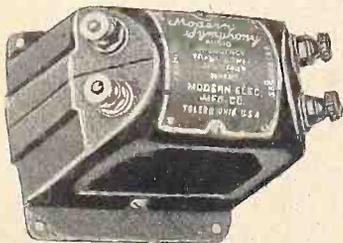
These Aero Coils are available at your dealers. Get yours today!

AERO PRODUCTS, INC.

1772 Wilson Avenue, Chicago, Ill.

Note:—Be sure to use the Aero Antenna Coupler (No. AX-45) and the Aero Radio Frequency Coil (No. WT-40) when building the Bernard Set described in this issue. Any dealer can supply you.

MODERN
Symphony
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Turn ratio 4 to 1; vacuum impregnated; coils further sealed on end against moisture. Primary impedance exceptionally high. All transformers tested at 500 volts for breakdown. Complete shielding eliminates all interstage coupling. List Price

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Modern Symphony transformers were chosen by Herbert E. Hayden for his Singletrot receiver, described in this issue. Says Mr. Hayden: "The audio transformers are Modern Symphony. They amplify tones evenly and with a purity that is decidedly pleasing."

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The Modern Electric Mfg. Co., 1231 Summit Street, Toledo, Ohio

A & B Battery Charger ONLY \$2

SATISFACTION GUARANTEED

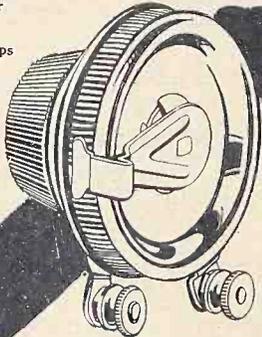


Charges any type of storage A or B battery, using a few cents worth of ordinary house current, either alternating or direct. Cannot injure battery. Complete directions enclosed. Anyone can operate it. No expensive "extras" to buy. Why pay \$10.00 to \$15.00 for a charger when you can get this splendid GUARANTEED R. B. Charger by mailing us two dollars (bills, money order, check or stamps) plus ten cents in stamps or coin to pay mailing costs. Charger will be sent postpaid. If you are not satisfied, return within five days and we will refund your money. Order at once—TODAY.

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Centralab RheostatS Permanently Noiseless

If your set is noisier using the new style tubes, look to your rheostat. Where your old design rheostat overloads, heats up and quickly becomes noisy on new style tubes using increased current, Centralab Rheostats have more current capacity, and will operate smoothly and permanently quiet.

Even regulation and no dead spots are assured owing to insulated metal discs which hold the resistance surface immovable and warp-proof. Centralab Rheostats, on any set, will make great improvement.

We make variable resistances for both the U.S. Navy and Signal Corps and for 69 makers of leading standard sets

Wire Wound—6, 10, 20 or 30 ohms..... \$1.00

Ribbon Wound—2 or 3 ohms for 5 to 10 tubes..... \$1.25

See your dealer, or order direct C. O. D.

Central Radio Laboratories
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Choose with Confidence



World Radio Storage "B" Battery 12 Cell—24 Volt



Proved value. Thousands of users find reception almost magical. Clear, true power—instantly and unendingly. Wise economy. Sturdy construction—Solid Rubber Case protection. Recharged for almost nothing. Endorsed and listed as standard by famous Radio institutions including Pop. Radio Laboratories, Pop. Sci. Inst. Standards, Radio News Lab., Lefax, Inc., and other Radio authorities. What more need be said? Extra Offer: 4 Batteries in series (96 volts) \$10.50. Just state number wanted and we will ship same day order is received, by express C. O. D. Pay expressman after examining batteries. 6% discount for cash with order. Remember—you save 60% on World Batteries.

Send No Money

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1219 So. Wabash Ave. Dept. 82 Chicago, Ill.
Makers of the Famous World Radio "A" Storage Battery
Prices: 6-volt, 100 Amp. \$10.00; 120 Amp. \$11.00; 140 Amp. \$12.00.
All equipped with Solid Rubber Case.

