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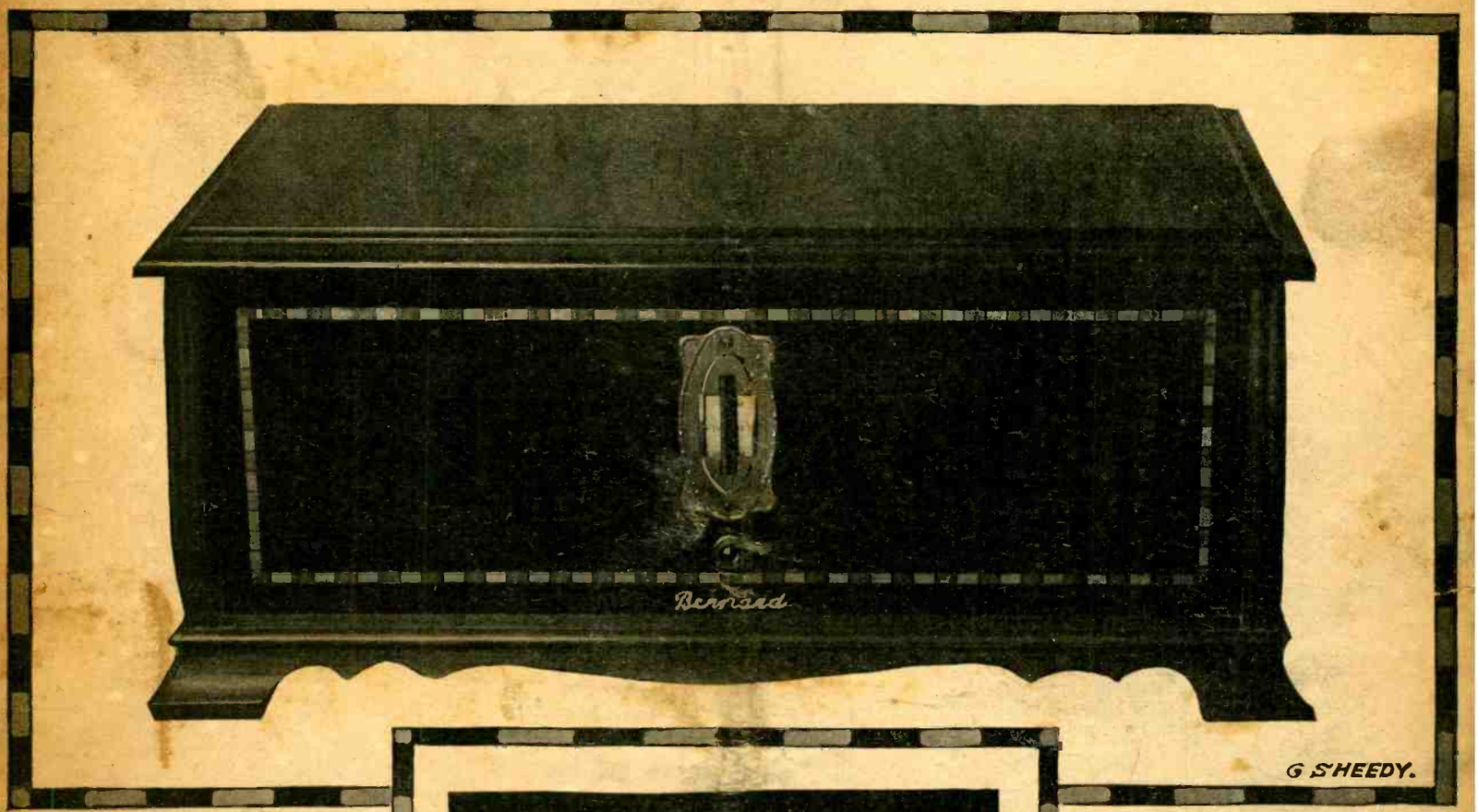
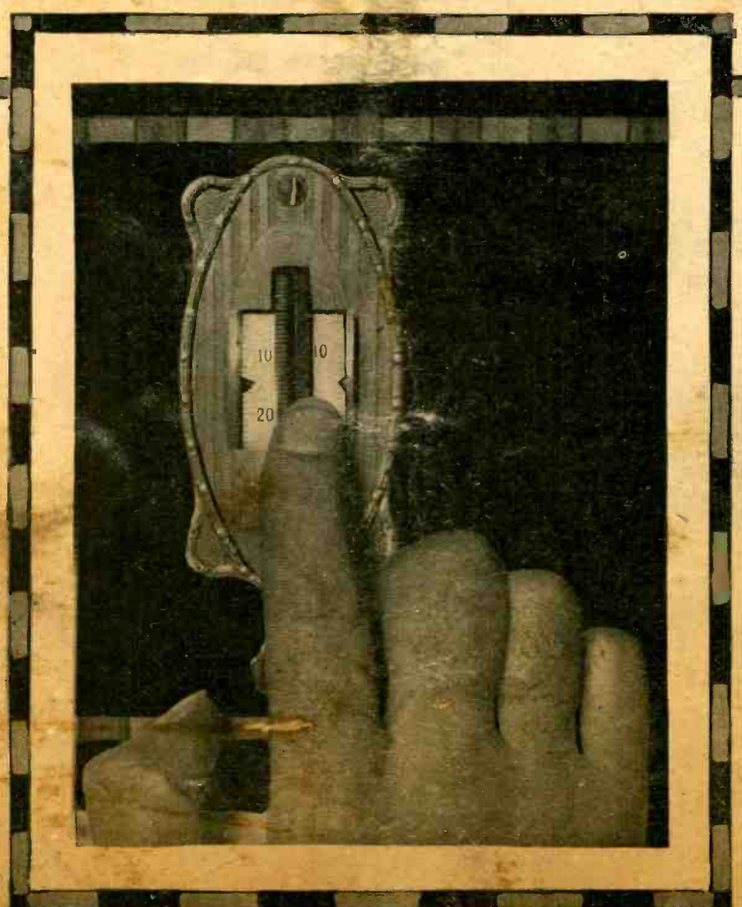
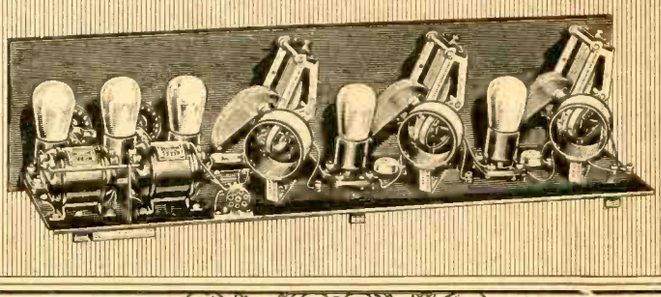


ONE FINGER TUNES BERNARD'S SET—See Page 3

*Build this Powerful Sweet-tone Receiver.*

# The Karas Equamatic Five Tube Sensation



## A Radical Development in Tuned Radio Frequency

THE Karas Equamatic Five Tube Sensation makes it possible for the first time to take full advantage of the amplification factor of your tubes. You can turn the dials from one end of the scale to the other and all stations within range come in with FULL VOLUME. No forcing of tubes at high wave lengths. No troublesome oscillations on low wave lengths. There is no need to touch your rheostats when tuning from one station to another. These results are possible because in the Karas Equamatic System there is always a CONSTANT EQUAL TRANSFER of energy between primary and secondary coils at ALL WAVE LENGTHS from 200 to 600 meters.

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In the Karas Equamatic System the primary and secondary coils of the R. F. transformers are entirely separated from each other. Each primary is mounted by a special fitting to the extended shaft of the condenser so that it turns with the condenser dial. The secondary coils are attached to sliding standards, and are mounted on the subpanel so that they may be moved toward or away from the primaries.

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### A Clear, Powerful Signal on ALL Wave Lengths

The arrangement of coils and condensers and the perfect coupling at every wave length setting eliminates overlapping of electrostatic and electromagnetic fields, and as a result there are no harmful broadening and distorting effects in the Karas Equamatic System. The signals are pure and clear as those from a crystal receiver. Volume is equal to the usual seven tube set. In addition, there is a sensitivity that rivals a regenerative circuit!

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Because all parts work at their highest efficiency, the Karas Equamatic has SELECTIVE qualities not found in any other five tube receiver. Stations snap in and out with remarkable precision.

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Packed with every set of Karas Equamatic Coils is a complete detailed manual of simple diagrams and instructions showing where to place every part and telling you exactly how to make each connection. In this manual the system is completely described and illustrated.

To build this receiver you will need the Karas parts listed on the coupon, plus other standard parts that you can easily secure.

### Order from Your Dealer or Direct

Karas Equamatic parts are carried in stock by reliable dealers in most cities. If your dealer happens to be out of stock, order direct from us by using the coupon at the right. SEND NO MONEY. Just pay the postman the price of the Karas parts, plus a few cents postage.

## KARAS ELECTRIC COMPANY

**1147 Association Building**

**CHICAGO**

### Karas Equamatic Is Licensed Under King Patents Pending

#### 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.

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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 refund any time within 30 days if it does not prove entirely satisfactory.

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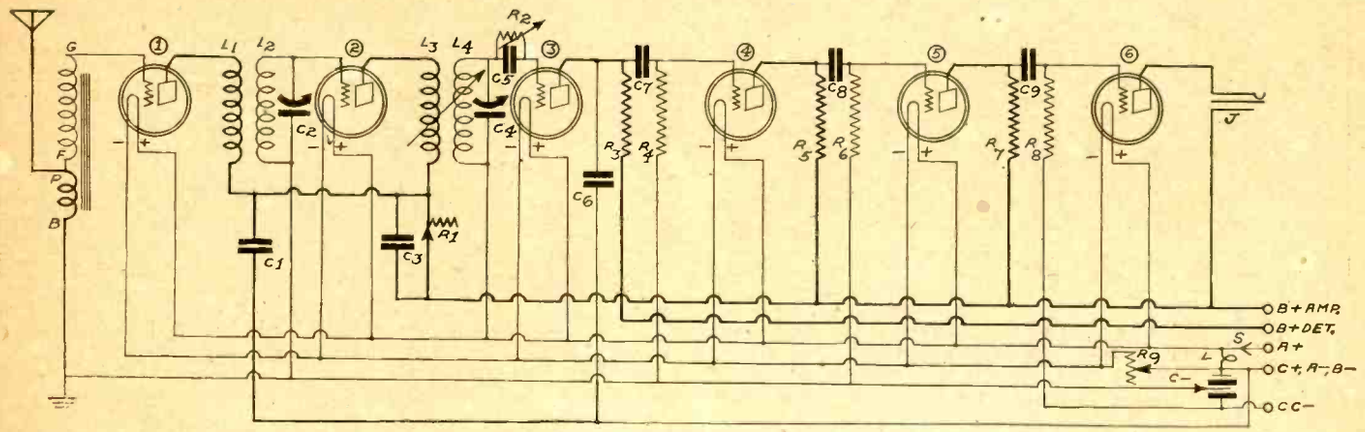
# BERNARD

## A 6-TUBE CIRCUIT BEAUTIFUL TO EAR AND EYE




(*Design Copyright* 1926)

**FIG. 1**
**The Bernard 6-tube receiver, shown in circuit network.**

# Tone Quality of Set Excites Hearers to Frenzied Enchantment—RF Channel Cleared of Distortion and Squealing by Six Points of Balance, Principal Among Them High Negative Bias, Recommended as Stabilizer for First Time—Drum Type Tuning Control Used—Only Other Part on Panel is the Switch—Audio Channel is Metallized Resistance Coupled

[*The complete article on how to construct the Bernard receiver is published herewith. The theory of the set is explained, as well as some points of quasi-construction, followed by full textual wiring directions that enable any one to build this set. No knowledge of radio is required, due to the picture diagram and the careful detail with which the subject-matter is presented by America's most lucid radio writer.*]

*By Herman Bernard*
**Associate, Institute of Radio Engineers**



THE kind of a radio receiver that everyone wants to have is one that not only gives delight to the owner even in his moments of solitude, but which excites visitors to frenzied enchantment and makes them inquire immediately where they can obtain such a set. This aim is easily reached where expense is not so important, but the problem of making available a splendid tone quality receiver within almost everybody's financial reach has not been wholly free of difficulty. Such an opportunity, however, is now presented to those whose hobby is to gather together parts so that with their own hands they can put together a set endowed with quality in every aspect.

Besides the fine, strong, evenly magnified tones that this set can feed to a speaker, an outstanding advantage in any set, and one only lately begun to be appreciated, the result is attained with manual simplicity. All the tuning is done with two drums that actuate the pair of tuning condensers. The device used is the Bruno Unitone, Model 2-CB.

Drum control became available to the home constructor only this season, and the present receiver is one of the first of consequence to utilize this convenient method. Besides the drums and the ornamental face plate slotted for their manual rotation no part appears on the front panel except the light switch, thus adding a touch of beautiful simplicity to the front elevation. The whole trend in tuning is toward simplicity and this is achieved in the present receiver to a degree almost impossible to surpass without utilizing gang devices that are fraught with possibilities of trouble.

### Faithful to the End

As the photographs show, the receiver is an ornament to any home, the beautiful appearance being due in no small degree to the inclusion of a special front panel, made of Lignole, done in walnut, with border of inlay, and matching a Corbett walnut cabinet.

As for electrical performance, the receiver is so faithful to tone values because of the complete balancing of the radio frequency amplifying channel by a method never before presented, so far as I am aware, and by the preservation of this faithfulness through the use of resistance-coupled audio frequency amplification.

Starting from the input, we find that aerial and ground are connected to the primary of a radio frequency transformer of the fixed or so-called untuned type. One primary post is joined to one secondary post, thus converting the coil into an auto-transformer, where PB is the primary and GB the secondary. (Fig. 1). This coil is an Acme R3, and it has an iron core. The transformer is peaked in such fashion that it favors amplification on higher wavelengths in the broadcast spectrum. This serves the triple purpose of flattening out the amplification curve, so that the RF magnification will be more nearly straight line frequency than would be possible otherwise, reducing the tendency of the set toward self-oscillation on the troublesome low waves, and removing the possibility of uneven dial readings or necessity for compensating subterfuges to make up for the uncertainties of capacity effects in the antenna-ground system.

### The New Stability Method

It will be noticed that the grids of the two radio frequency amplifying tubes, 1 and 2, are returned to a common C minus lead, and that the B plus amplifier voltage is fed to the plates of these two tubes, except only for the voltage dropped in the variable resistance, R1. This negative grid bias, seldom employed in any receivers in the radio channel, is used as the principal method of stabilization.

