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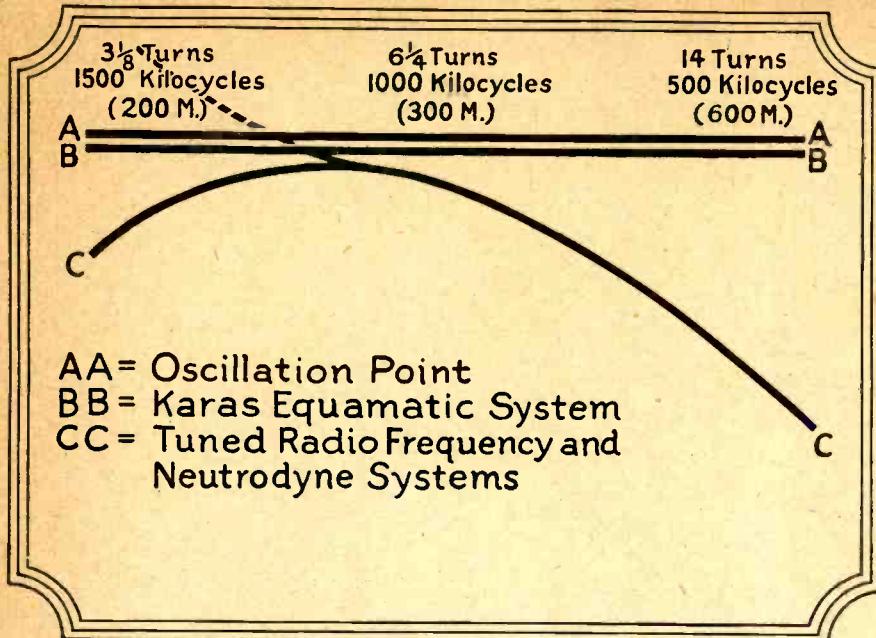
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Equamatic System Licensed under King Patents Pending
 (Caption 1)

Why is the Karas Equamatic the most efficient receiver ever designed?

YOU who have attended the great radio shows in New York and Chicago do not need to be told that the Karas Equamatic Receiver was not only the biggest new thing on exhibition there, but also the most talked about new receiver of either show.

Every visitor at both shows was given a new thrill when he observed how Karas had solved the last and most baffling problem of radio.

All who have heard this sensationaly successful receiver—all who have built Karas Equamatics for themselves—have been amazed at its flexibility—its selectivity—its great volume—it's remarkable tone, while at the same time marveling at the innate simplicity of the set and the ease with which anyone, without even a particle of radio experience, can quickly build the Equamatic and enjoy the possession of a receiver which is the last word in efficiency.

The Hidden Secret of Equamatic Efficiency

The efficiency of the Karas Equamatic lies in its unique ability to maintain the tubes at their very highest point of efficiency—just below the oscillation point. Radio engineers have known for years that this was desirable, but only Karas has been able to design a receiver that accomplishes this—not occasionally—not certain points of the dial—but AT EVERY WAVE LENGTH FROM 200 to 600 METERS! You can turn the dials of the Equamatic from one end of the scale to the other and the set will not lose one particle of its efficiency at any point. The tubes positively will not break into oscillation. Yet the slightest change in the rheostat setting will permit them to oscillate.

All of this has been achieved in the Karas Equamatic by providing a continuously equal transfer of energy between the primary and secondary of the inductance coils at all wave length settings of the dial between 200 and 600 meters, and by making this transfer of energy at all times the practical maximum necessary to keep the tubes exactly under their oscillation point. No other set ever did this before. No other set does this now.

Note the Three Lines on the Chart

In the chart shown above the line AA represents the oscillation point of a tube between 200 and 600 meters. The line BB, directly below this, is the point at which the tube will operate at its highest efficiency, and is also the point at which the radio frequency tubes in the Karas Equamatic operate at all wave lengths. The curved line CC indicates the tube efficiency of a tube in an ordinary tuned radio frequency set and in the neutrodyne circuit.

Note that the line CC falls far below the oscillation point at its right hand end, i. e., at low frequencies. Note also that such sets as tuned radio frequency and neutrodyne receivers approach the efficiency of the Karas Equamatic Receiver at only one point between 200 and 600 meters (this point being where the curve CC almost but not quite touches the line BB). At this one point in the broadcast wave band, and at this point only, do these sets come anywhere within range of Equamatic efficiency. If various stabilizers and other so-called lesser methods of control were not used to keep tubes from breaking into oscillation when tuned to the shorter wave lengths, the curve of these sets would extend far above the lines AA and BB, as indicated by the dotted upper portion of the line CC. Due to these lesser methods the tube efficiency of such sets at the shorter wave lengths falls away from the desired optimum line BB.

at which the Equamatic system always maintains the Karas Equamatic Receiver.

Note that the left hand end of the line AA represents 200 meters, and the right hand end 600 meters. Since the impedance of an inductance varies with the frequency and the amount of energy transferred from primary to secondary varies with the impedance, a primary coil must have much greater inductance to tune to 600 meters than will be needed to tune to 200 meters. Assume that these values are 14 turns of primary for the longer wave and 3 1/8 turns for the shorter.

One Hundred Coils in One

The Karas Equamatic Receiver automatically provides the exact number of turns of primary for **EVERY WAVE LENGTH SETTING OF THE DIALS**—its ingeniously designed Inductance Coils accomplish what could only be done otherwise with a hundred separate inductances, each of the proper value for a certain wave length—and the tubes thus are kept at precisely their proper point for highest efficiency operation—just below their oscillation point. The primary coil is mounted upon the extended shaft of the Karas Orthometric Variable Condenser at an angle of 58 degrees, which gives, in effect, the precise number of turns or parts of a turn needed to furnish the continuously increased inductance for each succeeding longer wave length.

What Is the Result of This Equamatic Efficiency?

As a result of its remarkable design the Equamatic has a selectivity undreamed of save in a superhet. It has a volume on DX that remains constant for every station brought in. It has a clarity of tone that is unlike any other receiver, regardless of price or number of tubes. It is easy to tune. Any member of the family can get superlative results from the Equamatic. It stays put—does not develop temperamental streaks—has no "off nights"—and performs consistently and uniformly at 100% efficiency always.

You, Too, Can Build This Great Receiver

Anyone, even without set-building experience, can build this wonder set in a short time. We furnish a complete manual of simple, easily understood instructions with every set of three Karas Equamatic Inductance Coils. We supply every nut, screw, binding post, for mounting all the parts. In addition to the Karas parts listed in the coupon you will need certain other standard parts easily obtainable anywhere. Your dealer can supply ALL of the parts you will require, including panel and subpanel completely drilled and wish. If he is out of stock you may order Karas parts direct from us by filling out and mailing the coupon below. SEND NO MONEY. Just hand the postman the price of the Karas parts plus a few cents postage.

Order your parts today so that you can begin building your Karas Equamatic Receiver just as quickly as possible. You want one of these great sets—you should have the most efficient receiver obtainable—you will have it if you build this Karas Equamatic. MAIL THE COUPON NOW!

Karas Electric Co.

1148 Association Building
 CHICAGO

Yes! You Can Tune to Within 1-1000th of an Inch with the Karas Micrometric



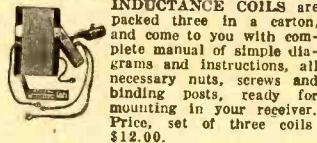
Radio Micrometric Dial
 Price \$3.50

Now would you like to be able to secure a vernier action in tuning that was as fine as 1-1000th of an inch. How would you enjoy operating a set with condensers equipped with vernier dials that had not a five to one, nor a ten to one, nor even a twenty to one,

but that had a 63 to 1 ratio between the vernier knob and the condenser shaft? Karas Micrometrics offer you this remarkable hair-splitting control. They are the only vernier dials made which do this. And they accomplish it without a particle of backlash. Karas Micrometrics use no cams, or other unreliable friction devices. They never pause, jerk or slip; just a liquid-like smoothness of operation. You should equip your set with Micrometrics. You will be amazed at the ease with which you can bring in stations you could never bring in before. Your dealer can furnish them in 180 or 360 degree types, the former with either right or left hand markings. Micrometrics are made of Bakelite. They have large, comfortable knobs, gold inlay markings of unusual precision, and may be attached to your present set without drilling any additional holes in panel. To really know sharp tuning you must use Karas Micrometrics. Order them today from your dealer, or if he cannot supply you, order direct from us. Price, each, \$3.50.