Set your radio dial at 288.3 meters for the World Storage Battery Station W5BC. Variety—New Talent—Always Interesting.
JERRY SULLIVAN—Director and Announcer—"Chi-CAM" '26



Bring in Every Station on the Air With a

WAVE-X Condensing ANTENNA

An aerial that can be erected on wall, chimney or roof, anywhere. 5 foot square is available. Provides sharper tuning, increases selectivity and is non-directional. Twelve highly conductive feelers reaching out in all directions have the capacity of long single wire. Perfect insulation prevents losses. Erected and dismantled quickly. A single upright to erect, hammer and screw-driver the only tools needed. No. 2, 8 foot pole ready to install, full instructions, \$12.50. Get a Wave-X now.

REDI-MAST FOR AERIALS

A strong hand turned rock maple pole 5 or 8 foot length. Fits any roof. Will carry heaviest sleet covered single or multiple wire antennas in strong wind. Complete, guy rods, web irons, roof sockets, anchor pins and full instructions. 5 foot mast \$3.50 each, 8 foot \$4.25. Ask your dealer. Dealers—Wave-X and Redi-Mast are quick sellers. Write today for our dealer offer.

THE ZINKE CO.
1323 S. Michigan Ave., Chicago
THE PRESSED METAL MFG. CO.
Waukesha, Wis.

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

Aid to Hoover DX Fan for Fair

WASHINGTON

Fans who sit up until 3 a.m. in their fishing expeditions for distant stations have nothing on H. D. Hayes, assistant chief radio supervisor. Mr. Hayes not only stays up but he generally gets a good bag, or at least he says he does.

Red-eyed from loss of sleep, Mr. Hayes spent part of a recent morning saying unkind things about a number of stations which interfered with Pacific Coast reception for him. Although he got KFI and two or three or far-western stations, he says it was not until the middle western stations closed down.

Mr. Hayes discovered among other things that reception from WEEF is bothered by a Chicago station; that two Iowa stations interfere with WJZ and that there is a whistle on WPG Atlantic City.

Mr. Hayes got Kansas City, Florida, New Orleans, St. Louis, Los Angeles, Seattle, Cincinnati, Cuba and Canada.

Samson Dual Impedance

The latest improvement in amplification at a low cost. Connects like audio transformer.



SAMSON ELEC. CO.
CANTON, MASS.

BST-5

A \$75 Set Sold Direct from Factory to You **\$40.00** for

A Powerful, Selective, Sensitive 5-Tube Set in Table Model Cabinet. Set in Console..... **\$57.00**

Satisfaction or Money Back!

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145 West 45th Street, New York City
(Just East of Broadway)

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Three Months..... 1.50
Six Months..... 3.00
One Year, \$2 Issues..... 6.00
Add \$1.00 a Year for Foreign Postage; 50c for Canadian Postage.

City and State

Radio Shares Stand Acid Test in Market

The depression in stocks during a recent fortnight served the twofold purpose of introducing an additional number of traders and the public to the average steadiness of radio shares as well as bringing into the market an increased buying power in these shares for investment purposes.

Though the great majority of stocks tumbled to the low of the year in many instances and in some cases made new low records the steadiness of the radio shares was at all times very noticeable. In their efforts to drive prices lower all along the line it was very apparent that the bears had a wholesome respect for radios, for in each instance when they endeavored to raid the market in these shares the steady way in which their offerings were absorbed without making any very appreciable headway on the downward trend compelled them to seek other stocks to hammer on.

In each attempt they found this class of securities almost invulnerable to their onslaughts. This only goes to show that the banking and other financial interests behind these stocks is of the very strongest and willing at all times to support their markets and accumulate holdings when offered below intrinsic valuation. It furthermore served to introduce to investors the radio shares as offering splendid investment opportunities with a broader field for expansion than heretofore enjoyed by this very rapid growing industry. It is safe to assume that the stockholders' list in the radio shares has been greatly augmented during the last two weeks. And now that traders and the public have awakened to the safety of investments made in this class.

WORLD'S FINEST LOUD- SPEAKER



A three-foot cone speaker—unit developed by the inventor of the Tropadyno. Easily assembled, saving 80% of the cost. Complete Kit with blue prints sold on rigid money-back guarantee—shipped prepaid or C.O.D. \$10.