It is well known that the grid of radio amplification tubes may be so biased, either negatively or positively, as to reduce the amplification, indeed, even cause the signal to disappear. The positive bias was resorted to a few years ago with

# Bias Balances Receiver

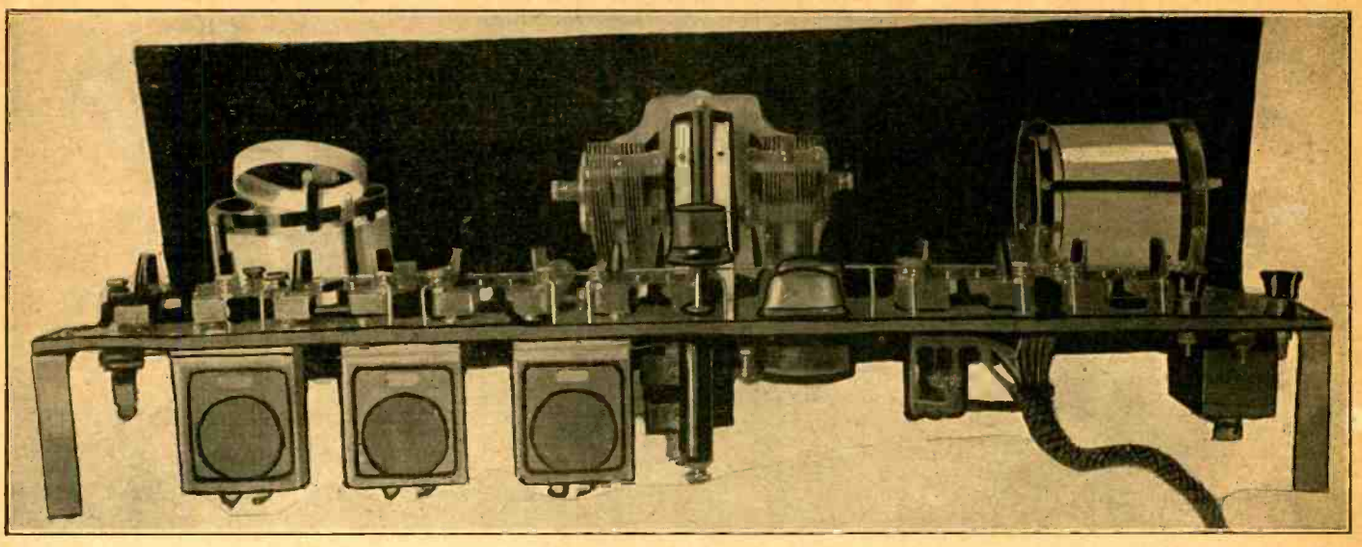


FIG. 2.

**The rear view of the receiver shows how the three .25 mfd. condensers are mounted vertically, these being, right to left, C7, C8 and C9. The Bretwood Variable Grid leak with grid condenser is at center, in plain view. The variable resistor, R1, is in the foreground, to the right of the Bretwood, and behind R1 is the rheostat, R9. The battery cable leads are soldered directly to points in the receiver, without going through any terminal strip.**

great fervor, a potentiometer being the instrumentality, and in its day it served its good purposes. But the potentiometer was nothing less than a control of regeneration requiring constant adjustment for different wavelengths or degrees of signal intensity. The present method uses a negative bias of a fixed or unvaried kind, and this is the new point.

### Why the Extra Bias

The rheostat R9, controlling all six tubes, which are of the 5-volt type, is utilized to drop the one volt necessary from the 6-volt storage battery source. This instrument is not mounted on the front panel, as once it is set there is no need to tinker with it.

The negative bias on the grids of tubes 1 and 2, therefore, is slightly greater than what is theoretically considered most suitable. Tubes used as audio amplifiers will stand a greater negative bias than when the same tubes are used as radio amplifiers, since in radio amplification it is important to operate the tube on the steep part of the grid voltage-plate current chart or characteristic curve.

Now, the negative bias for radio amplifying purposes, and particularly for stabilizing the tube by making self-oscillation utterly impossible on any broadcast wavelength, is rather critical. Since no grid current (DC) is flowing, fine graduations by means of an adjustable series resistance are not possible, for if a rheostat in this lead affected the grid bias to any noticeable extent it would merely prove there was something wrong with the set, possibly the A battery leads were reversed. A potentiometer across a C battery, with grid return to the movable arm, is one workable scheme, but the attainment of exactly the right negative bias this way is delicate and the potentiometer soon drains the battery. The only reason for the variable resistance R1 (Electrad Type F), therefore, is to cut down the plate voltage applied to these two tubes, hence the plate current consumption so that this current exactly matches the 3 or 4½ volts negative bias used for the two grids (the lead marked C— in Fig. 1). Hence nothing critical is encountered in the grid bias—you simply use 3 or 4½ volts.

The greater the negative grid bias, for any given plate voltage, the smaller the plate current. The drain may be reduced to zero, indeed this is the basis of one form of vacuum tube voltmeter. As we are faced with the practical necessity of choosing negative bias in steps of 1½ volts, since C batteries are made thus, we choose 3 volts, or, if need be, 4½ volts, and stop self-oscillation by turning the knob of R1 until the setting of greatest effectiveness is found. This is simple, for if the negative bias is too much as compared with the plate wattage, the signal strength will be low; if it is too little there will be squeals when one tunes in some stations, particularly on the lower wavelengths, while when it is just right full volume, quiet tuning and almost uniform amplification at radio frequencies will be obtained—without drop in volume on the higher waves, due to GFPB.

It will be noticed that the primary L3 of the coil system connecting the second RF tube to the detector is adjustable. This has some bearing on stabilization, too, but it is included principally as a means of obtaining such selectivity as one's location demands.

If one uses the receiver under such conditions of interference as are encountered in New York and Chicago, for instance, or lives near a powerful local, it will be necessary to move the primary L3 to a position of very loose coupling. This adjustment is finally completed in a few minutes, as the Aero coil primary in this case may be pushed one way or another. Set it as required and thereafter leave it alone. Thus is another control eliminated.

The closer the coupling between L3 and L4 the greater the tendency of tube 2 toward self-regeneration at the lower wavelengths. Hence smaller negative bias would be required in the case of loose coupling, and if tight coupling is preferred any experimental bias voltage may have to be increased. Remember, therefore, the tighter the coupling here, the greater the negative bias should be.

In closing the discussion of elements entering into stabilization one must mention the detector plate voltage and the Bretwood Variable Grid Leak, R2. The plate voltage applied to R6, in the detector circuit, may well be 45, due to the drop in the .1 megohm resistor before the voltage is actually useful on the plate, not to mention the resistance of the plate itself, some 12,000 ohms extra. If 90 volts are applied here, tendency toward self-oscillation in the detector tube may be experienced.

The Bretwood Variable grid leak is mounted on the sub-panel and is turned to the point of greatest volume, then left alone. The more the plunger is inserted (knob turned to right), the less the resistance.

### Points of Balance

Therefore the six points of balance are (1), state of lessened resonance in the first RF tube on the troublesome low wavelengths; (2) negative grid bias, with plate wattage adjustment for simplest achievement of the neutralized state; (3) setting of primary L3, primarily for selectivity as needed, but incidentally a self-oscillation suppresser; (4) setting of the variable grid leak, an over-oscillating detector tube being easily controlled in this way; (5) rheostat setting, this being incidental, as it is intended only to get the proper voltage of 5 on the filaments; (6) detector plate voltage.

Leaving the RF channel, in which the detector tube is included because its input is RF, we turn to the audio amplifier. The resistance-coupled stages are standard, the correct values of resistance being utilized, when the plate impedances are considered and the load on the grids of the respective tubes. The resistors must be of a type that will not materially change in value when the voltage is applied, even if the set is operated for hours and hours on end. That is why the Lynch metallized resistors were selected.

Special attention should be given to the negative bias (CC—) on the grid of the last tube, which should be a 5-volt power tube. It is inadvisable to pay much attention to grid bias formulas as published in the circulars enclosed in tube boxes, as these bias facts, while accurate mathematically, usually have to do with theory or the operation of the tube in a tester, rather than in an actual receiver. You may use the ear test, if you like, especially when you are told that with 135 volts on the plate of the last tube, the negative grid bias may be anything from 3½ to 6 volts, with the chances strongly in favor of 4½.

### The Steady Needle

A milliammeter in series with the plate lead of the last tube serves an excellent

# High Mu Tubes Add Pep

## Used in First and Second Audio Sockets, While a 5-Volt Power Tube Is Recommended for the First RF Stage and the Final Audio Position——Type A Tubes Used in the Other Sockets

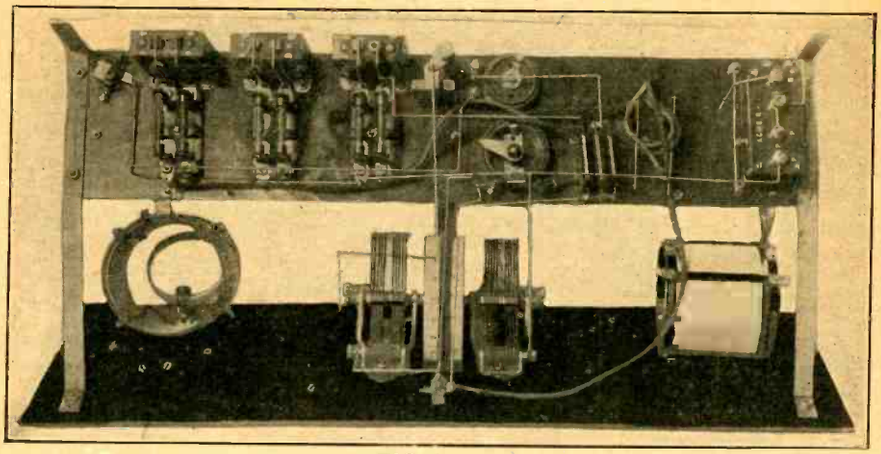


FIG. 3

**View of the bottom. The fixed condensers, in the audio circuit, are at left, being, right to left, C7, C8 and C9. The first Aero coil, L1L2, is secured to the sub-panel or socket strip by twisting each of the two mounting brackets that are supplied by the coil manufacturer. Note the A plus battery lead coming direct to the Bruno light switch.**

purpose in guiding you. Adjust the bias until the needle fluctuates least on loud signals. If the needle kicks up, reduce the bias. If the needle kicks down, increase the bias. You will find this bias a little bit critical, but select the most suitable post on the C battery.

The coupling-isolating condensers (that couple one audio tube to the next succeeding one, yet serve also to keep the preceding tubes' positive plate potential off the succeeding grid) should be of fairly large capacity in any resistance or impedance coupled audio circuit, and in this instance the Electrad 0.25 mfd. 200-volt bypass condensers were used.

Now, for the tubes. You may be surprised to learn that the tube favored for the first radio frequency stage is a power tube—the type usually marked "last audio stage only." The reason is that for any given plate voltage the RF amplification is about twice as great as if the A type of 5-volt tube were used, hence you get both radio and audio amplification, since you can not increase the RF without increasing the AF. Higher amplitudes are higher amplitudes, wherever encountered. The effect in the present instance is about the same as if an extra stage of resistance coupling AF were added, and it is strongly recommended that the first socket house a power tube unless your location requires extraordinary selectivity.

### Ce-Co Tubes Used

In the laboratory models of the Bernard receiver the tubes finally decided on, after many tests, were CeCo, and the types for the respective sockets follow: 1, type F power tube; 2, type A; 3, type A; 4, type G (high mu); 5, type G; 6, type F power tube. Those who intend to construct the receiver, using such other tubes they have, of the 5-volt variety, will employ a CX312 in the first and last sockets, or UV112, and in the other sockets CX301A or UV-201A or equivalents of these. The two high mu tubes in the audio channel, however, not only increase volume but stand a heavier load. It will be noted that tubes 4 and 5 (first and second AF) take whatever negative bias is made necessary by the balancing of the RF tubes, and this is good practice, since the negative bias is never to exceed 4½.

It will occur to many that a tube that amplifies at radio frequencies much more effectively than some other tube also is likely to introduce over-oscillation trouble, and in receivers not balanced this is indeed a drawback, and makes such tubes great nuisances instead of valuable assets as radio amplifiers. But in our receiver we have a balancing means that spreads in six directions, and we know that we shall be able to operate the set with full volume from highest to lowest wavelength without so much as a squeal emerging from the speaker, an asset that not only commends itself to the unexperienced tuners in the family, but also facilitates the reception of distant stations, as there is no need of getting rid of a whistle to be able to distinguish what is being said or played. And the orchestra from a far-distant station does not cause the reproduction of noises that sound like thump-thump on a cracked bass drum. Side-band cutting, worst cause of distortion on the radio side, is avoided, stations roll in without screeching the news of their anonymous arrival, and a distortionless audio channel permits real quality to be preserved.

### By-Pass Condensers

A few items in the circuit diagram have not been discussed in detail or at all. The fixed condensers C1, C3 and C6 are inserted for by-pass purposes, and may be small because their resistance at any radio frequency will be less than the resistance of the possible sources of losses they tend to remedy—B batteries that have developed high resistance due to use after exhaustion, the damping effect of the high resistor R1, and the RF resistance of R3, in the detector plate circuit. Sometimes when a set loses its selectivity, especially in one stage and not in another, fans often wonder why, and rundown B batteries are likely to be the cause. Even so, if a receiver includes the by-pass condensers, connected from the B plus end of the coils themselves, to A minus or C minus, selectivity often will return, though the battery resistance is higher than it ought to be. Sometimes, too, this resistance is high when the battery has many weeks of useful service ahead of it.

By the way, B batteries, if properly chosen, will last six to eight months, so by marking on your batteries the date of purchase you will be able to judge about when it is time to replenish them, although batteries never should be discarded until actual operating conditions further attest the advisability of replenishment. Though not as convenient as B eliminators, they are more economical, when every item of expense—investment and upkeep—is considered.

S is a switch, lower right in Fig. 1, and L is the flashlight lamp that fits in the special socket on this switch is provided. The instrument is a Bruno light switch and has a red window that glows fascinatingly when the set is in operation. To turn on the switch, turn the window itself strongly all the way to the right and let go. To turn it off simply press against the window with your finger. This releases a spring and the switch snaps off.

The other Bruno items in the list of parts are the collapsible brackets and the Unitune, Model 2CB. The two drums, two special Bruno .00035 mfd. variable condensers, mounted on a frame, and the embossed bronze panel plate, constitute the 2CB. The variable condensers are .00035 mfd., it will be noted, and not the .0005 mfd., ordinarily supplied with the Model 2-C.