Equamatic System 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 11 PLATE ORTHOMETRIC CONDENSERS three of which are used in the Equamatic Receiver, have special extended shafts upon which to mount the primary coils of the inductances. Price, each, \$7.00.



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

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

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

KARAS MICROMETRIC DIAL. It has a 63 to 1 vernier and tunes to 1/1000 of an inch. Price, \$3.50.

Karas Electric Co.
 Association Building,
 Chicago, Illinois.

Please send me 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 postage \$6.20, 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.

Name _____
 Address _____
 City _____ State _____
 (If cash accompanies order we will ship postpaid.)

Contrast the clumsy dials of only two years back... with the handsome illuminated controls MAR-CO makes today. Here is another good reason for building your set yourself!



Prominent among the advanced circuit designs which call for MAR-CO controls, is

Hayden's "Hi-Power"



Now dials give place~ to glowing spots of light

PICTURE a soft, subdued light in the room . . .

- • • your set in the corner ~ with glowing spots of light illuminating its swiftly readable *back panel* scales.
- • • this is radio at its handsomest . . .
- this is the panel arrangement, the type of skillful tuning, that distinguishes the 1927 trend in set construction.

Already, these new MAR-CO controls are specified or optional equipment in a score of this season's most advanced circuits. At once, they have become the standard in tuning control design. Use them, in whatever set you build, to give the final touch of style, and the utmost in precision control.

MAR-CO controls are easy to install. The steel template pro-

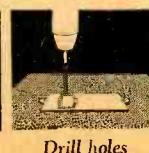
vided reduces panel-drilling to the simple, fool-proof operation illustrated below. The original MAR-CO "friction-drive"—the action that makes backlash impossible—has been strengthened, to accommodate gang condensers. The MAZDA lamp supplied runs on your "A" battery, using only .1 ampere. The switch that controls this lamp may also be used as your filament switch—the lighted scales then serve as pilots. Scales read 0 to 100, or 100 to 0, as preferred. Price, including template, bulb, and bezel, \$3.50. Replacement bulbs, \$.20. Write today for the booklet that illustrates 15 standard makes of condensers mounted on MAR-CO back-panel controls. Martin-Copeland Company, Providence, R. I. Branch offices and representatives in principal cities.

MAR-CO *Illuminated* Controls

Here's how
you drill
the panel..



Screw Template
to panel



Drill holes
through Template



Remove window
opening



Bezel covers
rough edge

that's ALL~
you CAN'T
go wrong!

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

The 4-Tube Hi-Power Set

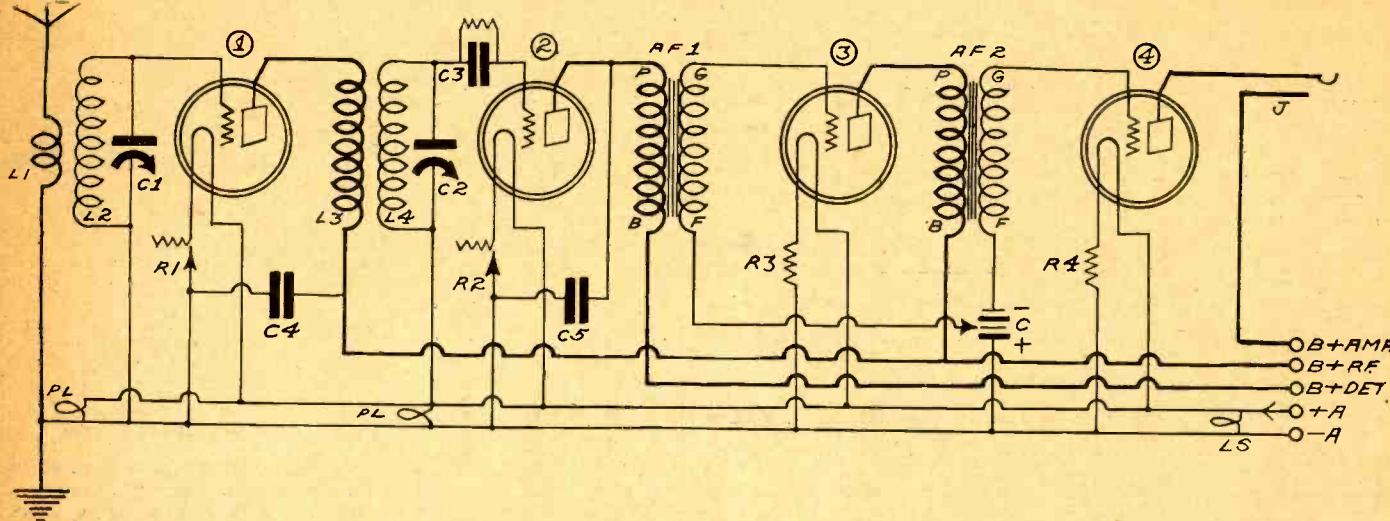


FIG. 1
The Hi-Power is simplicity itself. Only two tuning controls, only four tubes, and yet affording quality reception and volume extraordinary.

By Herbert E. Hayden

Photographs by the Author.

TWO controls are enough, say many folk. Very well. Then why not have only two tuned circuits? That's enough for general use. The woman of the house will be satisfied. The man will tune in distant stations when the locals have signed off. The number of tubes is kept within economical limits. The volume is adequate. So is the selectivity, unless one lives under the guns of a powerful broadcasting station, and in that event it is a case of a Super-Heterodyne, anyway.

Hence the Hi-Power was designed to meet general needs, and at the same time to afford a very good-looking set. Easy to wire, easy to tune, easy on the pocketbook, it combines many advantages.

Simple to Connect

The wiring diagram (Fig. 1) shows how simple it is to connect the leads of this set. The two Mar-co illuminated tuning controls are there in all their handsome glory. Two Carter rheostats, a Bruno light switch and a Carter jack complete the small family of panel parts (Fig. 2).

The assembly and wiring are done in the following order: (1), drill panel and mount parts; (2), cut baseboard to allow room for Mar-co controls; (3), place baseboard parts; (4), wire set, filaments first.

The use of Sickles shielded coils, which are diamond-weave, diminishes the likelihood of self-oscillation trouble, and if even a gurgle is heard on the lowest broadcast wave, why simply readjust the RF rheostat, R1. For tuning in local stations seldom will it be necessary to touch that rheostat. When the detector rheostat R2 is set, it is left that way forever and a day.

The tuning itself is simplified by the use of variable condensers that are called

LIST OF PARTS

L1, L2, L3, L4—Two Sickles coils, No. 30.

C1, C2—Two Metralign .00035 mfd. variable condensers.

C4, C5—Two Polymet .001 mfd. fixed condensers.

R1, R2—Two Carter 30 ohm rheostats.

C3—One Polymet .00025 mfd. fixed condenser, with mounting for 2-meg. Lynch grid lean.

AF1, AF2—Two Thordarson R-200 audio frequency transformers.

R3—One No. 1A Amperite.

R4—One No. 112 Amperite.

1, 2, 3, 4—Four Benjamin sockets.

J—One Carter "Hold-Tite" jack No. 101.

LS—One Bruno light switch, less bulb.

PL—Two Mar-co illuminated controls.

One 7x21" Radion panel.

One wooden baseboard, 9½ x 20".

One C battery.

Ten lengths of stiff Acme Celatsite, vari-colored.

straight line tuning, because the straight line is the result of plotting dial settings against frequency. The simplicity afforded by straight line frequency, straight line wavelength and straight line capacity is limited in scope, while the straight line tuning instrument combines the advantages of the others, and hence is a little of each.

Use of By-Pass Condensers

Notice that the radio currents are suitably by-passed. The condensers C4 and C5 are .001 mfd. and are manufactured by Polymet, as is the grid condenser, C3, which is .00025 mfd. and has clips on it to hold the Lynch metallized 2 meg. leak.

The audio compartment consists of two Thordarson R-200 transformers, which have a marvelously flat characteristic, meaning equal amplification of the various frequencies handled.

It is one of the flattest curves of any transformer I have ever tested.