Engineers'
Service Co.

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TUN-A-LOOP

THE LOOP SENSATION OF
THE NEW SEASON
AN ENGLISH-WHITMAN PRODUCT
If your dealer cannot supply you, write for
information.
ENGLISH-WHITMAN PRODUCTS
120 Broadway New York City

"B" BATTERY ELIMINATOR



Only \$7.95
MONEY-BACK GUARANTEE
No more worry with "B" Batteries! Hook up a Roll-O "B" Battery Eliminator and forget battery troubles forever. This wonderful new invention means better reception, sharper tuning. Gives you more real pleasure from your set.
Completely Equipped—No "Extras" to Buy
Operates perfectly on direct or alternating current, giving up to 36 volts current, and using the full force of the power supply. Simple directions enclosed—anyone can plug it in to any kind of set up to six tubes. Constant voltage gives set more power. Costs no more than set of good "B" Batteries. Solidly built in beautifully finished metal case, with genuine Bakelite top.
SEND YOUR ORDER NOW
Don't blame your set because run down "B" Batteries won't let it work right. Order your Eliminator NOW. Write name and address on a piece of paper, pin a dollar bill to it, and mail it TODAY. Pay postman balance (\$6.95 plus a few cents postage) when he delivers your Eliminator. Use it ten days. If not more than satisfied, return it and get your money back.
Roll-O Trickle Charger, for either "A" or "B" batteries, only \$3.95 (plus few cents postage). Send \$1.00 with order—balance C.O.D. Satisfaction guaranteed or money refunded.

THE ROLL-O RADIO CO.
Dept. O-6, 3d & Sycamore, Cincinnati, O.

BLUE PRINTS for 1927 VICTOREEN

Circuit diagram and panel layout, price for both together \$1.50

Blue Print for

LYNCH Lamp Socket
Amplifier, \$1.50
or \$2.50 for all three

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

NO RADIO'S CLEAREST DISTANCE NO
LOOP GETTER AERIAL

BRADLEY ANTENNAELESS

EVERYTHING ON THE LOUD SPEAKER

Simplest—Cheapest—Most satisfactory to build—Use your old parts. 1000 miles or more every night in the year. Used in Florida (static's home) where it brings them in when others can't get through. Construction prints have been sold all over U. S. A. and Canada and everybody happy. You lose Radio's Clearest Receiver if you fail to get this.

Greater Volume, Clarity, Selectivity
Than Three Tubes Ever Gave Before

COPYRIGHTED PRINTS, INSTRUCTIONS, DETAILS \$1.00

209 Hamilton Ave. C. C. BRADLEY Tampa, Florida

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ESTABLISHED 30 YEARS
RADIO'S LARGEST KIT
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Headquarters for Radio Kits

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Bernard Six

Tell us what you want—we will do the rest. Oldest mail order house specializing in Kits.

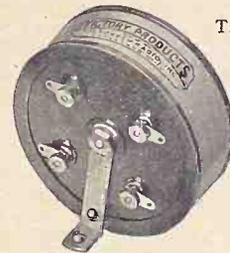
Our Catalog Will be ready soon.

It will pay Set Builders to send for it.

M.&H. SPORTING GOODS CO

512 Market St., Philadelphia

VICTOREEN RADIO PRODUCTS



R. F. Transformers

Made with air core construction. They are not merely "matched" but are actually tuned to a guaranteed precision within 1/2 of 1%.

Victoreen Super sets are free from oscillations, howls or squeals.

For range, clarity, volume, selectivity, a Victoreen Super cannot be excelled.

Use these parts:

- 4 Victoreen No. 170 R.F. Transformers, each \$7.00.
- 1 Victoreen No. 150 Coupling unit, each \$5.50.
- Should aerial be preferred to loop use Victoreen No. 160 antenna coupler, each \$3.50.