The Bruno condensers are unlike any other on the market, in that the shaft is of special clear Bakelite and is the only means of insulating stator from rotor, the stator being built in the frame, hence rotor plates must go to grid and stator plates to A minus, a rule that applies only to Bruno condensers. The high insulation shaft prevents body capacity effects in receivers prone to produce them, but the present set fortunately is not one of them.

The .00035 capacity is required for the tuned coils in the Bernard, these being Aero radio frequency transformers. One of them, L1L2, has a fixed primary, wound inside the secondary, near the end of the secondary which should go to the C battery lead. This position gives maximum inductive coupling consistent with minimum capacity coupling between the respective windings. Besides, the primary is widely space wound, a most excellent precaution against capacity coupling. Besides, the Aero coils are wound on Bakelite strips, thus having minimum insulation on the form, and represent extreme electrical efficiency.

The output jack is an Electrad single circuit closed jack, for it is well to have such a type here, in case one ever wants to use a power pack in conjunction with the set. Such a pack usually consists of a B eliminator and a stage of power audio amplification. The type of jack shown (J in Fig. 1), enables plugging in just as if it were a double circuit open jack.

The Bernard works on a lamp socket antenna in nearly all instances, and affords fine volume with this convenient form of aerial. No greater volume will be required by most persons, although of course an outdoor antenna does give more volume.

If an outside aerial is used the total length, including leadin, need not exceed 65 feet. It is advisable to have an outdoor antenna as high as possible.

# How to Wire the Bernard

## Textual Explanation of the Construction Sets Forth the Progressive Steps in Assembly and Connections — Rotors of the Bruno Condensers Go to Grid, Due to Special Construction



THE layout of the parts in the Bernard receiver is very orderly, and anybody will find it an easy matter to perform the wiring, either by following the schematic diagram, Fig. 1, on page 3 of this issue, or the picture diagram of the wiring, Fig. 4, if he is a novice. Even an experienced set constructor may find some simplifying points in the picture diagram, since it shows the physical location of the wiring.

Let us take up some of the mounting points first. The front panel, if obtained as part of the official kit, will be completely drilled and engraved, and the bracket holes will be suitable for the new Bruno adjustable brackets. However, the picture diagram shows panel holes and other data for use in case you are trying to accommodate the set to brackets of your own manufacture, hence the 9/64 hole at upper right on the front panel is intended only as a guide to including improvised brackets. The design for home-made brackets is shown at center left in the picture diagram.

The slot for the drum may be drilled oblong, 1 1/4x2 3/4, without rounded corners. The official panel, however, has all this drilling already done.

The frame for holding the condensers C2 and C4 and the panel plate, which is bronzed, is mounted on the front panel by means of machine screws held by nuts in the panel rear. The plate holes are two 9/64 one of which is so marked, although both are shown.

The light switch is mounted in a 5/8 hole, which is centered 1 3/8" from the bottom of the panel, in the central line. In following Fig. 4 for panel drilling directions, necessary only in case you are drilling your own panel, remember that the panel is shown as upside down, as it were, this representing the view of the panel when it is folded back, so that you see the rear, with the real bottom seemingly at top.

The picture diagram shows the mounting of the parts that go on the bottom of the socket strip, this view being at top of Fig. 4, while just below are set forth the parts that go on the top of the socket strip. The top view is marked "top" and the bottom view is marked "bottom." Therefore if you follow the layout as given you cannot go wrong, as the dimensions were taken from the laboratory model of the receiver.

Assuming that the panel parts are mounted, as well as the socket strip parts, first wire the filaments.

Connect all F minus posts of all six sockets with one bus. This lead runs on top of the socket strip. All A plus posts of the sockets are joined together with one bus, and this too is atop the socket shelf, although a little farther from the socket posts.

Make the following connections next:

Join the Ant. binding post to the F post of the Acme R3 transformer, GFPB, and join the F and B posts. Connect the B post to ground. G of this transformer is connected to grid of the tube through a hole drilled in the socket strip near the grid post of the socket (1).

Next tackle the coil L1L2. This has its P post connected to plate of tube 1, its B post to one side of C1, its G post to G of socket 2, while F is unconnected for the moment.

Going to the input into the detector tube, the coil system L3 L4 is wired with P to plate, B one side of R 1 and to one side of the fixed condenser C3. If only three posts are designated on the coils you can tell the missing one by deduction. G goes to one side of the grid condenser C5 and one side of the grid leak. With the condenser already mounted on the leak one connection takes care of both. The F post of L4 goes to F plus. The other side of the grid condenser-leak is leak soldered to the lug on the G post of the detector socket (3). The plate of detector tube is connected to C6, one of the three fixed condensers side by side on the bottom of the subpanel (Micamold. .00025 mfd. each). The other side of C6 is left unconnected for a while.

The Lynch mountings for the audio resistors next are wired.

The nearest terminal to detector plate is connected thereto, while the opposite points on the two other plate resistor clips are jointd together. Each plate lead of each of the three sockets, detector (3) first audio (4) and second audio (5), is joined to one side of a fixed condenser of .25 mfd. capacity, all these being the Electrad 200—volt bypass of that valve. The open sides of the .25 mfd. condensers then are joined to nearest Lynch mounting clips for grid resistors and to the grid of the succeeding tube.

## The Filaments Are Wired First, Then Radio and Audio Channels, and the Panel is Next Affixed So That the Variable Condensers and Light Switch May Be Connected

The single closed circuit jack is on the sub panel. The plus post (so marked on instrument) is joined to open side of the plate resistor clip for the second audio tube(5) and the corresponding clip of the previous tube (4), and this lead is carried to the movable arm of the Electrad Royalty type F and to the open side of C3, one of the three fixed condensers. If you can not easily distinguish the movable arm from the stationary post of the Royalty, R1, connect either way.

Now carry the closed sides of the grid resistor clips intended for service in the grids of tubes 5 and 4 to ground.

The front panel and the sub panel now may be joined and the top lead of the Bruno lig ht switch connected to the plus bus wire of all s ockets, at any one point. One side of the rheostat R9 is connected to the upper bottom switch point and the other side of R9 goes to the F minus lead of the six Air gap sockets. The free switch point goes to F plus.

Connect the variable condensers. The rotor of C2 goes to grid of tube 2 and stator to ground. The rotor of C4 goes to grid condenser C5 and stator goes to F plus (any socket.) For Bruno condensers rotor to grid is correct.

The open ends of C1 and C6 go to A minus.

Connect the cable leads. Red may be used for A plus and be connected to switch, the corresponding switch contact to the F plus bus of the sockets. The A minus, black, goes to the rheostat at post other than the one connected directly to F minus of tubes. B plus det. is soldered to the open terminal of the detector plate mount, while B plus amp. goes to the Electrad Royalty terminal other than the one connected to coils. CC minus is the le ad to the last grid leak, R8, while C minus is the ground lead, connected by cable to any convenient point.

The top should be put on the cable leads at the forked terminals reserved for battery connections.

Connect the coil side of C1 to the corresponding side of C3.

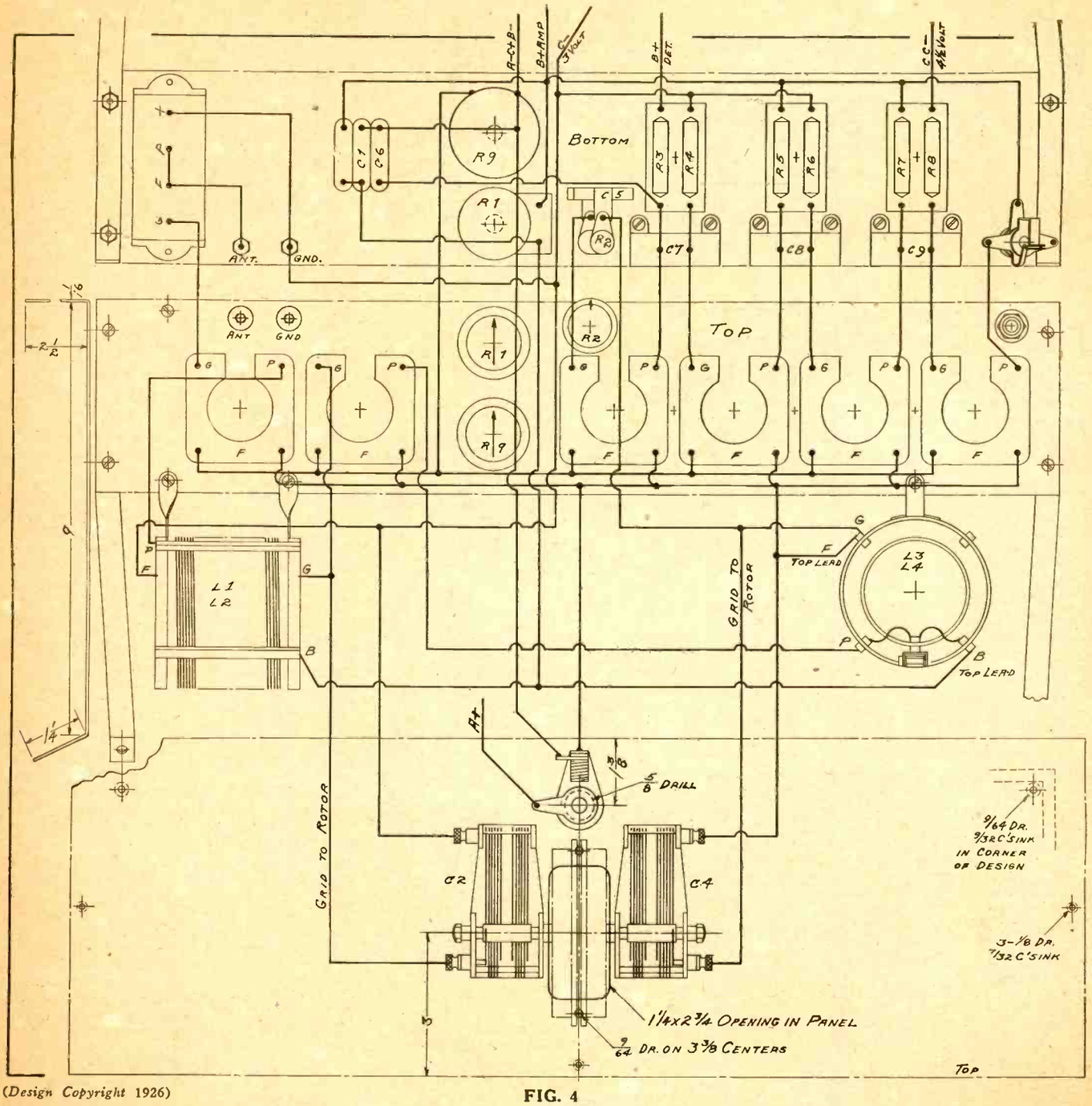
### LIST OF PARTS

**C2, C4—Two Bruno .00035 mfd. straight line frequency 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 meg. and 0.25 meg.**
**1, 2, 3, 4, 5, 6—Six Air Gap or Eby 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 Micamold .00025 mfd. fixed condensers.**
**One 7x21" Lignole inlaid walnut front panel, drilled and engraved.**
**One Birnbach 6-lead battery cable, with forked terminals.**
**Nine Glamzo 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 C. A. L. binding posts (Ant. and Grd.)**
**Three Lynch double mountings.**
**One pair of Bruno adjustable brackets.**
**Ten lengths of stiff Acme Celatsite (vari-colored).**

### ACCESSORIES

**One 7x21" Corbett cabinet, genuine walnut, with 2" 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.**

# Picture Diagram of Wiring




(Design Copyright 1926)

FIG. 4

**The picture diagram of the wiring of the Bernard 6-tube set. The subpanel or socket strip is shown in top and bottom views. The panel is shown folded back, so to speak, to align with the upper diagram. The C3 fixed condenser, top left, is unmarked.**

# "A" Problem Solved By Trickle Charger

## Bernard Receiver Draws 2 Amperes, But That Makes No Difference Where the Floating Charge System Is Used—Drain Is Conservative

The use of a 6-volt storage battery, with trickle charger, is very satisfactory in connection with the Bernard receiver. Under these conditions the storage battery need not be one of high rating in ampere hours. With the periodic charging system formerly so popular, a receiver like this, which, if a power tube is used in the first RF stage, and the other tubes as specified, draws 2 amperes, nothing less than a 120-ampere-hour storage A battery would be convenient. Otherwise recharging would have to be done too often.

But the trickle charger does away with the necessity of large capacity of the battery, because the trickle charging goes on (at a very, very slow rate) all the while the set is not in use, and does not take place while the receiver is being operated. Hence no wide range of drain is necessary.

If the longest stretch during which you use the set is 5 hours on end, then you would consume 10 amperes. Allowing a 50 per cent. safety margin, the A battery

(*Continued on page 8*)

# Sets Called Best on Music

## Background Noises Limit Field for Educational Lectures National in Scope, Says Gernsback, Adding Elimination of Parasitic Sounds Is Engineers' Greatest Task

*By Hugo Gernsback*

**Editor, "Radio News"**

IT is well known that, for the past few years, no revolutionary improvements in radio or revolutionary radio inventions have been created. Old, well-triedout, and reliable devices, which have been known to the art for many years, have been perfected gradually; and the development of radio receivers today may be said to follow very much along the same lines as that of the phonograph and the automobile.

It is this process of slow evolution that we may expect in the future, as well, and the old adage also holds true in radio: "Natura non facit saltum"—which, translated, says that Nature does not make jumps. In other words, all developments are part of a slow-moving plan of evolution. Even revolutionary inventions, when they do come along, will be found in the end to be not half as great a departure as they were thought to be at first.

When broadcasting was initiated, the prediction was freely made that radio would soon become a tremendous instrument for the purposes of education. It was foretold, on all sides, that every school would have radio outfits installed, by means of which the pupils would be instructed by lectures from a central place, where some men of great eminence would lecture, so that the classes all over the country would get the same information simultaneously.

### Hard to Practice

While this idea is feasible in theory, so far it has not been put into practice; though the question is often asked by many people in all walks of life, "Why is there not more instruction and more education from our big stations?" Let us analyze the problem, and see what really is wrong. We find at once that very few stations today give any great number of lectures. If these are given, they are usually limited to fifteen minutes' duration, and very seldom run much longer. The broadcast directors seem to have acquired from experience the idea that a listener will not stand for longer talks than fifteen minutes; and many directors maintain that even this is too long.

On the other hand, the majority of listeners, when questioned, will tell you that they wish to be entertained, or that, if they do listen to lectures, they tire one too quickly. The latter statement is full of meaning for those who can read the signs aright.

Let us take a typical case. You sit in front of your loud-speaker and listen to a highly instructive, important lecture. Or, if you wish to observe scientifically, try it with one of your friends. Then watch his face carefully, and you will find that at no time during the lecture is he completely at ease.