In the audio channel no rheostats are used, none being necessary. Suitable ballasts are incorporated, and these are 1A Amperite for R3 and 112 Amperite for R4, provided the 1A and 112 tubes are used in these positions, as recommended.



FIG. 2
The front panel view discloses the location of two Mar-co illuminated controls, the two rheostats, the light switch and the single circuit jack.

A Study of Eliminators

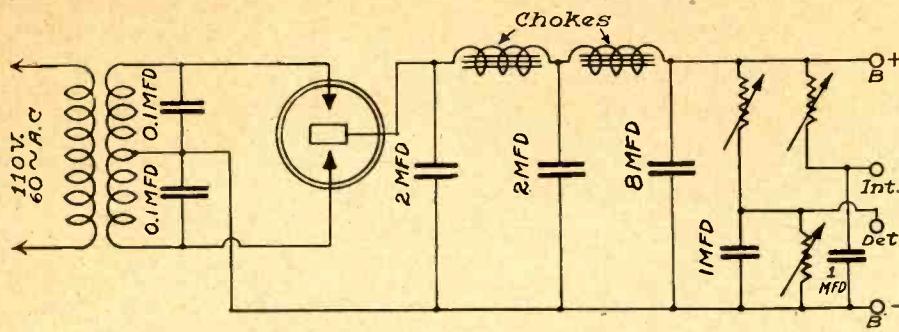


FIG. 1

THE circuit diagram of a B eliminator using the Raytheon tube. The B+ post is for the final audio tube or two audio tubes. Int. is for RF tubes. Det. is for B+ detector and B- goes to A+ or A-. The author's suggestion is to connect A- and B- to the Det. post in above diagram and join the B+ detector lead from your receiver to A+. Thus B- becomes C- of a value determined by the setting of the variable resistor second from B+ post. This is the same as the B+ Det. voltage would be ordinarily, only it is oppositely poled.

Combination for A and B Use Can Accommodate Only 99 Type Tubes, Except That Power Bulb May Be Used in the Final Stage, with Filament Heated by AC—Current Limit Is Reason—RF Oscillation Chief Cause of Motor-Boating, Says Bernard, Citing Tests with His 6-Tube Receiver

By Herman Bernard

Associate, Institute of Radio Engineers

INTEREST in battery eliminators is higher now than at any previous time in radio. Two problems that are engaging the attention of experts are efficiency and cost. The demands upon the resourcefulness of engineers are great indeed, and in some instances these have been met with brilliant solutions to difficult tasks. On the whole the public interest centers on the result, independent of the technical gymnastics that must be performed to achieve it. But wrapped up with the solution of the main problem of

getting the eliminator to work properly is the one of having it remain in that happy condition of service indefinitely.

The eliminators fall into two classes: (1) the B battery eliminator, and (2) the A battery eliminator.

The B Current Drain

Greatest advance has been made in the factory and home construction of B eliminators. The problems there is easier, because a much smaller amount of current need be passed by the system and the hum may be more readily filtered out.

A 5-tube set normally will draw less than 25 milliamperes, even with a power

tube in the final audio stage. This is the current supplied to the plates of the tubes. The voltage is highest in the last audio stage, usually, with a lesser potential for radio frequency tubes and a still lesser one for the detector tube. Multiplying the amperage drawn in the plate circuit by the voltage applied to the plate gives you the plate wattage. A detector tube, for instance 22½ plate volts applied, and drawing 2 milliamperes (.002 amp.) uses .045 watt. Each radio frequency tube, drawing say 4 milliamperes, at 90 volts, uses .36 watt. For the radio side of a 5-tube set, therefore, the normal wattage would be $(2 \times .36) + .045$ or .765, while the audio channel, two stages of transformer coupling, would add 1.251 watts, a grand total of 2.016 watts. Compare this with the filament wattage of the same set, with four type A tubes drawing .25 ampere at 5 volts, or $.25 \times 4$ or a total of 6 watts, and the final stage power tube, at 5 volts and .5 ampere, 2.5 watts, or a grand total of 8.5, or about 4 times as great as the plate wattage.

Naturally, for universal use, there must be two eliminators, one for the B battery, the other for the A battery, particularly as the current totals are so different.

The Combination Outfit

Where an attempt is made to combine the two, so that the same device eliminates both A and B batteries, this can be accomplished only by using the 99 type tubes on the radio and detector side of the set, with one or two audio tubes heated by alternating current. The 99 tubes must be connected in series, for each tube draws only .06 ampere at the filament, and series connection adds the voltages while the current remains the same. We have a wide choice of voltage but are restricted in amperage.

Take for example a 5-tube set. You would use four series-connected 99 tubes, applying 12 volts across the two resultant terminals, and each tube filament would drop 3 volts, hence give a filament voltage of 3, which is correct for each tube. The .06 ampere drain, expressed in milliamperes, is 60. If a Raytheon type BH tube is used as the rectifier in the eliminator circuit, and 60 milliamperes are drawn for the filaments of four tubes, then 25 milliamperes remain for use in the plate circuits. If a power tube is to be used in the last stage, it must be lighted from AC, hence the transformer in the eliminator will have an extra winding or tap which will permit connection to the power tube filament at 7 volts, any surplus being dropped in a filament resistor. The alternating current can not be used on the detector tube, because the hum would be severe, but it may be employed on the radio frequency tubes' filaments, by bringing the grid return to a strictly zero potential, by means of a voltage divider. At any instant, therefore, the grid return point is at zero potential, although the current alternating across the resistance element.

A popular power tube is the 171 or 371, both of which are the same type tube. For high plate voltages it requires high negative bias, e.g., for 180 plate volts, 40½ negative on the grid. The C bias from an eliminator is no real problem, in fact can be solved in many instances at the eliminator post marked B+Det.

Question of Receiver Tubes

In the class of gas conduction tubes, besides the Raytheon, there is the Tun-gar, usually employed in A battery eliminators and for chargers, but the rest of

USE THE SOFTTEST DETECTOR TUBE

Select It from Among Your Present Bulbs by Test in Receiver to Enable 6-Volt Potential on the Plate

The use of much lower plate voltage on detector tubes than customarily is employed or recommended is rendered possible by a combination of conditions. First, the radio frequency amplification ahead of the detector must be sufficiently high, and it is usually quite high enough in modern receivers. Second, the tube used as detector should not be so highly evacuated as are the radio frequency amplifying tubes. One will find by experiment which one of his tubes is the nearest to being "soft," that is rather gaseous. If one uses a special detector tube it is quite likely to be either of the gaseous type or, if not, it is less "hard" than the other types of tubes. It should be borne in mind that some special detector tubes

work better when the grid return is to negative, rather than to the more frequent positive A battery connection.

The connection of the plate lead from the detector tube to positive 6 volts of the storage battery greatly reduces the plate current drain and takes it from the A battery, to boot, instead of from the B battery or B eliminator.

This works out well particularly with resistance coupled audio amplification, where a resistor is in the detector plate circuit, because many such resistors will not dissipate the wattage entailed by special detector tubes, which draw a considerably higher percentage of plate current than other detector tubes.

—H. B.

The Batteryless Options

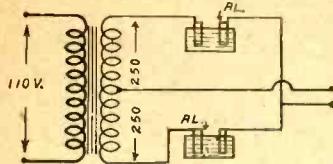


FIG. 3

A trickle charger that rectifies both halves of the wave, or full-wave charger

the rectifying tubes are filament tubes. Among these are the 216B and the 213.

From the foregoing it would seem that any demand for a combination A and B eliminator would presuppose either the use of the 99 tubes or the design and manufacture of tubes that draw still less current, even if at higher voltage than 3, or that operate at smaller voltage and smaller current. This is possible, but difficult. The 99 tubes themselves are hard enough to manufacture, but public demand is something that manufacturers are keenly desirous of satisfying, and something along this line is not wholly improbable.

Now, assuming a combination eliminator, or a separate B eliminator regardless of the nature of the A supply, it is possible to make these devices so that they will operate without a hum. The question of the hum is an important one, but it is safe to say that in B eliminators, or combination B and A eliminator, it has been solved. An eliminator may be said to be absolutely humless when no hum can be heard when one has his ear 6" from the speaker, with aerial and disconnected, or, if connected, with the set not tuned to any station that is bringing in signals. If one listens with earphones at the same output a slight hum may be discerned, but this is tolerable, because the final audio output is not intended for earphone service, and the test is to be made by the result from the speaker.