Victoreen Rheostats

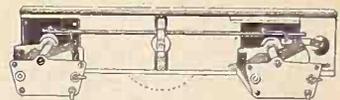
Have zero temperature coefficient—resistance remains absolutely constant; double the number of turns of wire used on ordinary rheostats. Three terminals simplify wiring.

Five resistances—2, 6, 10, 20, 30 ohms—\$1.20 each.

Victoreen Potentiometers—200 and 400 ohm resistances—\$1.50 each.



Victoreen Master Control Unit



A completely assembled, convenient single control unit for use on circuits employing two or more condensers of same capacity. Easy to mount—no change of wiring necessary. Simplifies tuning.

Victoreen Master Control Unit—Type V.S. \$19.50
Extra condenser, each 4.50

Ask your dealer for a free Victoreen folder and hook-up. It gives complete information.

THE
GEORGE W. WALKER CO.
6528 CARNEGIE AVENUE, DEPT. D
CLEVELAND, OHIO

Branches in Principal Cities.

Boyd Offers Plan For Set Trade-In

Something will be done very shortly about the accepting of used radio sets as partial payment on the latest models, according to Carl Boyd, first vice-president of the Radio Manufacturers' Association and one of the executives of the Reichmann Company. He said:

"While I am asked over and over again to explain the improvements in this year's models and where these differ from last year's sets, nine times out of ten the inquiry was followed by the request, 'How much do you think I will be allowed on my last year's set?'"

Mr. Boyd was not in a position to answer this question, for as it stands now the problem is one that must be tackled by the retailer and the retailer alone. The trade in general has discussed the problem but has not tackled it as if it belonged to the industry in general. The matter, when it has come up in trade meetings, has always or nearly always

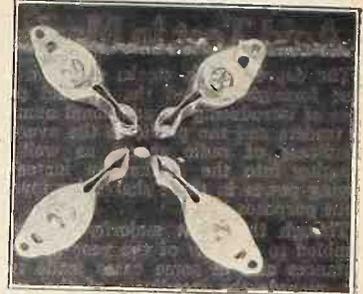
been tabled for future discussion. The suggestion recently has been made several times that a small allowance be made on each set offered as part payment on a new one and the set scrapped or used for its parts. This, however, is called economically unsound, as the small amount on the old sets would hurt the customer's respect for a set that had apparently depreciated so much in such a short time.

Mr. Boyd has a solution of the problem that he feels must come about in a short time. He says:

"We must follow the automobile industry in handling of used sets. The better class manufacturers will bring into being a rebuilding plant which will recondition their used sets for the retailer who accepts them as part payment. The retailer in turn will create a rebuilt set department in which to handle these reconditioned sets. This department will not, I believe, cut in on the sales of new merchandise, any more than the used car departments of the bigger automotive concerns cut in on the sale of their new cars.

"Of course there will always be the re-

FIRM SOCKET



TIGHTLY gripping, efficient socket prongs have been brought out by American Radio Hardware Co., 203 Lafayette Street, N. Y. City. With these the fan may quickly equip his set with any number of sockets. The hardware comes complete in envelopes. A template may be had that can be used for any number of jobs.

tailer who will feel that it is lowering his standards to sell what he will call 'second-hand' merchandise. For him there will have to grow in time regular marts that will do nothing else but sell these sets. He will in the due course of events sell his second hand sets to these marts or consign them for resale on a percentage basis. These marts ought to be very profitable since radio sets do not depreciate as much as automobiles and since automobile used-car marts are very important parts of the industry and had made several names."

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PATENTS—Write for free Guide Books and "Record of Invention Blank" before disclosing inventions. Send model or sketch of your invention for our inspection and instructions free. Terms reasonable. Radio, Chemical, Mechanical, Electrical and Trademark experts. Victor J. Evans Co., 924 Ninth, Washington, D. C.

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

THE 1927 MODEL VICTOREEN has been covered in the following issues of RADIO WORLD: Sept. 11, 18, 25, Oct. 2 and 9. Any copy sent on receipt of 15c., or the five issues for 75c., or start sub, with any one of these issues. RADIO WORLD, 145 W. 45th St., N. Y. C.