### Prefer Music

He has to strain to catch the words as they come from the loud-speaker, and very often an annoyed expression will come over his face. You can tell from his features that he is not being entertained. It is really hard work, nowadays, to listen to any lecture, throughout the greater part of the year. There are seasons when it is not quite so difficult; but we must be frank in admitting that during most of the time we would much rather listen to music, for we do not have to strain our attention to follow the motif, as we do when listening to a more or dry lecture.

What is the reason for this? Let us presume that the radio set is not at fault, or, at least, not greatly. Let us also presume that we have a first-class loud-speaker, which reproduces perfectly. Then, what is wrong?

The answer is simple. Turn on your radio set at any time during the evening, and set it at a point on the dials where no station is audible. You will immediately notice a background of sound "mush," whose intensity depends greatly upon your location, the season, and many other conditions. If you are located in a great city, all the man-made static in the neighborhood will be collected on your aerial or loop, and will make itself heard in the loud-speaker. Every time some one lifts a telephone from its hook, every time some one rings a bell, runs an elevator, starts his automobile or tunes his radio, every time a trolley car passes by, and from many, many other similar electrical disturbances, a slight noise is produced in the loud-speaker.

### Other Noises

Then, too, atmospheric electricity makes itself known by even louder noises in the loud-speaker. Of course, there is not always an abundance of static; but there is always some static electricity in the air, which, even during the best season, makes some impression upon the loud-speaker, loud enough to be heard.

The conglomeration of all these static noises comes out of the loud-speaker at the same time as the reproduced words; and in this fact the present deficiency of radio sets lies. We have no means as yet to stop this so-called static "mush," which blends with the transmitted voice, making it hard for us to understand perfectly the spoken word. The conditions are the same as if some one were speaking in a large room with every one else talking at low voice, making it almost impossible to understand the orator, or possible only with difficulty. At such a time, listening is no longer a pleasure, but becomes hard work.

In the modern radio set, furthermore, we have another producer of disturbing sounds, and that is the vacuum tube; marvelous instrument that it is, the tube is not perfect, for nothing in this world ever can be. The radio tube, due to its inherent sensitiveness, also gives rise to characteristic sounds commonly known as "tube noises." Even without the static "mush" background, there are always noises produced by the tubes themselves.

### Tube Noises

Every time a metallic particle is thrown off from an incandescent filament inside the tube, a noise is caused in the loud-speaker. There are various other tube noises, such as those produced by the slight jarring of the building in which the radio set is located, by temperature changes, etc. All of these give rise to some little current impulses, which, being amplified, produce a "noise level" of their own in the loud-speaker.

As long as all of these disturbances prevail it will be impossible to put on lectures that can be enjoyed by a very great number of people. While the imagination has to work hard to supply the miss-

(*Concluded on page* 26)

## NEW ADDITION

**COLIN O'MORE**

Major Edward Bowes, ever on the alert to provide the vast number of radio listeners with the best type of entertainment, has made an important addition to his Capitol Theatre Family in the person of Colin O'More, the popular American lyric tenor. Mr. O'More has done some distinguished work in the symphony and concert field, having appeared with such outstanding organizations as the San Carlo Opera Company, the Schola Cantorum, and several of the large symphony orchestras. The richness of his voice and the warmth of his personality have particularly contributed to his great success as an interpreter of Irish ballads.

Mr. O'More joins Major Bowes' Family in the broadcasting studio to contribute a group of songs of the type with which he has won favor throughout the country.

## Dispelling the "Mush" Level Will Be Brought About in Next Few Years, Says Noted Editor and Scientist—Cites Tube Noises as Deterring Factor to Speech

# Radio Divining Rod Tested

## Hope Is Held Out for Successful Location of Hidden Metals in Earth's Bosom for Easy Location of Rich Deposits—Hunt for Gold Goes On As Early Experiments Are Called Satisfactory

*By Thomas Stevenson*

DISCOVERY of the mythical pot of gold at the end of the rainbow may be accomplished with the development of the radio cameraphone which seeks precious metal deposits below the earth's surface.

In recent years geologists and scientists have been searching feverishly for a method of locating hidden ore bodies. Their hunt has held out greater promise of reward than the search for pirate gold and sunken galleons. To the successful will go fabulous wealth, greater than all of Captain Kidd's treasure.

According to the American Mining Congress there has been a steady decline in the mineral output of several Western states, because known ore bodies are being exhausted more rapidly than new ones are being discovered. The old type of prospectors who roamed over the hills with their burros and dogs have covered the field pretty thoroughly and most of the ore bodies with a visible outcrop have been found.

### Much Hidden Riches

Most of the large deposits of the country, however, have never been touched because they are beneath the surface and difficult to locate. No one can estimate the vast quantities of gold, silver and other precious metals awaiting the man who can penetrate the earth's surface and find them at will.

For a number of years the divining rod had a following as a means of locating oil and metals. But it was not long before all but the most credulous lost faith in it and efforts were turned in another direction for a way to seek out the earth's buried treasure.

Since 1924 William A. Sharpe of Denver, has been working on the radio cameraphone, which is his invention. He describes recent experiments as "satisfactory and convincing." The American Mining Congress believes Mr. Sharpe is following the right lead and has given him editorial endorsement.

Mr. Sharpe's cameraphone consists of three units—the radio broadcaster, the receiver and the motion picture camera. The transmitter sends radio waves into the earth, extending to regulated progressive depths, the length of the wave advancing one foot at a time. This radio wave is returned by a closed circuit to the receiver, where the tone pitch of the sound varies according to the mineral, metal or substance at the far terminal of the wave.

### The Pitch Varies

Metallic substances produce a much higher tone pitch than any other mineral, and recognizable variations in tone are produced by different minerals. These tones might be described as radio echoes, although they are not so technically. This name, however, is very expressive of the effect produced, each mineral giving forth its peculiar echo.

**WILIAM A. SHARPE,**
**with radio cameraphone, searching for meteor in Northern Arizona and supposedly embedded.**

The photographic unit of the radio cameraphone is fitted with a vibratory illuminated thin metal foil about 1" square, suspended by a fine hair spring in contact with the diaphragm of the telephone mechanism in the radio receiver. The illumination of this foil is reflected in a magnifying mirror that intensifies it 30 or 40 times, so that the tiniest vibration is caught.

The reflected light of the foil in the magnifying mirror is thrown on a ground glass screen, the vibrations appearing as lights and shadows, and these are photographed by a regular motion picture camera which is automatically exposed. One picture is taken with each foot of advancement in the radio wave length and the photographic film developed from these exposures may then be thrown on a screen by a regular motion picture projecting machine.

### Metals Almost Violent

The radio cameraphone has been perfected from a similar instrument designed to locate oil and gas pools. The detecting of different densities and compositions in rock beds, earths, fluids and gasses proved a delicate undertaking and innumerable tests were required to learn how each mineral and compound reacted on the instrument.

Mr. Sharpe found that metallic substances behave in a positive and almost violent manner toward the instrument. A most illuminating demonstration was obtained when the radio camera photographed the steel beams of the seven floors of a Denver office building with great clearness.

One of the most interesting accomplishments of the radio cameraphone was the location of a mysterious meteor which buried itself in the earth centuries ago at Meteor Crater in Northern Arizona. Although many fragments of the shooting star were scattered for many miles around the crater, the large iron core that tore the hole had never been found.

### Instrument Responds

Shaft sinking and drilling were fruitless but pictures taken by the radio cameraphone showed that the iron body of the meteor lay 100 feet south of the rim of the crater, and at a depth of 1,410 feet. This showed that the meteor had hit the earth at an angle.

Another important test was made in the Gold Dust section of the Las Animas mining district in southwestern New Mexico. The mineralization there con-

(*Continued on page* 27)

# HAS GIANT RECEIVER

(*Keystone View*)

**H. P. HAYES, extreme left, noted Boston radio engineer, is the designer of the the gigantic receiver shown above, which is valued at $3,500. Eight months were spent in designing this receiver, while two months were spent in the construction. Five different tuning bands, from 35 to 20,000 meters, without the change of coils, are covered.**

# *New Chain Effected; WGBS, WIP, WPG*

## Two Gimbel Bros. Stations Permanently Hooked Up With Atlantic City Broadcaster—May Add WCAE, Pittsburgh, to List

A PERMANENT hook-up has been inaugurated between the two Gimbel Brothers stations, WGBS in New York and WIP in Philadelphia. Later, WPG, Atlantic City, was added to them, forming the nucleus of a permanent chain broadcast.

Gimbel Brothers has been a pioneer in the development of radio. WIP, in Philadelphia, has been established for four years, during which time it has sent out on the air many events of importance, such as sporting events from Franklin Field, the University of Pennsylvania, etc. The station has recently been considerably enlarged, both as to staff and equipment.

A little less than two years ago WGBS began its operations in New York (although Gimbel Brothers had been broadcasting for two years before) leaping at once into the front rank of broadcasters with a stellar program which superseded any single program that had even gone out in the air prior to that time. Eddie Cantor, as master of ceremonies on that all-star night, made his radio debut at that time; other celebrities who participated included "Bugs" Baer, Harry Hershfield, Fannie Hurst, Louis John Bartels, Cliff Edwards, George Gershwin, Edythe Baker, Rudolph Friml, and others too numerous to list here.

Only several days after the gala premiere, WGBS did the impossible—the broadcasting of "The Miracle" from the Century Theatre. This was hooked up with WIP, by the way. Experts had said the beauty of Morris Gest's spectacular production would be lost in an air presentation; the verdict of the thousands who heard it, however, was that it was one of the most beautiful things that had even been their privilege to listen to.

Later came the broadcasting of a specially devised entertainment staged on board the gigantic liner, S.S. Leviathan, the first time a program had been broadcast from a ship. This was done primarily for the purpose of experimenting in the radioing of programs to ships at sea and was extremely successful, for reports were received from many transatlantic boats far out in the ocean that the program was heard clearly.

Another unusual experiment was the broadcasting of a musical program from the Sikorsky airplane, which has figured in the news of late as the one that was to attempt to cross the ocean. Programs were picked up without difficulty by listeners in New York, Atlantic City, Baltimore and Washington as the airplane flew over those cities. Thus, WGBS was the first station to broadcast entertainment from the air.

While the antennas and operating plant were originally located atop the Gimbel Brothers store at Broadway and 33rd street, New York, WGBS engineers conducted experiments over a period of six months to find the most suitable point for sending out the programs. An automobile with portable broadcasting set made a thorough tour of the Metropolitan area and selected a site in Astoria, Long Island, opposite 90th street, Manhattan, as the most desirable spot. The towers and power plant were moved there and now the programs are sent via landwire from the Gimbel studio at 33rd street to Astoria.

Plays have been given particular attention by the WGBS staff and Dailey Paskman, director of the station. Mr. Paskman, associated with the theatrical world before his entry into radio, has been responsible for the development of the radio drama. A highly successful prize play contest was held last year, in which plays were submitted from all parts of the country—plays writen expressly for broadcasting in the air theatre.

Mr. Paskman has originated the particular type of radio play which is known as the music drama; he makes the musical setting or background an integral feature of the many plays broadcast from the Gimbel studio with professional players of wide repute, including Howard Kyle, Charlotte Walker and others. Likewise, he has dramatized the lives of many of the world's greatest composers—Beethoven and Mozart—presenting plays around these interesting figures with their own works played throughout the action.

All these features which are to be continued during the season, which will also probably see the introduction of many new and novel events on the air, are thus to be given a wider audience with the hook-up with WIP, increasing the area of listeners.

From Philadelphia will be heard many musical events, programs from the Metropolitan Opera House there, by the San Carlo Opera Company and other groups, symphony concerts, including the Philadelphia Symphony Orchestra and features from the Sesquicentennial, now in progress.

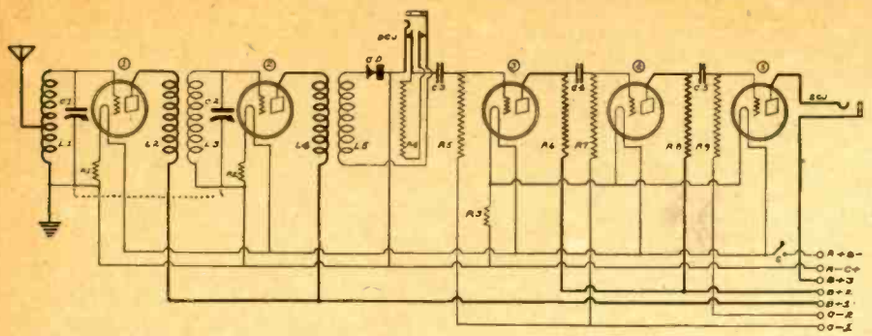
This hook-up does not merely mean that New York programs will be broadcast through a Philadelphia station, but that features of interest from other cities will be brought to the Metropolitan audience.

Gimbel Brothers have recently acquired the Kaufman and Baer Store in Pittsburgh, Pa. The Kaufman & Baer Store operates station WCAE. WCAE is another station belonging to the Gimbel Brothers' group, but at this time is not being included in the chain. However, these are three broadcasting stations that are controlled by Gimbel Brothers.

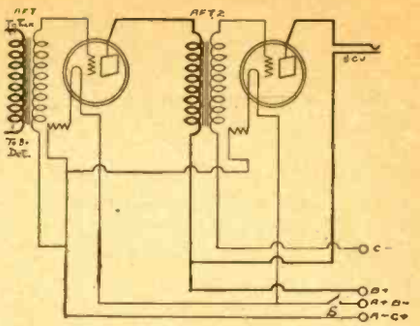
## WGY Aids Many

WGY is proving a valuable training school for radio announcers. Occasionally listeners twisting the dials may discover a familiar WGY voice, coming from a wholly unexpected quarter and on wavelengths far removed from that of the Schenectady station. A few months George Markham, formerly in charge of the agricultural hour at WGY, left to become general manager of WDBO, at Winter Park, Florida.