The A Eliminator Problem

As for universal A eliminators, these are hard to get in the humless state, but it can be done. The question then arises whether the hum is so slight as not to be annoying, particularly as you can not hear it when the program is coming in, the signals completely drowning out the hum. To some persons the slight hum heard when there is a moment of silence at the station is annoying. Others are not bothered about by it, in fact never seem to notice it, so here the matter of personal taste and inclination comes in. An A eliminator that does not hum is practical, of course, but a choke coil in addition to those normally included is almost a prerequisite, and the physical dimensions of the entire outfit are likely to be bulky. On the whole, therefore, it can be truly said that the universal A eliminator has not reached the point of humlessness that characterizes the B eliminator.

Now, granting that the B eliminator does not hum, are all our troubles solved? They are not. One cause of annoyance is the put-putting or "motor-boating," sometimes bad enough even to ruin or prevent reception. This eliminator disease is due to oscillation, either radio, audio or both. J. E. Anderson ascribes the common impedance of the circuits the B eliminator feeds as the principal cause. Let me tell of some experiences I have had with B eliminators.

Some Experiments

I tried one on a 6-tube circuit (the Bernard, Oct. 16 issue), and operated the circuit steadily for ten hours on November 30. No sign of motor-boating. The

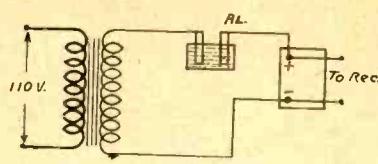


FIG. 2

A trickle charger that rectifies half of the wave.

next evening the set was run for three hours and the succeeding evening for five hours more. Still no trouble. The set was neutralized, no radio frequency oscillation could be produced within the broadcast band, and no trouble ensued.

A slight adjustment was made purposely to put the receiver in a condition ripe for radio frequency oscillation. Immediately the motor-boating started in, and in fact prevented reception.

Now, the B eliminator was replaced with a block of B batteries, totalling 120 volts. These batteries had been used for seven months, and while they were not exhausted (had not reached the cutoff voltage of about 110), they had rendered true service so long as not to be rated as in first class condition. The motor-boating went on just the same.

Instead of using a separate B battery for the detector plate, to remedy this, I changed the detector plate lead to A plus, affording say 6 volts positive, thus taking the detector out of the impedance common to the rest of the set, and the motor-boating stopped.

It was apparent from this test, and the fact was confirmed by other means, that the detector tube had been self-oscillatory. The reduction of the detector B voltage (usually uncertain in B eliminators), had cured the RF oscillation evil in the detector tube and had stopped the motor-boating. But I would advise any one resorting to the lessened detector plate voltage method to turn off the set and the eliminator, and leave them off for a minute, before giving the changed condition a trial.

Observe that omitting the cable connection conventionally to B+ Det. gives you an immediate access to high negative bias from the eliminator. You connect

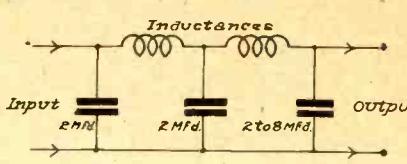


FIG. 4

The filter system used in eliminators.

B minus to B+ Det. post of the eliminator, the detector plate lead from the receiver going to A plus as described. The post on the eliminator marked B- becomes C minus at a potential determined by a variable resistance.

Turn Set Off

Once the motor-boating has set in, the receiver can not be neutralized, nor can the put-putting always be stopped simply by reducing the detector plate voltage or by doing anything else by way of reduction of RF oscillation. Different radio frequencies oscillate and beat an audio frequency and audio oscillations arise and persist. When you take out the radio oscillations you may still have the audio ones. So turn the set off.

From these experiences it seemed clear that motor-boating is not solely a B eliminator vice, nor a B battery vice, but primarily results from poor receiver design, wherein RF oscillation occurs. It also suggests that not too much be expected of regenerative receivers when a B eliminator is used. This does not mean that a B eliminator will not work a regenerative set. It does mean that difficulties arise. To overcome them iron-core radio choke coils are put in the grid returns of the radio circuits and iron-core audio chokes in the grid returns of the audio circuits, all intended as oscillation killers, so that the RF oscillation is kept, so far as possible, right in the RF amplifying tubes, and not inter-communicated. As the detector is usually the regenerated tube, transformer coupling is favored as the first AF stage, or impedance coupling, because the winding acts as a choke.

So far we have concerned ourselves strictly with eliminators, that is, devices that operate from the lamp socket and

(Concluded on page 8)

VOLTAGE TESTS OFTEN DECEPTIVE

Too Low Resistance of the Meter Per Volt Causes Part Shorting of Circuit and Lower Indicator Than Actuality

The voltages at the output of B eliminators are not readily metered by home constructors, because they frequently employ voltmeters which have too low a resistance per volt. The result of using a low resistance meter is to get a reading much lower than the actuality, due to the circuit being partly shorted by a resistance less than the resistance of the eliminator. The same situation prevails at the input points, where special meters to gauge alternating current are required, and where their resistance is just as important. For these reasons many

fans report that their eliminators do not give the rated output voltages, although all parts have been used just as an author may have specified. The fact usually is that the output voltages are correct, but the fan's facilities for testing or measuring them are inadequate. Hence much greater voltages than expected are supplied to RF and detector tube plates, which increases the amplification, hence heightens the tendency toward self-oscillation and introduces unexpected trouble.—H. B.

TURN OFF YOUR ELIMINATOR, TOO

Failure to Do So Keeps Transformer, Chokes and Condensers Charged and Starts Motor-Boating When Receiver Is Turned On

(Concluded from page 7)

themselves deliver the desired DC. Due largely to the difficulties in designing a satisfactory A eliminator and still keeping the price and the bulkiness down to reasonable limits, the trickle charger has come into great vogue. This device is simply a battery charger of the same types that we have been familiar with for years, but which charges at a much slower rate.

Ordinarily chargers' rates are 2.5 or 5 amperes, whereas the trickle charger is usually from .6 to 1 ampere. The idea is that the charger is turned off when the set is turned on, and the charger is turned on when the set is turned off. Hence, while the set is not operating the charger is charging the storage A battery. This is not an eliminator, since the idea of elimination is that the battery is eliminated, yet every trickle charger requires a storage battery.

The terminology, however, is unimportant, except that many folk not versed in radio do not know what they are getting when they buy some "socket power supply." Some advertisers of trickle chargers purposely omit calling their product a trickle charger and do not state that a battery and charger constitute the unit. They should so state, especially since "lamp socket this" and "power supply that" are terms frequently encountered, yet even radio engineers, reading only the titles, can not tell what the device is. Even the entire reading matter in the advertisement does not disclose the real state of affairs. Only recourse to the illustration of the product, plus surmise based on technical radio knowledge, enable an engineer to know what it is all about, and yet the public is expected to understand fully and at once!

Different Switches

The trickle charger, that is, combination slow rate charger and storage A battery, to give it the definite title, is a good solution of getting rid of the necessity of quick charging of the battery at intervals or removing it for any charging purpose. What the trickle charger eliminates is inconvenience, not batteries.

If a bulb type trickle charger is used a triple pole double throw switch is required, because it would have to affect the lamp from the main, besides putting charger on and battery off, or battery on and charger off. However, with the electrolytic type of charger only a double pole double throw switch is needed, because the circuit is not completed to the main unless the charger is on.

In either of these cases, of course, the usual A battery switch on the set has to be turned on if the set is to be worked. If this switch is left on all the time no harm is done, for the other switch will wholly disconnect the battery nevertheless.

A system of growing popularity in connection with eliminator or charging switches is that embodying the relay. A relay operates on the magnetic principle, closing or opening a circuit due to the contact or release of a magnet. The relay

is connected to the regular battery switch on the set, and when this switch is turned on the charger is disconnected, while when the set switch is turned off the charger is connected. The same system may be used in connection with a B eliminator or an A eliminator. In fact, if the A eliminator has a relay, the connection to the B eliminator may be made through the relay, too, by using an outlet built into the A eliminator, instead of plugging directly into the line. Thus, turning the switch on the set controls everything.