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OFFICIAL LIST OF STATIONS, giving call letters, owner, location, wavelength in meters, even unto decimal fractions, and the frequency in kilocycles, was published in the October 2 issue of RADIO WORLD. Send 15c for copy. RADIO WORLD, 145 West 45th St., N. Y. City.

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Your dealer will gladly secure Yaxley Approved Radio Products in the Gold Plated Finish for your hook-up. The parts are actually gold plated, not merely washed, and will retain their rich handsome appearance.

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10 and 20 Ohm Rheostats.....	\$1.50
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All other parts also furnished in Gold

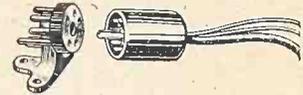
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The No. 660 Cable Connector Plug for quickly and conveniently connecting and disconnecting battery wires will give you a new kind of satisfaction from cable plugs. Bakelite construction. Try it..... \$3.50

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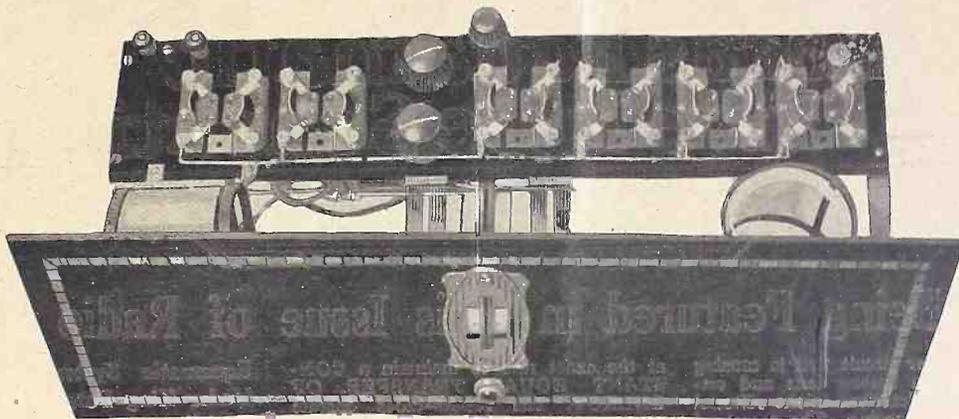
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VIEW OF SET made from the official list of parts, as printed below.
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Exactly as Specified by Herman Bernard and Bearing His Personal Endorsement

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|---|---|---|---|
| <p>C2, C4—Two Bruno .00035 mfd. straight line frequency variable condensers, which, with two drums, mounting frame, panel plate and screws constitute the Bruno Untune, Model 2CB.</p> <p>LS—One Bruno light switch, bronze type, special for this kit.</p> <p>L1L2—One Aero fixed primary radio frequency transformer, stock No. WPT-40.</p> <p>L3L4—One Aero adjustable primary radio frequency transformer, stock No. AX-45.</p> <p>PB—One Singletrol radio impedance coil or an R3 transformer.</p> | <p>C3, S1, C6—3 Aerovox .00025 mfd.</p> <p>R2, C5—One Bretwood variable Grid Leak with grid condenser, .00025 mfd.</p> <p>R3, R5, R7—Three Lynch metallized fixed resistors, 0.1 meg. each.</p> <p>R4, R6, R8—Three Lynch metallized fixed resistors, respectively 1.0 meg., 0.5 meg. and 0.25 meg.</p> <p>1, 2, 3, 4, 5, 6—Six Air Gap push type sockets.</p> <p>R1—One Electrad Royalty variable high resistance, Type F, range 0 to 2,000 ohms (or lesser maximum.).</p> | <p>C7, C8, C9—Three Electrad 0.25 mfd. fixed condensers.</p> <p>R9—One Electrad 2-ohm rheostat.</p> <p>J—One Electrad single closed circuit jack.</p> <p>One pair Bruno adjustable brackets.</p> <p>One 7x21" Lignole inlaid walnut front panel, drilled and engraved.</p> <p>One 20x1" drilled socket strip.</p> <p>One Birnbach 6" lead battery cable, with forked terminals.</p> <p>Nine American Radio Hardware Company cable tags (one A plus, one A minus, one C plus, one B minus, three C minus, one B plus amp. and one B plus det.)</p> | <p>Two C. A. L. binding posts (Ant. and Grd.).</p> <p>Three Lynch double mountings.</p> <p>10 lengths stiff Acme Celatsite.</p> |
|---|---|---|---|