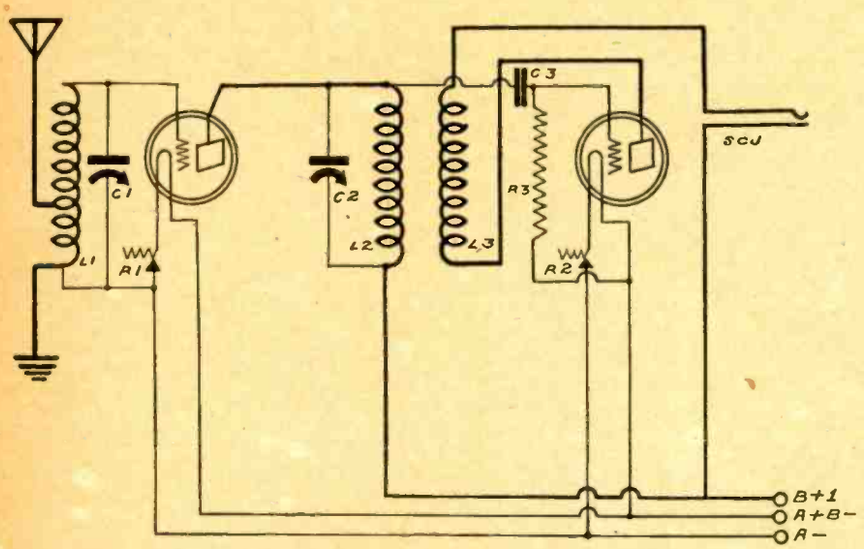
Now Witter T. Cook, a graduate of Massachusetts Institute of Technology, more recently an announcer of WGY and one of the WGY Players, has accepted a position with the air forces of WDAE, at Tampa, Florida. Cook has a voice that is chockful of inflections and he can make the reading of a market report a thing of beauty and delight to the ear.



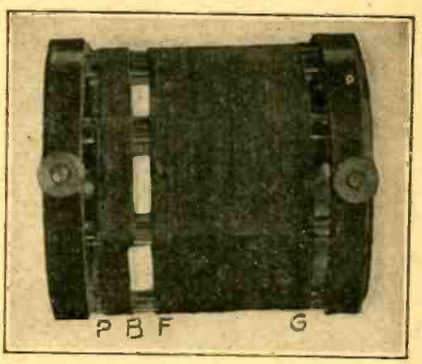
A 5—TUBE quality receiver, employing two stages of tuned radio frequencqy amplification, a crystal as a detector and three stages of resistance coupled audio frequency amplification. An untuned RFT is used to coupled the RF output to the detector input. Ballast resistors are used throughout for filament control.



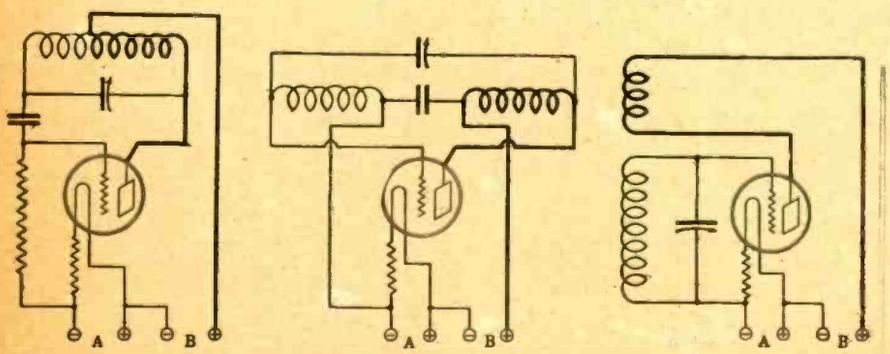
THE SCHEMATIC diagram of a 2—stage transformer coupled AF amplifier, with the proper connections for the installation of a power tube. The "To Tick" connection may go to the tickler post in detector plate circuit or to only the plate post of detector tube. Ballast resistors control the filaments of both AF tubes. Note the C battery connection.



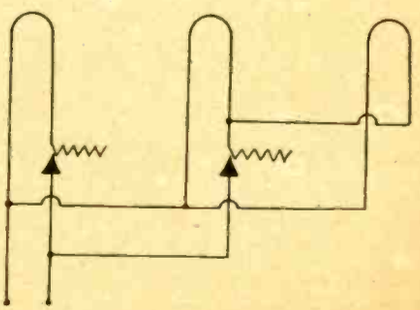
THE ELECTRICAL diagram of a 2-tube receiver, employing a regenerative RF and detector tube. This set is quite critical, but will give excellent results when properly controlled. Impedance coupling is used.



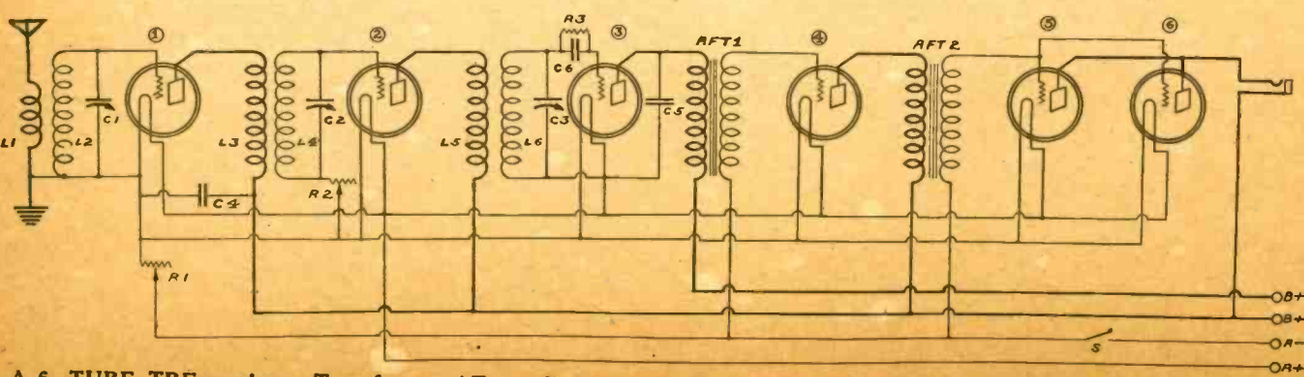
HOW TO wire up a standard tuned radio frequency coil is clearly outlined in the above photograph. P equals plate; B equals B plus; F equals A minus or plus and G equals grid. Note that B and F, the low potential points, are kept together.



THREE POPULAR oscillator systems, employed in Super-Heterodyne. The most stable of the three is the 3—circuit tuner, shown at the right.



THE ABOVE electrical diagram shows how to connect up one rheostat to control the filament of the detector tube and another rheostat in a 2—stage audio amplifier circuit, for filament control.



A 6—TUBE TRF receiver. Transformer AF coupling is used. Two tubes are used in the last AF stage, so that the output is balanced and free of distortion. A single rheostat is used. to control the filaments of all the tubes.

# Radio University

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

*When writing for information give your Radio University subscription number.*

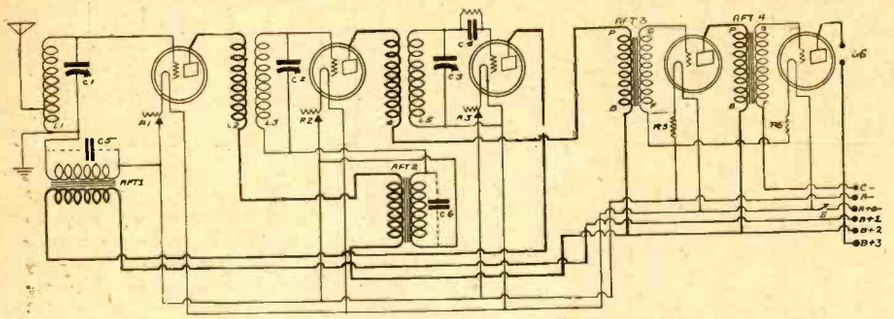


FIG. 443

**The circuit diagram of the 5-tube reflex, from which results equal apporximately to a 7-tube receiver are obtained. The broken plate lead in the det. circuit is not intended.**

**I HAVE** one 6 to 1 ratio AFT and three 3 to 1 ratio AFT. Please give the circuit diagram of a 5-tube receiver using these parts and whatever else is necessary. I wish to use —01A tubes all through, except in the last stage of audio frequency amplification, where I would like to use a power tube (—112 type). I also have .0005 mfd. variable condensers, which I would like to use. The electrical data on all other parts would be appreciated.—Arthur Roberts, Glenn Cove, L. I., N. Y.

The circuit diagram of such a receiver is shown in Fig. 443. You will note that the first and second tubes act both as radio and audio frequency amplifiers. AFT1 is the 6 to 1 ratio audio frequency transformer. AFT2 is one of the 3 to 1 ratio audio frequency transformers. The other two 3 to 1 ratio audio frequency transformers are used in the regulation transformer stages. The antenna coil L1 consists of 65 turns, tapped at the 10th turn. This is wound on a 2¾" diameter tubing, using No. 24 double cotton covered wire. The primaries, L1 and L3, consist of 10 turns. The secondaries, L2, L4, consist of 55 turns. Each primary and secondary is wound on a separate tubing, which is 2¾" in diameter. No. 24 dcc wire is used in both cases. A ¼" space is left between the two windings. The fiilaments of the RF-AF and detector tubes are controlled by 20 ohm rheostats. C1, C2 and C3 are the .0005 mfd. variable condensers. R5 is a ¼ ampere ballast resistor. R6 is a ½ ampere ballast resistor for the power amplifier tube. C5 and C6 are .001 mfd. condensers and as indicated by the dotted lines are experimental. C4 is the .00025 mfd. grid condenser. The grid leak is of the 2 megohm type. The output connections are made via binding posts or phone tips, and indicated on the diagram by LS. The plate of the detector tube receives about 45 volts. The plates of the RF-AF tubes receive 90 volts. The voltage to be applied to the plate of the power tube should be noted on the carton. S is the filament switch. Place AFT1 and AFT2 at right angles so that there is no coupling between the two. The antenna coil should be placed horizontally, the first RF coil perpendicular and the last RF coil at an angle.

* * *

**IS THE** detector circuit of the reflex shown in Fig. 442, Radio University columns, Oct. 9 issue of RADIO WORLD, wired for the—00 or —00A type tube? I note that the grid return is to A minus.—Tom Rogers, Los Angeles, Cal.

Yes. If you wish to use the —01A tube, the grid return is to the A plus.

* * *

**I HAVE** some 2¼" diameter tubing and some No. 24 dcc wire. Please give the electrical data of the coils used in the 5-tube receiver, shown on page 9 of the July 17 issue of RADIO WORLD, using these tubings and wire. What capacity condensers should I employ?—Frank Werner, Boston, Mass.

The primaries consist of 10 turns. The secondaries consist of 80 turns. This secondary is for the .0005 mfd. variable condensers. If you wish to use .00035 mfd. variable condensers, then the secondaries should consist of 95 turns.

* * *

**I AM** building a battery table and would like to get the approximate size of the cabinet portion. I wish to place an A battery (100 ampere type), A charger, and three large upright 45-volt B batteries inside.—Clark McDonnaugh, Atlanta, Ga.

The cabinet portion of the table should be approximately 31" wide, 17" high and 15" deep. This will allow ample space for the articles you mention.

* * *

**WHEN DID** Prof. L. A. Hazeltine receive his patent on neutralization? (2) When were the first licenses issued to broadcasting stations? (3) In what year did constant radio communication between Japan and U. S. go into effect? (4) Where were the terminal stations located?—Larry Mason, Pittsfield, Mass.

(1) 1923. (2) Sept., 1921. (3) July, 1915. (4) The terminal stations were located at San Francisco, Cal., and Funabashi, near Tokio.

* * *

**PLEASE GIVE** the values of the rheostats to employ, when using from 1 to 8 —01A type tubes, on a 6-volt battery. (2) Please give the values of the rheostats to employ, when using from 1 to 4 —112 type tubes, from a 6 volt battery.—Dave Martens, Rocky Mount, Mo.

(1) For one tube, use a 20 ohm rheostat; for two tubes, use a 10 ohm rheostat; for three and four tubes use a 6-ohm rheostat; for five and six tubes, use a 3 ohm rheostat and for seven and eight tubes, use a 2 ohm rheostat. In each case the resistance wire must be heavy enough to pass the current, e.g., the 3 ohm rheostat should be able to pass 1½ ampers, etc. (2) For one tube use a 10 ohm rheostat; for two tubes, use a 6 ohm rheostat; for three tubes, use a 3 ohm rheostat and for four tubes use a 2 ohm rheostat. Again the wire must be heavy enough to pass the proper current.

* * *

**I HAVE** a 50,000 ohm variable resistor. I would like to connect this up, so that it will control the volume output of my set. How can this be done?—Jack Barrett, Turner, Ia.

This can be connected at the speaker output terminals. That is. one terminal of the resistor should be connected to the plate terminal of the last tube, while the other terminal should be connected to the B plus amp. post. Both these terminals are already connected to the speaker.

* * *

**WHAT IS** .0025 megohms equal to? (2) What is .05 megohms equal to? (3) What is 400,000 ohms equal to? (4) What is 6.000,000 ohms equal to? (5) What is 2.5 megohms equal to?—Walt Clifton, Jersey City, N. J.

(1) 2,500 ohms. (2) 50,000 ohms. (3) .4 megohms. (4) 6 megohms. (5) 2,500,000 ohms.

* * *

**I HAVE** three 50 turn honeycomb coils. Can these be used as L1, L2 and L3 in the 5-tube receiver shown on page 9 of the Sept. 4 issue of RADIO WORLD? (2) What capacity variable condensers should be employed?—Roy Namm, Hutton Valley, Mo.

(1) Yes. (2) Use .0005 mfd. variable condensers.

* * *

**IN SOME** circuit diagrams of single tube regenerative receivers using the tuned plate and tickler systems, the grid leak is run to the A plus, instead of across the condenser, as is usually done. Are the results any better. if this method is used?—Carol Kingle, Redford, N. Y.

The results will be the same.

* * *

**I HAVE** a double condenser, each section having a capacity of .0005 mfd. which I would like to use in the 7-tube receiver, described in the radio university columns of the Sept. 11 issue of RADIO WORLD. Instead of using three stages of tuned RF amplification, I would like to use two stages. Can this be done, using the double condenser? How?—Gerald Green, Conway Springs, Kans.

Yes. The double condenser should be connected in the second RF and detector circuits; stators going to the ends of the secondaries, while the common rotor goes to the beginnings of the secondaries. The single condenser is connected in the secondary circuit of the first RF circuit. The antenna, ground and rheostat connections are made in the same manner as per original diagram.

* * *

**I HAVE** two .00025 mfd. variable condensers. Please give the constants of the coils for the set shown in the Radio University columns, Fig. 418, Aug. 28 issue of RADIO WORLD.—Robert Hamrard, Adams City, Col.

Using a 3" diameter form, the secondaries consist of 65 turns. The primaries consist of 10 turns. Use No. 22 double covered wire. Allow a ¼" separation between the windings.

* * *

**I AM** building the old type Harkness reflex, described in the May 15 issue of RADIO WORLD, Radio University columns. The text states that the coils should be mounted on the end plates of the variable condensers. I find that if the coils are placed in this manner, they would hit the tops of the tubes, this being due to the narrowness of the cabinet. Could these coils be placed directly on the baseboard at right angles to each other? The leads to the condensers will only be 3" distant. —Wilbert Donald, Havana, Cuba.