With trickle chargers it is assumed that a set is used for an average period each day or night, for instance the set is in average operation four hours a day, let us say. It will occur to some that if anything happens to change this system, as for instance if you take a vacation, the calculation is upset. So it is, unless you wholly disconnect the trickle charger, which is not too much to ask, at that. Otherwise the charger keeps on going and your battery may become overcharged.

A solution of this problem is offered by another type of relay, one which operates only when the A battery needs charging, but which throws the battery off charge as soon as it is fully replenished. Hence, using only the master switch on your set, to which the relay is connected, the battery and the charger are taken care of automatically. In the absence of this sort of relay, or any other automatic system controlling both the A and B sources, the tubes in the set should be lighted before the B eliminator is turned on. In most cases, not only must the A battery be turned on and off, but the eliminator must be likewise controlled, from the lamp socket switch, requiring an attention not pertinent to B batteries.

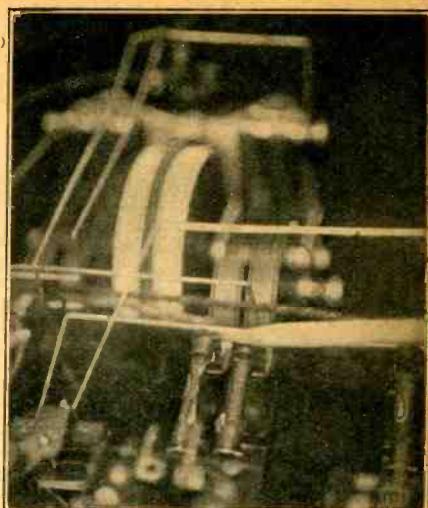
Long Speech Banned Over WEAF Chain

The objective of National Broadcasting Company, formed by the Radio Corporation of America to take over Station WEAF, was disclosed by M. H. Aylesworth, president, at the Electrical League in New York City. He outlined the policy of the new company. He said:

"Broadcasting is a ticklish business, because I won't be able to make any money for my people for some time. But in the meantime I can promise you finer programs, better music and no long speeches. We have only sixteen hours at our disposal, and we cannot afford to crowd the air with programs which will not interest people. We are not in the position of a magazine, which can extend its pages and leave the reader to select what interests him."

"We shall not be in competition with newspapers. They have a far larger field. We shall not cram education down the throats of people who do not want it. What we shall strive for is to make people everywhere happier. We want to carry radio to the hospitals and to the people who can't get out but are mentally equipped to enjoy the same things as you and I."

CLIP FAST



(Radio World Staff Photo)

LOOSE contact between mounting clip and leak causes scratchy reception. Bend one clip (where pencil points) toward the other clip. That will afford strong spring clamp.

New Radio League Announces Purposes

WASHINGTON

Proposing to consolidate radio manufacturers, broadcasters and the public into one giant organization, the Radio League of America pledges itself to attempt to do the following things:

(1) Raise enough money from the public to support all of the broadcasting stations of America.

(2) Influence Congress to pass the kind of legislation which, in its opinion, will make for best reception.

(3) Create a court of arbitration which would settle all patent or other disputes between manufacturers, broadcasters, etc.

The Radio League gives fourteen reasons why manufacturers should become members at a certain price. Among them are relief from station support, a legal department, a national research department, an export service department, Court of Arbitration, a united industry, etc.

Appeal to the broadcasting stations to become members is based on the promise that after organization expenses have been paid, the remainder of the money collected will be turned over proportionally to station members to defray the cost of broadcasting.

The listener-in is told that for his payment he will receive monthly a high-grade magazine; that he will be made a part of the great industry and that he will have a national organization to look after his interests.

PWX Renders Tourist Service

The enormous yearly increase of Americans visiting Cuba during the Winter has resulted in a novel service furnished by PWX during its Sunday concerts, whereby under the direction of the Cuban Official Tourist Commission, indications are given to both actual and prospective visitors, covering clothing and travelling advice, point of interest, amusements, and short talks about Cuba, so that all visitors that visit that country can have the most comfortable and enjoyable time possible.

Station PWX hopes to enroll the names of at least 25,000 visitors, in their radio book this year.

SIGNALS CUT BY A RISE IN HEAT OF AIR

That Accounts for Lessened Efficiency of Summer Transmission, Says Dr. Austin—Sun's Effects Are Various

WASHINGTON

Why are radio signals strong at one time and weak at another? This question was discussed by Dr. L. W. Austin, chief of the laboratory for special radio transmission research at the Bureau of Standards, at Tokyo. This is an old question which the Bureau of Standards has been attempting to answer in part. It is also one of the problems contained in the program of the International Union of Scientific Radio Telegraphy formulated by the Union at its meeting in 1922.

In the attempt to solve this problem, observations extending over more than ten years have been made at the Bureau of Standards on stations of wavelengths varying from 1,000 meters to 25,000 meters and at distances up to 3,500 miles.

Two Decided Factors

In addition, the data of other observers have been examined as far as possible.

Out of this mass of observational material two factors have emerged which, so far as present knowledge goes, seem to be important influences in radio transmission. These are air temperature and solar activity. The temperature changes appear to control the seasonal signal strength variations except at great distances, giving strong signals during the cold of Winter and weaker signals during the Summer. Even the day by day temperature signal relationship can often be traced especially during the Winter months.

Solar activity, especially as manifested in magnetic storms, appears to produce large variations in signal intensity, the signals generally becoming stronger in the daytime and weaker at night during the disturbed periods.

Theory of Sun Spots

It is also possible that the changing solar activities during the sunspot cycle may produce general changes in signal intensity from year to year.

The other natural phenomena examined, air pressure, humidity, rainfall, etc., appear, so far as observations show, to have very slight if any influence on radio signals. From the observations it is, however, evident that other factors still unknown play an important part in radio transmission.

RESULTS EDITOR:

We have a 1925 Model Diamond of the Air, which was built by Mr. Summers and I must say it is a wonderful set. It is so good I wouldn't consider having any other. I just delight sitting at it in the evenings and pick up station after station, without any difficulty. I even picked up KFIU, the Alaska Electric Company station in Juneau, Alaska, which uses only 10 watts and have received certification with a stamp. All in all I have received more than 200 stations.

MRS. H. SUMMERS,
1733 North 22nd St.,
Philadelphia, Pa.

SHORT WAVES AIDED BY RAIN

Downpour Over Wide Area, Including Transmitter and Receiver, Helps, But Cloudy Skies Are Detriment, Engineers Report

SOUTH DARTMOUTH

Weather conditions and the time of day definitely affect radio signals in short-wave transmission over relatively short distances, engineers of Massachusetts Institute of Technology have found in experiments being carried on at a new station for radio research on the estate of Colonel E. H. R. Green at Round Hill near here.

These experiments, which are being carried on under the direction of Dr. Vannevar Bush, Professor Edward L. Bowles and James K. Clapp of the Institute's Department of Electrical Engineering, are made possible through the generosity of Colonel Green, whose interest in radio is widely known. His own private broadcasting station, WMAF, stands close to Technology's field station, for which Colonel Green recently provided additional buildings and antennae equipment.

Talk Over Distances

Amateur operators as far distant as lonely islands in the South Seas and in Europe as well as America and South America have already "talked" with 1-XV, the call letters of Technology's field station.

Through the cooperation of Colonel Green further studies over a period of several years are to be made with the object of definitely establishing the relations between weather conditions, the time of day, and radio transmission. Much is being accomplished with the cooperation of the amateur operators in all parts of the world. Operating schedules of Station 1-XV and cards upon which data may be forwarded to the station have been sent to all interested amateurs.

Experiments have revealed that signals are more or less regular when the sky is clear, but weaken or entirely disappear when certain conditions of cloudiness are encountered. A wide-spread area of rain which includes both transmitter and receiver has generally been found to give better signals than those obtained in clear weather.

Minimum Wave

It has been found that for short wave transmission to a fixed receiving station there is a minimum wavelength beyond which signals disappear entirely at the receiving station. The wavelength at which the signals disappear is called the "cut-off" wavelength. In transmission over a distance of 75 miles, for example, the "cut-off" wavelength varies between 32 and 50 meters for various times of the day. Commencing in the afternoon the "cut-off" wavelength is smallest throughout the afternoon, which is considered the best time of day for short-wave signals over short distances, but rises rather rapidly after sunset until the maximum value of about 50 meters is reached soon after midnight. From that hour until noon it decreases slowly and fairly regularly except for slight variations at sunrise. It again reaches its lowest value of about 32 meters shortly afternoon.