ACCESSORIES

- One 7x21" Polly cabinet, genuine walnut, with 2" slope for panel.
- One Electrad Lamp Socket Antenna.
- One R.F.I. Balanced Oval Cone Speaker.
- Five CcCo Tubes (two F, two A, two G.)
- One Centralab Modulator Plug.

SHEER Beauty, Plus Electrical Efficiency and Utter Simplicity, mark the Bernard set, designed by Herman Bernard, Managing Editor of RADIO WORLD. Its tone is entrancingly full and true, with distortion absent alike in the radio and audio channels. The radio side is stabilized by six points of balance, so that the set will not squeal at any wavelength. This is just the kind of set you want to build.

The manufacturers whose parts are used in this receiver follow:

Bruno Radio Corp., 40 Payntar Ave., L. I. City, N. Y.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Powertone Electric Co., 221 Fulton St., N. Y. City
Electrad, Inc., 428 Broadway, N. Y. City
North American Bretwood Co., 143 W. 45th St., N. Y. C.
Arthur H. Lynch, Inc., Fisk Bldg., N. Y. City

Airgap Products Co., 10 Campbell St., Newark, N. J.
Aerovox Wireless Corp., 489 Broome St., N. Y. City
Lignole Corporation of America, 508 South Dearborn St., Chicago, Ill.
Birnbach Radio Co., 370 Seventh Ave., N. Y. City.
American Radio Hardware Co., 203 Lafayette St., N. Y. C.
Acme Wire Co., New Haven, Conn.

The manufacturers whose products are recommended as accessories are:

Polly Cabinet Co., 57 Dey Street, N. Y. City
Radio Foundation, Inc., 25 West Broadway, N. Y.

C. E. Mfg. Co., Providence, R. I.
Central Radio Laboratories, 13 Keefe Ave., Milwaukee, Wis.

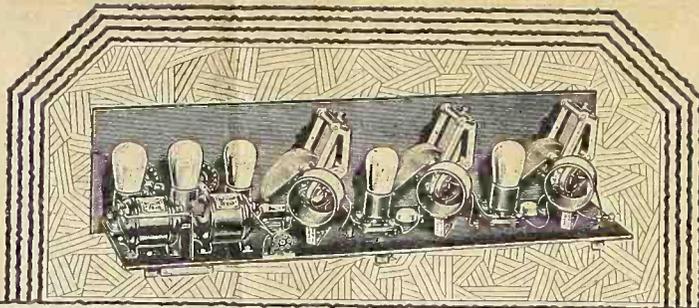
GREAT ATLANTIC RADIO COMPANY

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NEW YORK CITY

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The Karas Equamatic Five Tube Sensation!

Now Being Featured in This Issue of Radio World

This new wonder circuit that is causing such a sensation among fans and set-builders is fully described in the editorial pages of this magazine. The secret of this receiver's remarkable efficiency is due to the solving in a very simple mechanical way a problem that radio engineers have been striving to find the answer to for years.

In the Karas Equamatic there is always a **CONSTANT EQUAL TRANSFER OF ENERGY** at the practical maximum between primary and secondary inductances. This action is continuous throughout the entire band of broadcast wave lengths. Without this feature perfect reception is impossible on all wave lengths, but in the Karas Equamatic five-tube Sensation stations on all wave lengths come in with the same full volume and undistorted tone quality. No more thin, weak signals on high wave lengths. No troublesome oscillations on those lower down on the scale.

How These Results Are Possible

In order to get a **CONSTANT EQUAL TRANSFER OF ENERGY** at all wave lengths the Karas Equamatic System uses a radically new and different radio frequency transformer. In the Karas Equamatic coil the primary is entirely separate from the secondary and is mounted on the extended shaft of the condenser so that it turns with the condenser dial. The secondary is attached to a sliding standard and mounted on a subpanel allowing it to be moved toward the primary or away from it to get the proper degree of coupling.