Yes. this can be done. Be sure that the coils are at right angles to each other, with the center of the secondary winding of one coil facing the circumference of the other coil.

* * *

**I HAVE** two tuned radio frequency transformers and a 3-circuit tuner. The primaries on each of the coils consist of 10 turns. The secondaries consist of 40 turns. Each primary and secondary is wound on 3¼" diameter tubing, using No. 22 dcc wire. The tickler consists of 30 turns of No. 26 SSC wire, wound on a

1¾" diameter tubing. Could these be used in the Crosley 5-38 receiver shown in an electrical diagram on page 11, July 31 issue of RADIO WORLD?—Henry Stone, West Point, N. Y.

Yes. Use .0005 mfd. variable condensers.

* * *

**I HAVE** two 3 to 1 ratio audio frequency transformers. Can these be used in the 2-tube reflex, shown on page 15 of the Aug. 28 issue of RADIO WORLD.—Edward Marret, Clinton, N. Y.

Yes.

* * *

**I HAVE** a piece of galena crystal. Can this be employed in the quality receiver shown in the Radio University columns of the May 29 issue of RADIO WORLD?—Harry Mertens, Los Angeles, Cal.

Yes. However, if the input signals are too strong, it will burn out. A fixed or synthetic crystal would give longer service. The strength of the signals with the latter at the output will not be as loud as with the galena, but you will be assured of more steady reception.

* * *

**IN THE** Sept. 18 issue of RADIO WORLD, page 13, there appeared a circuit diagram of a 3-tube reflex, using a non-regenerative detector. Would you please give me detailed information regarding the type of coils; capacity of the variable condensers; size of rheostats; capacity of condensers, C5 and C6; ratio of the two audio frequency transformers and the resistance of P. (2)—What is SCJ? (3)—Please state the respective markings or method of wiring up the radio frequency transformers.—F. J. Jones, Los Angeles, Cal.

(1)—L1 is a continuous winding antenna coil, consisting of 50 turns tapped at the 8th turn, wound on a tubing 3" diameter, using No. 22 dcc wire. L2 and L4, the primaries of the RFT, consist of 10 turns. L3 and L5, the secondaries, consist of 45 turns. These are wound on the same tubings as their respective primaries, on a 3" diameter tubing, using No. 22 dcc wire. Allow a ¼" separation between the primary and secondary windings. R1, R2 and R3 are 20 ohm rheostats. Both audio transformers are of the 6 to 1 ratio type. P is a 400 ohm potiometer. C1, C2 and C3 are .0005 mfd. variable condensers. C5 and C6 are of the .001 mfd. fixed type. C4 is a .00025 mfd. grid condenser. R4 is a 2 megohn grid leak. (2)—SCJ is a single circuit jack. (3)—The beginning of the antenna coil goes to the G post of tube 1. Tap goes to the antenna. End of coil goes to ground. Beginning of L2 goes to plate post of tube 1. End of winding goes to top spring on DCJ. Beginning of L3 goes to rotary plates of C2 and to G post on AFT2. End of winding goes to G post on tube 2 and stationary plates of C2. Beginning of L4 goes to plate post on tube 2. End goes to top spring of SCJ. Begining of L5 goes to rotary plates of C3 and to A plus. End of winding goes to stationary plates of C3 and one terminal of C4 and R4.

* * *

**I HAVE** a fixed radio frequency transformer, marked 150 to 600 meters, which I would like to use in the Federal type 59 receiver shown in the Aug. 14 issue of RADIO WORLD, page 13. I also have a tuned RFT, having a 20 turn tapped primary and a 50 turn secondary, both of which are wound on a 3" diameter tubing. No. 22 dcc wire is used. Could these be used? (2) What capacity variable condensers should be employed? (3) What is the resistance of the potentiometer? (4) Will the —01A type tubes work successfully here? (5) What is the resistance of the rheostats? (6) What is the ratio of the AFT? (7) Are DCJ1 and DCJ2 double circuit jacks? (8) Is C3 a .00025 mfd. grid condenser? (9) What value is R5?—John Rand, Pittsburgh, Pa.

(1) Yes. (2) C1 should have a capacity of .0005 mfd., while C2 should have a

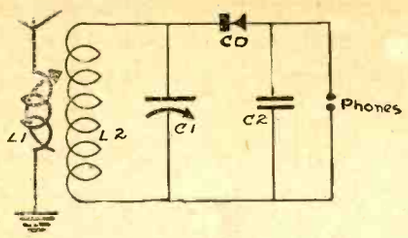



**FIG. 444**

**The circuit diagram of an efficient crystal receiver.**

capacity of .00004 mfd., (midget type). (3) 400 ohms. (4) Yes. (5) 20 ohms. (6) AFT1 is a 3 to 1, while AFT2 may be a 3 to 1 or higher ratio. (7) Yes. (8) Yes. (9) 2 megohms.

* * *

**I HAVE** an antenna coupled, with a variable primary. This consists of 20 turns, wound on a 2" diameter tubing. The secondary is wound on a 3" diameter tubing and consists of 65 turns. The wire seems to be No. 24 double cotton covered. The primary is placed inside of the secondary winding, at the end of the winding. I have a fixed crystal detector also. Could I have a circuit diagram of a crystal receiver, using these parts. What capacity variable condenser should I place across the secondary?—Manny Jules, Milwaukee, Wisconsin.

A receiver using these parts is diagrammed in Fig. 444. L1 is the variable primary, while L2 is the secondary. C1 is the variable condenser and is of the .00025 mfd. type. C2 is the .001 mfd. fixed condenser, while CD indicates the crystal detector. The phone connections are indicated at the word "phones." This receiver should give excellent results. The variable primary aids the receiver's selectiveness.

* * *

**PLEASE SHOW** how to connect a double circuit jack, so that a loop or an antenna may be used interchangeably. Explain method of connection. (2)—Please show how to connect a double circuit jack at the detector output. Explain connections.—Gilbert Stram, Tulsa, Okla.

(1 and 2)—Fig. 445 show both methods of connection. In A, we have the loop-antenna method illustrated, while in B we see the detector output method. As to the loop-antenna. The beginning of the secondary of the RFT is connected to the second spring from the frame. The end of this winding is brought to the third spring from the frame. The top spring is connected to the stationary plate terminal of the variable condenser and to the grid post of the socket. The frame terminal of the jack is brought to the rotary plate connection of the variable condenser and to the A minus battery post. Be sure that the coil connections are connected to the inner terminals of the jack, also that the proper potentials are kept. As to the detector output connections. The plate post of the detector tube is brought to the top terminal or fourth spring from the frame of the jack. The second spring from this terminal is connected to the P post on the AFT. The next spring is brought to the B post on the AFT, while the last terminal or frame is connected to the B plus detector voltage. It will be noted in both cases that the inner terminals of the jacks are connected to windings.

* * *

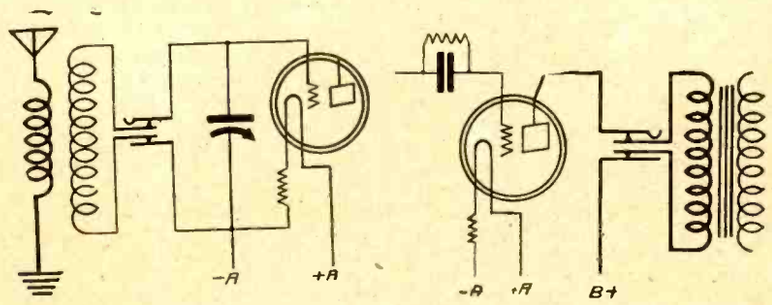
**WILL AN** indoor antenna about 60 feet in a straight line, give results equal to an antenna the same length out of doors, on a Super-Heterodyne?

Yes, for local reception.

* * *

**HOW MUCH** filament current does the CX300A draw at 5 volts at the terminal?—Numan Rogers, Dillard, Ga.

This tube draws .25 ampere, the same as the -01A type.




A FIG. 445 B

**The electrical diagrams illustrating the proper methods of hooking up double circuit jacks, for use in the antenna-loop circuit and in the detector output.**

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# EXPERTS REFUTE EDIS

## Noted Inventor's Statement That Radio Music is Distorted, and Not to Be Compared with Phonograph's, Answered by Goldsmith, Free, Lynch and Others

*[Thomas A. Edison, the great inventor, said: "Music on the radio is very poor because it is distorted. The chief difference between the radio and the phonograph is in distortion." Herewith are published statements answering Mr. Edison's charge.]*

### *By Arthur H. Lynch*

**Former Editor, "Radio Broadcast"; noted designer, author and parts manufacturer**

It was with a great deal of surprise that radio engineers observed the statements made by Mr. Edison that the reproduction by radio is inferior to the reproduction of music by the phonograph. To make such a statement regarding either art without fully explaining the basis on which the statement is made hardly seems fair.

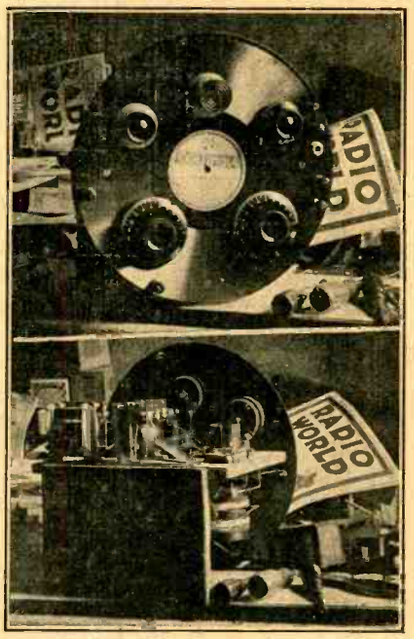
While it is perfectly true that a modern phonograph is capable of reproducing music with great volume and fidelity, it is also true that this same volume and same fidelity is possible by radio. In fact, nearly all of the more recent developments in phonograph engineering which have made the newer type of phonograph possible are the result of scientific investigation carried out in radio and other electrical laboratories. The modern phonograph is an entirely different sort of contrivance from the phonograph of yesterday. The best phonograph reproduction now comes from a film rather than from a record of the usual character. Without going into a long technical discussion of this subject we think it but fair to radio to call to Mr. Edison's attention the fact that once the recording has been finished, the fundamental system of amplification and reproduction in a modern phonograph are identical to those used in radio and most of these fundamentals have been adopted by the phonograph companies after their use has been proven satisfactory in radio laboratories.

From a scientific viewpoint there are many more obstacles to overcome in the development of a perfect phonograph than there are in a perfect radio receiver, and these problems have been mastered to a surprising degree by the technicians who work in both arts. It is very doubtful that the average person would be able to find any difference whatever between the reproduction of the latest type phonograph and the latest type radio receiver, and it is equally true that even scientific measurements of the difference in this reproduction would show discrepancies very little in favor of one over the other.

It is most unfortunate that Mr. Edison, enjoying the reputation and confidence he does should at the beginning of the radio season make such an unwarranted statement.

There is a real place in the modern home for both the latest type phonograph and the radio. Each offers a service which cannot be supplied by the other. In their present state of development, both are extremely satisfactory, and because of the recent developments which have been applied to both radio and the phonograph, the business done during this season by each of these branches of the acoustic industry should be particularly gratifying.

## SOME IRONY




**ANENT the phonograph-radio controversy, behold the radio set made on a phonograph record as a panel, by W. F. Innis, 1218 Belgrade Street, Philadelphia, to prove what he prefers. Mr. Edison's defense might be it was not an Edison record!**

### *By Dr. A. N. Goldsmith*

**Chief Broadcast Engineer, Radio Corporation of America**

Every one today respects and admires the sterling achievements of Mr. Edison in the electrical field. He was a pioneer in the early days of the industry and has given much to the perfection of phonographs, electricity and moving pictures. But, as much as we respect and admire him, we disagree with his opinion that radio is a failure as far as reproduction of music is concerned.

When orchestra leaders and critics find radio a necessary adjunct to their work, Edison's opinion in the matter is inconsequential. Engineers have instruments that can take the measurements of reproduction of music, both by radio and phonographs. If their findings were made known the results obtained by radio will be as good, if not better, than those received from a phonograph.

The final judgment comes from the public. They are the ones who cast the deciding vote in the matter—and they are in favor of radio. Thousands of letters in broadcasting stations show the faith people have in radio as a dispenser of music. They, as final arbiters, are satisfied.

We are close to the point where, with a good receiving set, music from any part of the country can be heard and enjoyed by radio. Broadcast receivers today are being built to reproduce good music.

### *By Joseph D. R. Freed*

**Set Manufacturer**

Thomas A. Edison is wrong in his conception of radio.

The most important distinction between the radio and the phonograph is that radio is alive in the sense that the imagination of the listener is stimulated by the fact that there is a real human being at the microphone.

I do not take the position that there is a waning field for the phonograph. The talking machines will, I believe, always remain a factor in the home. Its usefulness in the future will be limited to its specific capability, namely:—the reproduction of music which has heretofore been produced, whereas the field of radio is the reproduction of music which is actually at the moment being produced. The phonograph will always be valuable in preserving the voices of great singers who have passed away. The radio will give to millions the voices of those who are still with us.

It is my opinion that when Mr. Edison speaks the world should listen, but even greatness such as is his may be constrained to utter a dictum which is proven incorrect by the avalanche of public interest in the music delivered by modern radio. We wish Mr. Edison success with the new record he is out to place on the market.

### *By Dr. Sidney N. Baruch*

**Inventor and Broadcast Engineer**

Those remarks by Mr. Edison are too puerile to deserve any discussion.

### *By Dr. E. E. Free*

**Consulting Engineer**

Music from a first-class broadcasting station, in my judgment, is reproduced every bit as well by a radio set as the reproduction by a phonograph or any other electro-mechanical instrument. Of course there are some cheap old-model receivers on the market that cannot do this, but later models can.

Distortion is due to one of two things: either the set is not properly designed to handle music or the person tuning the set has no knowledge of what it is all about. When the latter is the case distortion invariably occurs.

I have a set at my home that I will match against any phonograph Edison has produced, and guarantee that the repro-

**WHAT do you think of Edison's RADIO V**

# SON'S SLUR ON RADIO

## DELIGHTS FANS

## Priess Points to the Wizard's Defective Hearing, Freed, Palmer, Eisemann and Reichmann Lift Voices to Disprove Allegations in Inventor's Statement

duction will equal, if not excel, that of the phonograph.

### *By William H. Priess*

**Engineer and Set Manufacturer**

Mr. Edison is quite deaf, and if the opinion voiced in the press was his, he should not be taken as a final judge in the matter.