Use Tiny Antennas

Test are also being made with many

types of antennae for short-wave transmission. These vary from a small antenna mounted entirely within the station to a large exterior structure more than 100 feet in the air. One of the most remarkable features of the short wave research is that signals may be sent great distances without a large antenna structure. Communication between Station 1-XV and various stations in Europe, Australia and South America has been carried on regularly on an antenna system consisting of only two wires slightly more than 20 feet long and six feet apart.

A special form of transmitter has been constructed and is now being tested. In this the antenna system may be turned to take any direction, both in vertical and horizontal angle, and the transmitter consists of a wooden framework carrying a 50-foot copper tube which is the actual antenna conductor. The transmitter equipment is mounted in the framework and turns with it. The frame itself is mounted on a universal joint secured to the top of a fifty-foot pole so that no matter what the position of the frame may be, the copper tubing is always 25 feet off the ground.

Change of Rod

Changing the position of the rod has been found to produce very little effect on the wavelength or frequency. Theories of antenna work say best signals should be obtained when the antenna is in a vertical position, while here, when working over a few hundred miles, the best signals are obtained when the antenna rod is nearly horizontal. The direction in which the rod points when in a horizontal position apparently has little effect on the strength of signals at the receiving station, although there are indications that the strongest signals are obtained when the antenna rod is pointing north and south. Communication with stations at great distances, notably Australian and European stations, have been obtained with this antenna system.

Studio Locked, Program is Upset

BALTIMORE

Watts and waves ran wild the other day (and incidentally, so did a few announcers) at one of the Western stations, when, in the midst of a program, the studio door suddenly locked and prevented the egress of the artists finishing their number and the entrance of the artists announced as the "next" feature. The result, according to newspaper accounts, was a few impromptu wringing of hands, plus some confidential "annotations" on the part of the frantic announcer and studio manager as they struggled desperately to release the artists.

Such a mishap could not occur at WBAL's studios, says S. W. Barnett, adding:—

"The doors of our large and small studios have no locks or latches on them, mainly because the latch of a door causes more or less noise and WBAL has taken every precaution to keep its broadcasts absolutely unmarred by such interference."

The Daven Bass Note Set

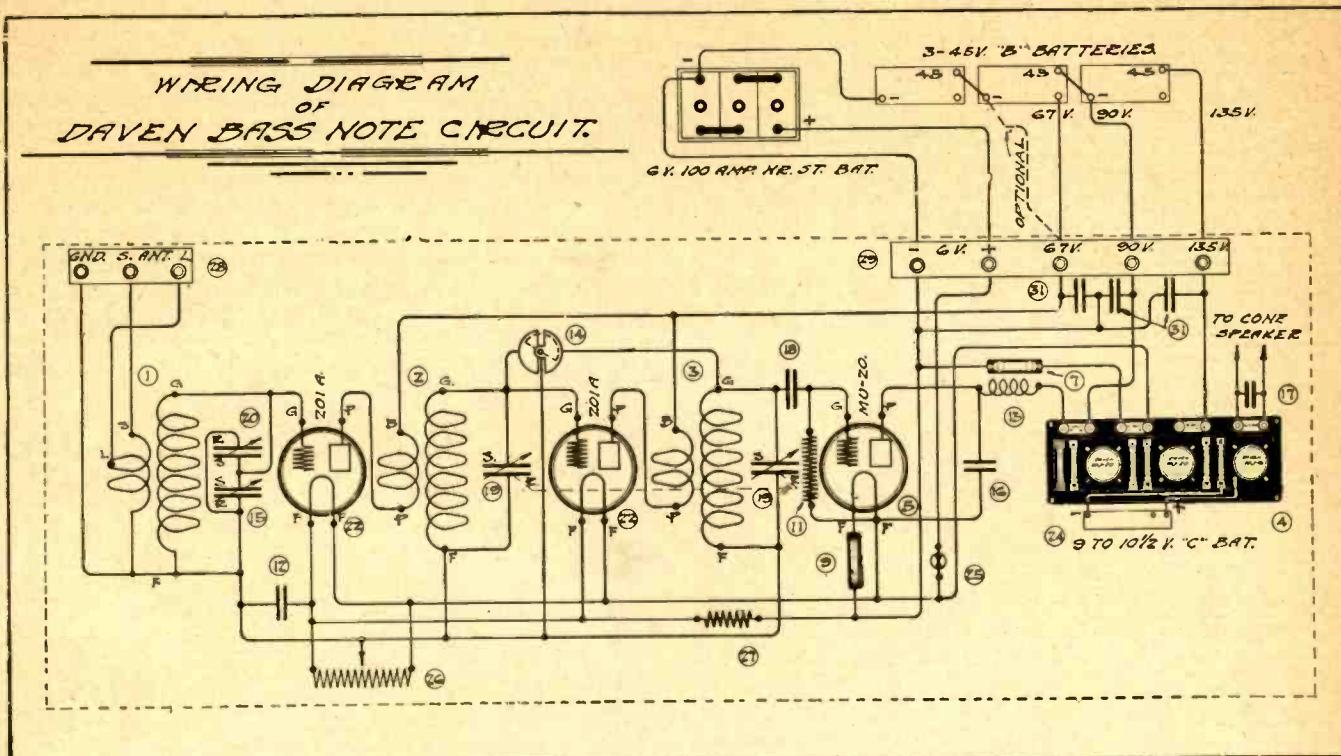


FIG. 1
The wiring shown schematically, except for the audio amplifier, which is shown pictorially.

Circuit Appears in Refined Form, Although Following the Fundamentals of the Hookup So Popular Last Season

By T. T. Williams

THE Daven Bass Note Circuit was first brought out last spring as a three dial design. The new receiver, which is now being described, has the same fundamental circuit which has proved such a success all over the country, but with various new developments and features which improve reception.

The following features make the Daven Bass Note Circuit outstanding:

1. The circuit incorporates two stages of tuned radio frequency controlled by a potentiometer.
2. Specially designed solenoid coils (which have been designed by the U. S. Bureau of Standards to be the most efficient), which permit no magnetic feedback and which give the utmost in selectivity, sensitivity and volume with extreme ease of control.
3. A special balancing condenser causes both dials to read exactly the same over the entire range, without changing the setting of the balancing condenser.
4. A special compensating condenser takes up the slack in the tandem condenser, making both units tune to resonance at the same wavelength.
5. Resistance coupled audio amplification with provision for a power tube permits tremendous volume without distortion by overloading.

Quality reproduction can never be any better than the radio frequency amplifier and detector feeding the audio end.

We have all noted the great number of circuits which employ various forms of neutralization, balancing and the like. The

number of methods available for accomplishing this end is varied.

Almost any coil and condenser combination can be balanced in the radio frequency amplifier but not always in a very inefficient fashion. Technically speaking, the following are generally employed.

1. An insufficient number of turns for primary windings of the RF transformers, so that oscillation is stopped, balanced at the shortest broadcast wavelength, but the small number of turns is not sufficient to deliver enough power to the coil system secondary winding.
2. The use of fixed resistances placed in series with either the tube grid or plate, or,
3. The use of an insufficient plate voltage and,
4. Combinations of the several means.

Since free oscillation is always most troublesome at the lowest wavelengths, self-balancing must be done at those frequencies. This explains frequently poor efficiency at the higher wavelengths. At any rate all of those are, at the best, insufficient expedients for getting around the problem.

This tells us why a simple regenerative detector often gives better results than many five-tube receivers.

In the Daven Bass Note Circuit, all three radio frequency transformers or inductances are so designed as to give high efficiency, distance and proper selectivity at all frequencies within the broadcast range by means of potentiometer control. The coils were designed especially for this circuit and follow improved engineering practice.

Sensitivity in Coils.

To obtain sensitivity it is necessary to have a coil of reasonably low radio frequency resistance, which in turn means a minimum of distributed capacity, copper and dielectric loss.

Further, there must be a proper relationship between the turns and inductances of both primary and secondary windings.

To insure proper selectivity it is required that when the antenna and ground are disconnected from a receiver, the coils will not pick up local signals from powerful transmitters.

In other words, the conditions for maximum selectivity call for the signal going first through coil number one, thence on to the second and third coils in just this order, so that each tuned circuit acts as a filter. If the incoming signals are picked up by either the second radio or detector coils, the full tuning effect of the preceding circuits will not be obtained.