Karas Micrometric Dial. Price \$3.50

Makes Possible
Perfect Coupling
at All Wave Lengths

After the coils in a Karas Equamatic Five Tube Sensation have been adjusted the coupling is varied **AUTOMATICALLY**

at the exact rate to maintain a **CONSTANT EQUAL TRANSFER OF ENERGY**. The result—tubes operate always at their highest efficiency—just below the oscillation point. This action requires no extra control. It takes place automatically as the set is tuned in the regular manner.

Results Never Before Attained with Five Tubes

Due to the perfect coupling at every wave length and the correct placing of all parts, there is no over-lapping of electromagnetic and electrostatic fields. As a result the circuits in the Karas Equamatic System tune sharply on all wave lengths. Stations on any part of the dial snap in and out with remarkable precision.

The volume of the Karas Equamatic Five-Tube Sensation is equal to that of most seven-tube sets, and it has the pure, clear tones of a crystal receiver. In addition it has a range and sensitivity equal to a regenerative circuit.

Build this Powerful Set Quickly and Easily

It takes but a few hours of your time to build this powerful, rangy, wonderfully clear toned receiver. There are no technical tricks nor complicated wiring.

Packed with every set of Karas Equamatic coils is a manual of simple diagrams and instructions showing where to place every part and how to make each connection. The working principle of the system is also clearly illustrated and described.

When building the Karas Equamatic Five-Tube Sensation you will need the Karas parts listed on the coupon, plus other standard parts easily secured.

Order from Your Dealer or Direct

Karas Equamatic parts are carried in stock by reliable dealers in most cities. If your dealer happens to have none, order direct from us by using the coupon at the right. **SEND NO MONEY.** Just pay the postman the price of the parts plus a few cents postage.

Build your Karas Equamatic Five-Tube Sensation **NOW** and you will be sure of having a set that will deliver the most perfect radio reception that it is possible to obtain with any set regardless of the number of tubes.

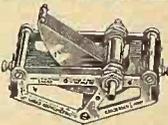
Equamatic System Licensed
Under King Patents, Panama

Essential Parts of the Karas Equamatic Sensation



KARAS EQUAMATIC INDUCTANCE COILS are packed three in a carton, and come to you with complete manual of simple diagrams and instructions, all necessary nuts, screws and binding posts, ready for mounting in your receiver. Price, set of three coils, \$12.00.

KARAS SPECIAL 17 PLATE ORTHOMETRIC CONDENSERS, three of which are used in the Equamatic Receiver, have special extended shafts upon which to mount the primary coils of the Inductances. Price, each \$7.00.



KARAS HARMONIK AUDIO FREQUENCY AMPLIFYING TRANSFORMERS are essential to the tone quality success of the Equamatic receiver. Two of these are used for the two stages of audio frequency amplification. Price, each \$7.00.

KARAS EQUAMATIC RETARD COILS, two of which are used, were designed especially for the Equamatic System. Price, each \$1.00.

KARAS EQUAMATIC SUB PANEL BRACKETS. To insure the necessary exact positions of primary and secondary coils these brackets are essential. Price, set of three, 70c.

KARAS MICROMETRIC DIAL. It has a $\frac{1}{32}$ to 1 vernier and tunes to 1/1000 of an inch. Price, \$3.50.

KARAS ELECTRIC CO.
1147 Association Building, Chicago, Illinois.

Please send me a set of 3 Equamatic Inductance Coils, \$12.00;
3 special Orthometric Condensers with extended shafts, \$7.00 each;
3 Micrometric Vernier Dials, \$3.50 each; 2 Harmonik Audio
Transformers, \$7.00 each; 2 Equamatic Retard Coils, \$1.00 each;
and 3 sub-panel brackets, 70c. for which I will pay postman
\$60.20, plus postage, upon delivery. It is understood that I
have the privilege of returning any of this apparatus for full
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satisfactory.

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(If cash accompanies order we will ship postpaid.)

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