The public never had faithful reproduction of music until the advent of radio. The old phonograph was a tin pan affair, and when radio became popular, due to its faithful electro-mechanical reproduction of music, it naturally hurt the phonograph business.

Today the phonograph is coming back, thanks to radio. Engineers of the various phonograph concerns are taking a page from the book of radio and trying to duplicate the tonal effect obtained with a good receiver.

Formerly an artist played into a horn in the recording studio, and when the record was played behind the music was a "scratchy" sound. Now the artists are playing into a microphone, thereby eliminating the "scratch" from the records. The same applies to the horn in a phonograph. What the phonograph engineers have learned regarding the acoustics from radio, they are applying to phonographs.

Phonographs are always given a formal artificial performance; not so with radio. When you tune in on a symphony orchestra many notes that are not heard on a record can be readily distinguished by radio. There is more life to a selection played by radio than there is to the same selection when played on a phonograph.

### *By Eric H. Palmer*

**Radio Publicity Expert**

A recent attack upon radio has been turned into its greatest advertisement.

This was the criticism of radio music by Thomas A. Edison, which for his purpose, that of particularly emphasizing the merits of the phonograph, could not have been more ill-timed.

It came when the minds of 25,000,000 people were upon the magnificent program of the Annual Radio Industries Banquet, probably the finest entertainment ever put on the air, and also upon the eve of the broadcasting of the Dempsey-Tunney, which was listened to by an equal number of people in the United States and Canada, and even in far-off England and South Africa.

Complete and prompt answers to Mr. Edison's attack were made by representatives of the broadcast public, of which the Radio Queen of America, Mrs. Lotta Harrauff, was one; by the official organizations of the radio industry, and by the press in leading editorials.

There is no rivalry between the radio and the phonograph, no more than radio can take the place of the printed word. Each supplements the other for the benefit of the people. The radio has its peculiar advantages and a special fascination all its own, which are apparent. The phonograph, which recently has been improved by radio devices, occupies an enviable position in bringing into the homes of the world the finest of music. Every great invention, records show, has found its place, and few have brought about revolutionary changes.

But Mr. Edison was further wrong in classing radio music as "tinny." The greatest improvement in radio has been along the lines of superior reproduction. Acoustical experts agree that the advance within the last year has been striking. At the Radio World's Fair the subject of finer tonal qualities was one of main discussion.

Through shielding of the radio and audio frequency stages of receivers, to eliminate damaging stray currents that tend to distort reception, through the use of finer tubes, capable of carrying highly amplified signals, and by reason of the excellent new speakers that have been put on the market, radio music is charming to the ear. We confess that a few years ago, loud speakers were not all they should have been, but even Mr. Edison should have no reason to complain of the present day results.

The great inventor, by his attack, centralized attention on the all-round merits of the radio, not the least of which is its worth as a factor in our sociological progress.

Attacks on radio are about on a par with casting a pebble to smash Gibraltar.

*(Fotograms)*

**ANNA CASE, famous American soprano, who opened the Atwater Kent radio concert series for 1926-27 from WEAF and a chain of stations throughout the country. Miss Case is known as the "Star Spangled Banner Lady," since she has sung this national anthem at more public functions than any singer.**

### *By Frank Reichmann*

**Set, Parts and Accessory Manufacturer**

Thomas A. Edison, the well known inventor, recently announced that radio had been a failure and did not compare with the phonograph industry as a business, or with the phonograph as a means of reproduction.

I am citing statistics recently announced by the Radio Manufacturers Association that definitely answer Mr. Edison's argument that the radio industry is not thriving.

As yet I have had no reply to my offer to supply Mr. Edison with a radio receiving set so that he may compare the quality of reproduction of the receiver with that of his own or other phonographs.

I am presenting these facts, believing it unfair for the young and thriving radio industry to be the victim of such an attack. The statistical reports follows:

The growth of the radio industry is shown in statistics recently prepared by J. B. Hawley, chairman of the statistical committee of the Radio Manufacturers Association.

From 37,000 radio receiving sets in operation in 1920 the industry has developed to the point where more than 5,000,000 homes are equipped with radio, according to the statistics prepared by Mr. Hawley.

The detailed figures follow:

**Sales by Years**

| | | |
|---|---|---|
| 1922 | | |
| | Sets | $5,000,000 |
| | Parts | 40,000,000 |
| | Accessories | 1,500,000 |
| | Total | 46,500,000 |
| 1923 | | |
| | Sets | 15,000,000 |
| | Parts | 75,000,000 |
| | Accessories | 30,000,000 |
| | Total | 120,000,000 |
| 1924 | | |
| | Sets | 100,000,000 |
| | Parts | 100,000,000 |
| | Accessories | 150,000,000 |
| | Total | 350,000,000 |
| 1925 | | |
| | Sets | 175,000,000 |
| | Parts | 74,000,000 |
| | Accessories | 200,000,000 |
| | Total | 449,000,000 |
| 1926 | | |
| | Sets | 225,000,000 |
| | Parts | 75,000,000 |
| | Accessories | 230,000,000 |
| | Total | 530,000,000 |

**Sets in Use by Years**

| | |
|---|---|
| 1920 | 37,000 |
| 1921 | 75,000 |
| 1922 | 150,000 |
| 1923 | 2,000,000 |
| 1924 | 3,000,000 |
| 1925 | 4,000,000 |
| 1926 | 5,000,000 |

**remarks? Write your views to WORLD**

# WAVE QUIRK MAKES A SET SOUND ROUGH

## Dr. Dellinger Explains Mysterious Effect as Not Due Either to Transmission or Reception, But to Some Strange Intervention—Dead Spots Investigated

WASHINGTON.

Radio dead spots are caused by the topography of the land or by the presence of peculiar kinds of obstacles, according to Dr. J. H. Dellinger, chief of the Radio Laboratory of the Bureau of Standards. Dr. Dellinger is planning to make a study of dead spots this winter with the hope of finding some way to counteract them.

"There are frequent complaints of the existence of dead spots," says Dr. Dellinger. "They are tied in with the fact that radio transmission is better in some directions from a staton than others. These differences can usually be explained in terms of topography of the land or presence of particular kinds of obstacles.

"The radio waves travel better and are less absorbed over water than over land, and hence tend to follow rivers. They are impeded by mountains which, so to speak, cast a shadow or cause something of a dead spot in the region beyond them.

"In special cases where a mountain or large cluster of tall steel buildings is near the transmitting set, the shadows may be very marked indeed and may practically cut off all reception in regions beyond them. The largest cluster of tall buildings in New York creates dead areas in which reception from WEAF is very poor; these areas extend well into Connecticut and Long Island."

Roughening of the quality of received sounds sometimes may not be due to the transmitting or receiving apparatus, says Dr. Dellinger, but actually something in the wave transmission is responsible. The roughening quality is more likely to appear in the case of weak signals, he says.

# Deaf and Dumb Girl Learns How to Talk

LOS ANGELES.

One of the more wonderful things that has been credited to radio is the teaching of a little deaf and dumb girl to learn how to talk. Eddie Albright, at KNX, has spent many months working with "Little Jean" and at the recent radio exposition held here showed the rapid strides that had been made in her education.

"Little Jean" has learned to tell how old she is, what color her hair is, who she loves best and such things during the time that Mr. Albright has worked with her. She is just four years old, and last year, before it was discovered that, through the aid of radio sound could be transmitted to her, she had never heard at all.

Now the remarkable thing about the work is that, after many months of diligent work, "Little Jean" can talk and hear sounds without earphones.

# CAPITOL FAMILY PORTRAIT


THE CAPITOL Theatre Family. Left to right, seated, are Caroline Andrews, Major Edward Bowes and Celia Turrill. Standing from left to right, Martha Wilchinski, C. Barclay, Dr. Billy Axt, Sigurd Nilssen, Waldo Mayo and Yasha Bunchuk.

# *Inspectors Stop Fight on Noises*

## Interference from Power Lines, Static Machines, X-Rays and Wave Deviation Outside Their Legal Scope, Attorney-General's Opinion Holds

WASHINGTON.

Fans who suffer from interference this Winter need not look to radio supervisors for help. Chief Radio Supervisor W. D. Terrell has instructed supervisors throughout the country that they have not the authority to act in most cases of interference and they, therefore, cannot do anything about it.

According to the interpretation of the law by the Department of Justice, radio supervisors have the authority only to inspect ship and land stations. They have no jurisdiction whatever over the wavelength or power of stations nor can they act in cases of non-radio electrical interference.

A large percentage of interference is caused by stations themselves through deviation of wavelength or the use of too much power. The wave deviation causes the station to interfere with some other broadcaster, while too much power in a congested area results in a blanket of the immediate neighborhood.

Last winter inspectors attempted to minimize this type of interference. Also in cases of non-radio electrcial interference investigations were made whenever possible.

Whenever it is possible, however, the radio supervisors will co-operate with fans, Mr. Tyrrell says.

"I believe the best bet," Mr. Terrell advises, "is for fans who suffer from interference caused by power lines, elevators, street cars, etc., to report the trouble to the companies themselves. These companies are generally glad to do everything in their power to eliminate the interference.

"If the interference is caused by stations, I'm afraid there's nothing that can be done about it, unless the fans complains to the station that causes the interference."

# Better Class Music Gains Popularity

LOS ANGELES.

Is the trend of the public mind turning with the constant use of radio? Are listeners in enjoying classical music more than they used to? These two questions have caused station managers to worry and grow gray.

Naylor Rogers, manager of KNX, believes that radio has served to bring about a desire on the part of the radio public for better quality and higher class numbers.

In the earlier days of broadcasting the so called "jazz" music was in demand. Everyone that phoned in wanted one of the popular airs played. The mails were crowded with requests of this kind. Now it is a different story; the phone calls are divided and so is the mail.

"It indicates very clearly to me," said Mr. Rogers, "that radio is doing a great deal in educating the public to better music."

# AIR PIRATES FEEL EFFECT OF STRIKERS

## Chicago Headquarters Established by Broadcast Listeners' Association that Opposes Wave Jumping, Time Seizure and Unauthorized Power Increase

CHICAGO.

A very short while ago, Chicago claimed the distinction of having the first broadcasting listeners' strike. At that time it was directed against stations which remained on the air during the desired Monday night of silence. Again the BCLs of Chicago come into prominence with a strike against those stations which have taken other than their assigned wave, increased their power or taken unassigned time, as a result of the recent Department of Commerce announcement stating that the 1912 radio laws gave the department no control over broadcasting. The Broadcast Listener's Association is again backing the strike.

The last strike made a decided impression on the broadcasters, for they soon abided by the "gentlemen's agreement" of the other silent stations and remained off the air. This was due to the empty mail basket the morning after and also the poor response via the telephone for requests, etc.

The association contends that new broadcast transmitters which may come on the air in its present crowded condition and those which select wave-lengths other than those to which they originally were assigned by the Department of Commerce are "unfair" and urges its members to pass them over when they are turning their dials.

In addition to affecting Chicago stations, the association has stated that its movement is nationwide and that listeners all over the country are joining in the effort to keep the air free of congestion. They are also taking upon itself the task of warning stations which stray about in the air, advising them that their listeners will decrease in number as a result.

Response to the strike has been large, the association officials said today, adding that the drive will be continued until more stable conditions prevail, or until Congress enacts a law governing the situation.

The newest feature is the established strike headquarters at the radio fair here.

## Diskay Popular With Coast Fans

LOS ANGELES.

Joseph Diskay, Hungarian tenor, has established himself, through the aid of radio, as one of the outstanding tenor voices on the coast. KNX has used Mr. Diskay as an exclusive artist for many months and his following in the radio world is extremely large.

## CAGE AERIAL OVER HEAD

**GRACE ORRELL of Somerville, Mass., and Minnie Butler of Boston, Mass., left to right, with the new cage antenna headpiece, which was on exhibition at the Boston Radio Show.**

## WRNY Gets Along Without Announcer

A metropolitan newspaper radio critic recently came out with the opinion that stations could do very well without announcers.

WRNY was willing to try the recommendation, and on October 15 for the entire evening program had no announcers whatsoever. For the whole evening the station tried to get along and the public was asked to judge whether announcers are really needed. Not even the station's call letters were mentioned—there being no announcer to give them—but after every selection the Staccatone signal was used, which itself identifies WRNY.

The radio listeners expected quite a few surprises during the course of this announcerless evening. Just how the whole program would be managed was a little secret of WRNY up to the last minute. On the very same evening, Friday night being novelty night, there was the usual novelty feature, at 10:15, also announcerless. The novelty consisted of a peek behind a broadcast station's scenes. The entire staff of WRNY was heard preparing the next week's program, interviewing artists and getting "samples" from the various performers. It was the first time that the public listened to what goes on behind the scenes in a modern broadcast station—not only from the program end but from the technical end as well.

### THREE IRISH STATIONS

WASHINGTON.

Three new broadcasting stations are to be established in the Irish Free State, according to a report to the Department of Commerce. The new stations will each be of 1,500 watts power and are designed to make programs available to owners of low power sets.

# World to Celebrate Invention of Bulb

"Electric Night," marking the anniversary of the invention of the incandescent lamp by Thomas A. Edison and heretofore a national observance only, will become world-wide October 21, when fifty broadcasting stations scattered throughout the world will join in offering programs to mark the forty-seventh anniversary of Edison's epochal invention.

People in the Far East, South America, South Africa, the countries of Europe, Canada and the United States will listen to special anniversary programs initiated by leaders in the electrical industry.

Two years ago a few radio stations broadcast an "Electric Night" anniversary program and the folowing year the number of participating stations was increased so that the entire United States was literally covered. At least one station is within listening distance of everyone. This year the interest in "Electric Night" is even greater in the United States where thirty-five stations will cooperate, while stations in many foreign lands will dedicate programs to Thomas A. Edison and the industry which has grown out of his invention.

Forty-seven years ago, October 21, after months of patient work, Edison carbonized a piece of cotton sewing thread bent into a loop. This he sealed in a glass globe from which the air had been exhausted. The lamp was put on an electric circuit and was lighted brightly to incandescence and burned steadily for over forty hours. That marked the birth of a practical incandescent lamp. From that lamp, with its sewing thread filament, has grown the electric light and power industry which in 1925 showed a gross revenue of $1,470,000,000 with an estimated capitalization in 1926 of $7,500,000,000.

# Church Exhibits At Chicago Show

For the first time in history a church exhibited at a radio exposition.

At the invitation of the Radio Manufacturers' Show Association, the Immanuel Lutheran Church of Valparaiso, Indiana, was represented at the Chicago Radio Show at the Coliseum.