Coils Have Small Field

Another feature of these coils is that due to their small field, interaction or self-oscillation between the several coils is eliminated. The method of placing these inductances are such as to warrant complete stability.

To obtain maximum volume it is necessary to have a proper amount of coupling between the secondary and primary winding; this also affects the overall selectivity of the set.

In the coils employed in this receiver, research and experimental work which extended over a number of months, determined proper size of coils to be employed so as to give maximum voltage amplification per stage with the least loss in the final performance.

This, of course, also depends in a large way on the methods of placing and the distance separating the several coils and other existing components.

The coils are only 3" long and 1½" in diameter.

Balance for RF Circuit

Straight line frequency or wavelength shaped plate variable condensers are used to tune the several inductances and one of the capacities will cover the entire broadcast range from 200 to 550 meters.

The special compensating condenser is a miniature split stator condenser. It is used in the Daven Bass Note Receiver to balance the capacity in the two radio frequency circuits which are tuned by

Set Features Tone Effect

Two-Section Condenser Is Used to Reduce Major Controls to Only Two—Resistance AF Preserves Excellent Tone Quality

the tandem condensers. These capacities vary but slightly, but when receiving distant stations it has been found advisable to correct even such slight variations. These variations in capacity are due to one or more of several things.

The very best condensers have slight variations, no two of them increasing in capacity at exactly the same rate as the dial is tuned. The coils, also though very carefully matched, introduce very slight variations in the tuning of the two circuits. Furthermore, the distributed and stray capacity which exists between the wires that connect the condenser and coils of the tuned radio frequency circuits, introduce variations and finally even though none of these factors existed, the different loads in the two circuits would introduce these variations. Though there appear to be many causes for variations in capacity, each of them is very slight and they are not cumulative.

Advise General Use

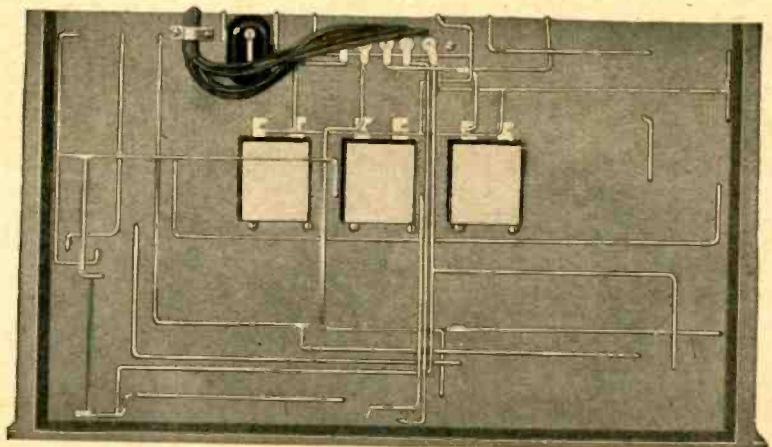
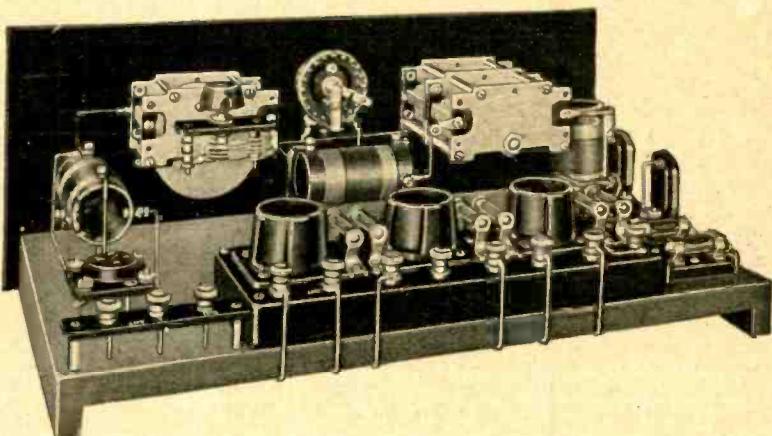
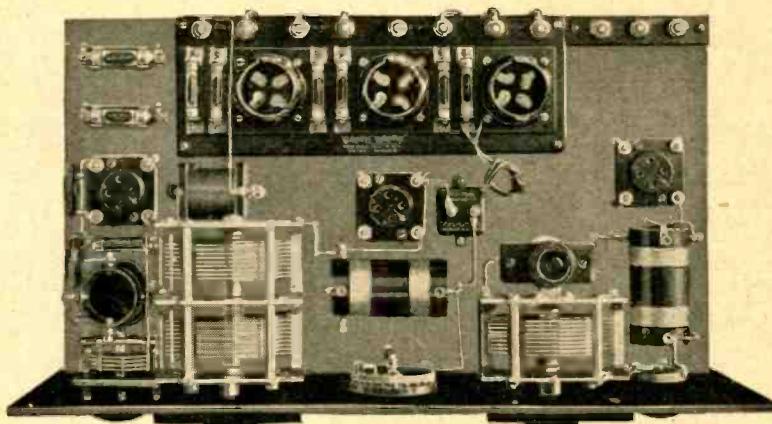
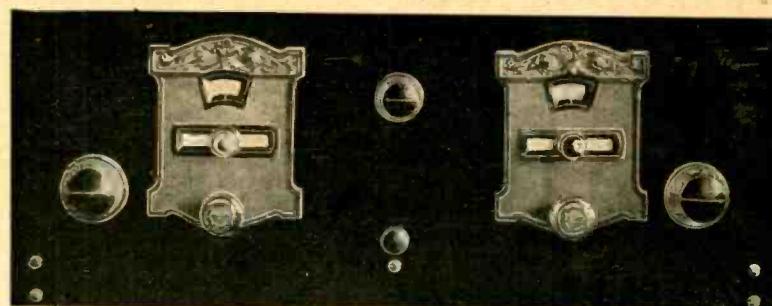
Such conditions exist whenever two resonance circuits are used together. Therefore, this type of compensating condenser should be used whenever two resonance circuits are tuned by one dial.

This balancing condenser is a small unit used to add sufficient capacity to the condenser in the first radio frequency circuit of the Bass Note Set to balance the capacity added to the second and third circuits by the compensator. It is attached to the framework of the first radio frequency condenser and is set only once, requiring no further attention.

Because of the compensator which is used with the second and third radio frequency condensers, the dial which controls the tandem condensers will ordinarily read lower when the set is tuned to a certain station than the other dial. This difference in reading will not usually be more than four or five divisions on the dial. In order to correct this discrepancy the Daven Balancer is used. The set is tuned to receive a station at one of the intermediate wavelengths. After the set has been accurately tuned the dial on the right which controls the first radio frequency condenser is turned to agree with the dial on the left. This will slightly detune the station and it should be brought back into perfect tuning by adjusting the balancer.

When the adjustment has once been made the settings of the panel dials will be the same over practically the entire broadcast range the balancer requires no further adjustment.

[This concludes Part I of the article on how to build the Daven Bass Note Circuit. The constructional article will be completed in next week's issue, November 20. In that instalment Mr. Williams will discuss hi mu tubes, volume, selectivity and wiring.]



FIGS. 2, 3, 4 AND 5

Views of the receiver. The two tuning controls are recording dials, as shown in front panel view. The top view gives a clear definition of the layout of parts, while the relative positions of the parts above the panel is emphasized in the rear view, taken at an angle. How neatly the underneath wiring is done is shown in the view of the subpanel bottom.

SETS CLASSIFIED FOR SELECTIVITY

Goldsmith Places Super-Heterodyne First and the Simple Three-Circuit Tuner Last, Considering Models in General Use

[Reduction of interference was discussed in the November 6 issue by Dr. Alfred N. Goldsmith, chief broadcast engineer, Radio Corporation of America. He brought the discussion up to a table showing that 500 watts antenna power gives a 10-mile service range, 5,000 watts gives 30 miles and 50,000 watts 100 miles. The following is the conclusion of the article.]

By A. N. Goldsmith

Reprinted by permission of the Institute of Radio Engineers from the October "Proceedings."