A model of this church, with its famous radio station WRBC, was shown to 250,000 visitors.

"This is a happy illustration of the tremendous strides that radio is making towards our well-being," declared G. Clayton Irwin, Jr., general manager of the show. "We believe that radio has been of tremendous assistance to the church. We congratulate the Rev. Dr. George Schutes, pastor of Immanuel Lutheran, on his wonderful success in touching so many hearts with his sermons over the radio and increasing the number of his congregation, visible and invisible, each succeeding Sunday." Dr. Schutes quite proudly recalls the fact that WRBC was one of the first stations established for church extension, but it also features lectures by the faculty of Valparaiso University, farm organization leaders, agricultural experts, and others.



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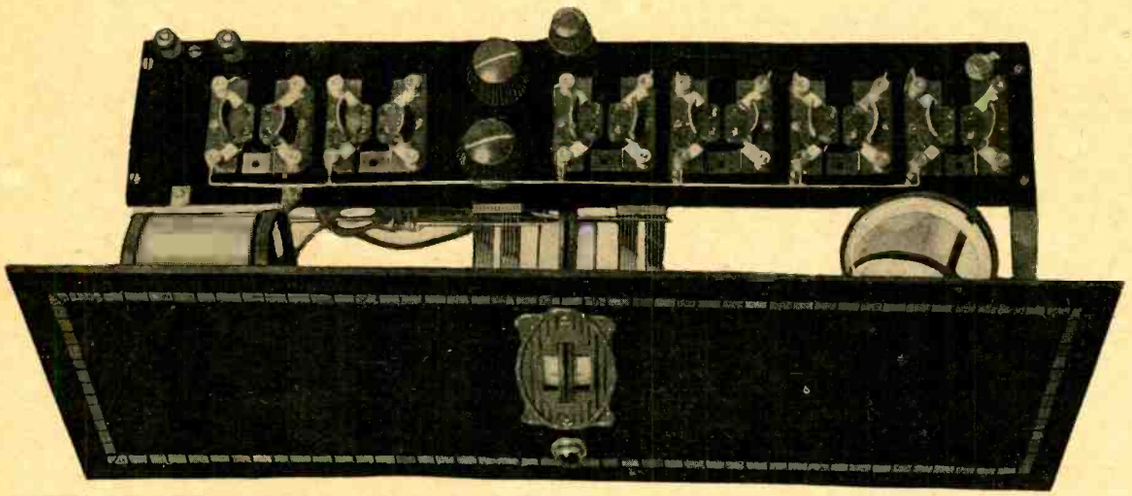
# A New Note of Beauty Has Struck!

# The Bernard 6-Tube Kit Makes the Handsomest Set



**VIEW OF SET made from the official list of parts, as printed below. Note the Bruno Unitune, Model 2CB, constituting the Tuning Control.**

## OFFICIAL LIST OF PARTS

**Exactly as Specified by Herman Bernard and Bearing His Personal Indorsement**

C2, C4—Two Bruno .00035 mfd. straight line frequency variable condensers, which, with two drums, mounting frame, panel plate and screws constitute the Bruno Unitune, Model 2CB.

LS—One Bruno light switch, bronze type, special for this kit.

L1L2—One Aero fixed primary radio frequency transformer, stock No. WT-40.

L3L4—One Aero adjustable primary radio frequency transformer, stock No. AX-45.

GFPB—One Acme R3 radio frequency transformer.

C3, C1, C6—3 micamold .00025.

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

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

R4, R6, R8—Three Lynch metallized fixed resistors, repectively 1.0 meg., 0.5 meg. 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.

One pair Bruno adjust. brackets.

One 7x21" Lignole inlaid walnut front panel, drilled and engraved.

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

Nine Glamzo 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 C. A. L. binding posts (Ant. and Grd.)

Three Lynch double mountings.

10 lengths stiff Acme Celatsite.

**Official Blueprint of Wiring Free With Each Kit Order**

**Each Kit Boxed and Sealed**

**$40**

## ONE FINGER TUNES THE SET!

*The inclusion of the Bruno Unitune, Model 2CB, enables the tuning to be accomplished with one finger. The only other panel part is the Bruno light switch, which also illuminates the scale on the tuning drums. Beauty of appearance and tone combine with simplicity to make this kit the prime attraction of the season.*

*Order Your Kit NOW for Immediate Delivery from*

## B-C-L Radio Service Corp.

**Dept. RW, 221 Fulton St. N. Y. City**

**B-C-L RADIO SERVICE, INC.**
**221 Fulton St., New York.**

Gentlemen: Enclosed please find (check) (money order) for $40, for which please ship at once one complete boxed and sealed kit for the Bernard 6-tube set, as advertised by you in Radio World.

NAME .....

ADDRESS .....

CITY AND STATE .....

## Authorized Agents for the Bernard Kit

**New York City**

B-C-L Radio Service Corp., 221 Fulton St.
Enter-City Radio, 223 Fulton St.
Try-Mo Radio, 9 West Broadway
Radio Kit Co., Suite 1202, at 1482 Broadway
Walthal Electric Co., Inc., 60 Cortlandt St., and 142 East 86th St.
Yorkville Radio Co., 86th St. and Lexington Ave.
Fanmill Radio Co., Inc., 62 Cortlandt St.
Klein's Radio Stores, 30 Park Place, and 120 Fulton St.
Perfection, 58 Cortlandt St.
Jaynxon Laboratories, 57 Dey St.
Ameo, 65 Cortlandt St.
Kenwood Radio Co., Inc., 63 Cortlandt St.
Oscar's Radio Shop, 172 Washington St., 176 Greenwich St.
43d St. Radio Shop, 100 West 43d St., and 407 Lexington Ave.
City Radio Stores, 110 W. 42nd St., and 79 Cortlandt St.
J. Modell & Co., Vesey & Church Sts.
Otto Furman Radio Corp., 175 East 86th St.
Holland Radio Stores, 75 West 125th St.
S. & S., 305 West 125th St.
Elliott's Radio Dept., 59 Cortlandt St.
Spartan Electric Co., 350 W. 34th St.
Haynes-Griffin, 141 W. 43d St., and 10 Wall St.
Saul Birns, 111 Second Ave., and 407 Lexington Ave., and 12 W. 45th St., and 16 Ave. B. and 1366 Fifth Ave.
Davega's, 125 W. 125th St., and 831 Broadway, and 111 E. 42nd St., and 15 Cortlandt St.
Blan the Radio Man, 145 E. 42d St.
Heins & Bolet, 52 Park Place.
Radio Mail Order House, 296 B'way.
Wholesale Radio Service Co., 6 Church St.
Sun Radio Co., 64 Vesey St.
Kit Service Co., 209 Center St.
Seminole Co., 427 E. 16th St.
M. Lerner, 143 W. 45th St.
Paul R. Fernald, 168 Washington St.

**Bronx**

Davega's, 120 E. Fordham Rd., and 1011 Southern Blvd.
Excelsior Radio Co., 2320 Westchester Ave.

**Brooklyn**

Walthal Electric Co., Inc., 118 Flatbush Ave., opp. L. I. R. R.
Rix Radio Supply House, Inc., 5595 Fourth Ave.
Brooklyn Radio Service Corp., 577 Myrtle Ave., and 1188 Fulton St., and Smith and Livingston Sts., and 20 Fourth Ave.
S. Hammer, 303 Atkins Ave.

**Chicago**

Barawik Co., 541 Monroe St.
New Eng. Mills Co.
Chicago Salvage, 500 S. State St.
Randolph Radio, 180 N. Union Ave.

**Elsewhere**

Radio Shop, 20 Worth St., Stamford, Conn.
Consumers Service, 261 42d St., Paterson, N. J.
Radio Guild, 243 Market St., Newark, N. J.
Standard Radio, 1410 Walnut St., Kansas City, Mo.
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## Great Atlantic Radio Co.

***International Distributors to the Trade***

**223 Fulton Street New York City**

**Inquiries Invited from the Trade**

# Receiver Properly Located Cuts "Mush"

(*Concluded from page* 10)

ing words which the ear does not catch, studying by radio is too much of a task; and the public would much rather listen to music, when these disadvantages do not cause so much annoyance.

It seems to me that the greatest task of the radio engineer at the present time is the elimination of the extraneous, parasitic noises, which now issue from every loud-speaker over the whole world. Nor is the task hopeless. It seems possible that it can be accomplished by the use of correct filter circuits, installed in the radio sets.

It would be welcome even to cut down the power of the set, if by so doing we could at the same time cut down the static and "mush" level. I have no doubt that this trouble will be dispelled during the next few years.

# RICH ORE IS DETECTED

(*Concluded from page* 11)

sisted of complex ores, mainly those containing lead, iron and manganese at the top of the limestone and those containing gold, silver and copper deposited in single veins or shear zones in the andesite. The instrument responded very sensitively to the metallic enrichment in the veins and ore bodies, so that the lean and rich areas were readily detected.

In the tests made in the Las Animas district eighteen new veins were found, all of which have been prospected with good results.

The zone of the ore deposits is at a very considerable depth in the earth's crust, and when ores are exposed on the surface today it is because they have been laid bare by surface erosion. It is obvious that all of the ore bodies in the earth's crust which were formed by rock replacements or fissure filling have not yet been exposed by the wearing off of the earth's crust, as has been shown by occasional discoveries at deep levels in mines. Ore bodies in many instances have been discovered whose highest point has never been reached by surface erosion.

So startling have been developments in other directions during the past few years that it is remarkable no one has hit upon an efficient method of locating hidden ore bodies until recently. It is believed the radio cameraphone may solve the problem of finding new deposits to replace the ones that are exhausted and place at the disposal of man the mineral wealth of the earth.

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



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

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**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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**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.

**THE BROWNING-DRAKE CIRCUIT**—Text and illustrations covering this famous circuit starting with our issue of Aug. 14. The 3 numbers sent on receipt of 45c. RADIO WORLD, 145 W. 45th St., N. Y. C.

# Gem Tube Company In New Quarters

The Gem Tube Company, pioneer tube manufacturers, and first to make and popularize a good dollar tube, have removed from 200 Broadway to much larger quarters at 16 Hudson street, New York City, one of the radio centers of the metropolis. The half floor they occupy in this large building is well laid out in the modern manner for the best service. First come the executive offices and the reception room for the trade, followed by the testing laboratories and the shipping rooms in that order. In the test room every tube receives a triple test before going on to the shipping room. In the laboratories proper their experts are continually experimenting towards the perfect tube.

The great growth of this concern in most part is due to the constant good values and satisfaction they have given the public. This is evidenced by their now motto, "Winning and holding good will,," and the fact that they are working night and day to fill their orders. The old-timer, Lou Newman, has reached his Mecca, one also for which many are striving, and that is, the Gem tubes are now stocked in every good radio store in Greater New York and most of them all over the country. He is a hard man to see nowadays as he is so busy trying to keep the local trade supplied. Besides the New York oce, this concern also has offices in Newark, Chicago, Detroit and Windsor, Canada. They will be pleased to send interesting tube facts to all who ask. Mention Radio World.

# B S T-5 Gets Certificate of Merit

from

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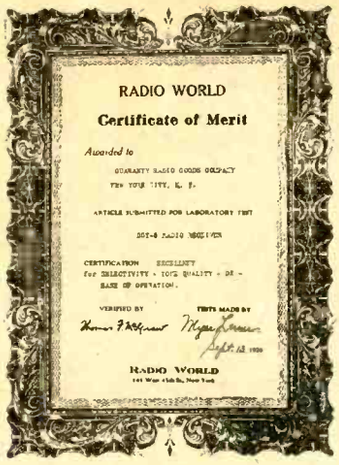
**B—Beauty**

**S—Selectivity**

**T—Tone**





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## Powerful, Selective, Highly Sensitive
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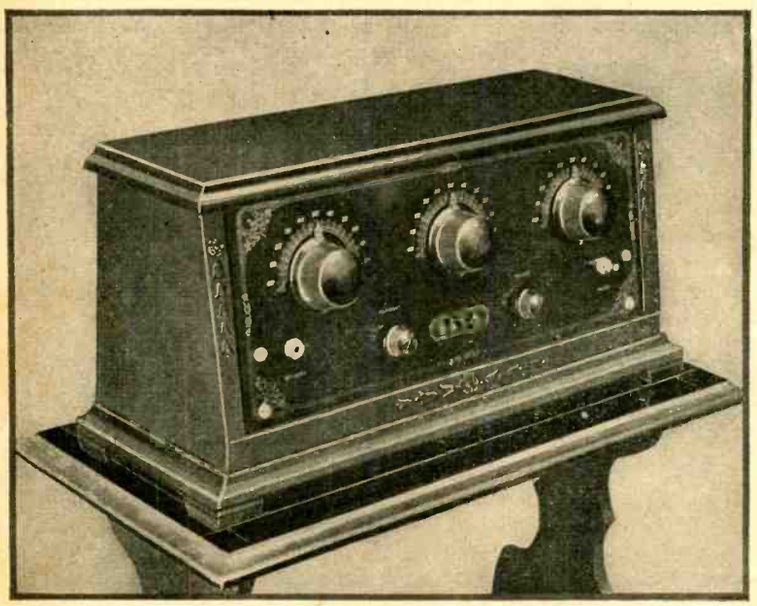
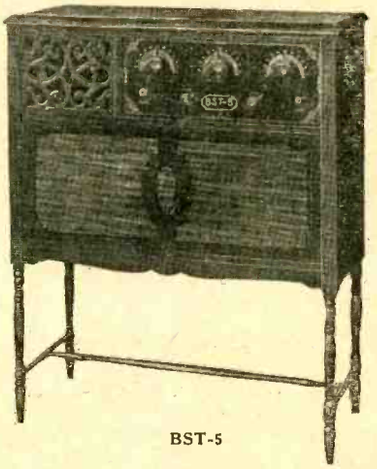


*New model cabinet, Du Pont Duco finish; base 21" long by 8" wide, height 9½", top 21" by 6" Five-ply walnut veneer piano finish.*



BST-5

### RENAISSANCE MODEL CONSOLE

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

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

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Mr. E. H. Thiery, Tax Collector, New Hartford, Conn., writes: "I am well pleased with my BST. In three hours and a half last night I got the following stations: WTIC, WJZ, WGY, WBZ, WPG, WNAC, WMSG, WEEI, KDKA, WAAM, WEAN, WSAR, WJBI, WMAC, WLWL, WJAR, WAHG, WBNY, WEAF, WNJ, WCSH, WSAN, WHK, WMCA, WRVA, WHN, WHAR, WWJ.

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**GENUINE RCA RADIOTRONS**

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Write for our beautiful new booklet illustrating and describing our 1927 Receivers and Accessories

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