The clear and outstanding conclusion from an analysis of these figures is that it is necessary, in a large country like the United States with its great rural areas, to have stations which can law down field strengths in excess of 1 millivolt per meter over great areas. Every device of human utility has passed from the playboy stage into the stage of reliable service. In terms of broadcasting, this means that field strengths of the order of tenths of a millivolt per meter, despite their sporting fascination to some people, will play little part in the future development of broadcasting. Conversely, it means that field strengths of the order of tens of millivolts per meter represent the goal of service for broadcasting of the future.

(c) **Receiver Classification and Performance.** The great majority of receivers now used for broadcast reception fall into the following classes, which are arranged in order of increasing selectivity:

Receivers employing a single radio-frequency tuning stage, generally with adjustable regeneration.

Receivers employing three radio-frequency tuning stages, each stage being fairly heavily damped and without effective neutralization of coupling between stages of radio-frequency amplification.

Receivers utilizing three radio-frequency tuning stages, generally of low damping, and with more or less

complete neutralization of inter-stage couplings.

Receivers utilizing one or more intermediate-frequency tuning stages, and one or more radio-frequency tuning stages.

The typical performance of some of the above receivers is given, approximately, in the following table. It is assumed the receiver is tuned to 660 kc (455m) and the voltage reaching the final detector grid from a given signal, corresponding to satisfactory volume in a loud speaker attached at the end of the audio frequency amplifier, is measured. An equal signal voltage is then applied to the receiving set, but at a frequency of 670 kilocycles, or 10 kilocycles off the desired signal frequency. The ratio of the voltage produced by the desired signal to that produced by the undesired signal, at the detector grid in this case, is given in the second column of the table. If the undesired signal is 710 kilocycles, or 50 kilocycles removed from the desired signal frequency the corresponding voltage ratios of desired signal at the detector grid, are given in the third column of the table. It must be remembered that individual receivers vary in this regard, and that the following values represent order of magnitude only in each case:

TABLE 3

Type of Receiver	One Radio-frequency stage	5.5
Same, but with regeneration	18.	60.
Three Neutralized Radio-frequency stages	15.	8000.
One Radio-frequency and two intermediate-frequency stages (super-heterodyne)	800	over 10000.

It is obvious that suitable tuned circuits have the same functional importance in receivers as red corpuscles have in the blood. On this basis it is found that some of the simpler receivers are suffering severely from pernicious electrical anemia. Their present debilitated condition results from their failure to meet the stringent broadcasting conditions of today, however placid and useful may have been their existence in the pioneer period of broadcasting.

It is clear that there are possibilities of trouble from interference in a district where owners of receivers using a single radio-frequency tuning stage have become accustomed to receive distant signals from weak stations fairly well, but where receiving conditions are altered by the establishment in that district of a powerful transmitting station. Receiving sets which have been getting signals of the order of 0.5 millivolt per meter, will then have impressed upon them signals of the order of 100 millivolts per meter. The unsuitability of such receivers for modern broadcasting conditions will be glaringly displayed, and listener dissatisfaction results. Yet radio progress, as pointed out in the previous discussion, depends upon the production of higher field strengths from broadcasting stations of increased power, whereby real service can be given to large areas.

In the case of the establishment of the

Bound Brook station, it was found that the great majority of complaints came from owners of home-made sets. Those of the single radio-frequency tuning stage variety, and of the three highly damped radio-frequency tuning stage manufactured type gave trouble, also.

The Bound Brook Station

When it became evident to the executives and engineers involved that the next major forward step in broadcasting involved the establishment of a high power broadcasting station, careful preliminary studies were made of the anticipated performance of a 50-kilowatt transmitter located in the neighborhood of New York City. Numerous apparently suitable sites were selected, and the field strength distribution around a station located at each of these sites and at various distances from the station was calculated and plotted in map form. It was found that many important conditions had to be met by any location to be finally selected as suitable.

Ostensibly cooperative persons kindly suggested that the station be located at the tip of Montauk Point, Long Island, on a remote lightship, on the highest and most inaccessible peak of the Alleghany Mountains, or even on an anchored balloon high in the air. Suffice it to say that unsympathetic engineers did not regard these proposals as feasible either technically or economically.

The most desirable location for the station having been pre-determined to be near Bound Brook, the station was built and placed in experimental operation for a week early in November, 1925. After certain modifications in the equipment had been completed it was again placed in experimental operation early in December, 1925, and has been transmitting since that time under the call letters 2XAR or WJZ.

As soon as the station had been in operation for a few days it was found that some interference was being created in a region which we may term as "interference area"—a roughly circular region centering on Bound Brook.

Interference Reduction Service

(Here Dr. Goldsmith tells how WJZ investigated interference complaints. Then he continues.)

In each case where demonstrations of interference reduction were given to the listener, the type of receiver experiencing the interference was noted on the report blank. The percentage of each type of set found are given in Table 4.

TABLE 4

Percentage of sets visited, experiencing interference from nearby high-power station

Single-circuit	59.0 per cent
Two-circuit	12.1 per cent
Three-circuit	27.3 per cent
Four-circuit	0.4 per cent
Super-heterodynes (including home-made)	1.2 per cent

Single Circuits Poor

It is seen that single-circuit receivers were most open to interference, and actually nearly 60 per cent of the instances of interference from Bound Brook were found in receivers of this type. The primary usefulness of such receivers is found in large territories where radio interference is lighter and will probably remain so.

Next came the two-circuit and three-circuit receivers. Here it was found that more than twice as many three-circuit receivers experienced interference as two-circuit receivers. However, the explanations are simple. In the first place, very few two-circuit receivers are used nowadays. In the second place, the two-circuit receivers in general utilized tuning circuits of average quality and damping. In the third place, the three-circuit receivers (which were largely of the un-



(Herbert Photos, Inc.)
THE comparative sizes of the small peanut dry-cell and the gigantic and powerful 1500 watt tube are shown.

neutralized factory-built "tuned radio-frequency" types), utilized alleged tuning circuits which were artificially damped to prevent self-oscillation. As a result the high losses of the various circuits broadened the tuning and lowered the selectivity to the point of making such so-called three-circuit receivers quite open to interference. This is a point to be borne in mind by radio engineers interested in the progress of broadcasting.

Little Trouble Here

As was to be expected, only negligible percentages of Super-Heterodyne receivers (including home-made Super-Heterodynes), and four-circuit receivers experienced interference. There was an early impression among some of the prematurely disconsolate listeners that the interference problem presented was inseparable, and some wrote in lugubrious fashion assuring the station officials that the interference could not be eliminated by any conceivable remedy. Quite a volume of propaganda to this effect was also circulated at one time.

What are termed "three-circuit receivers" are widely current, but poorly selective devices. They do not include neutralized three-circuit receivers having high-quality tuning circuits, from the users of which practically no complaints were received. Clearly only superheterodyne receivers and high-grade three-circuit receivers fully meet modern selectivity requirements in the vicinity of average modern broadcasting stations.

The Mind at Work.—Dependence of Complaints on Psychological Factors. A rather astonishing number of listeners will sign a vigorously protesting petition more or less as a favor to a friend, or for some other inherently inappropriate reason. Excessive caution leads some persons having no radio sets to protest vehemently. For example, the following were among the letters of this sort received:

"Have no radio, but if any trouble ensues from WJZ, will come back at you for improvement."

Fears and Compulsions

—petition was signed by Mr. —. He has no radio but he thinks perhaps some day he will have one and he wouldn't like any interference."

To our regret, we are bound to confess that we were unable to eliminate potential interference perhaps to be experienced in the distant future by prospective radio listeners using poorly selective receivers. However, there was a redeeming and bright side to the situation in the form of splendid letters of enthusiastic commendation which were received from great groups of listeners.

The total number of complaints was less than 1,500. Only a little over 2 per cent of these remained dissatisfied, which is a most satisfactory result. It may safely be stated that these figures are far below the impressions which might have been gained from the press at the height of the initial dissatisfaction when interference from the Bound Brook station was first experienced. Sensational reports under such conditions obviously require liberal discounts before acceptance.

Few Dissatisfied

In other words, only a few hundredths of one per cent of the total listeners to the station remained dissatisfied because of interference. Certainly the proportion of dissatisfied listeners in the radio audience of a high-power broadcasting station is less than one out of every thousand, which state of affairs represents an overwhelming verdict in favor of such broadcasting and a degree of public favor probably unattained by any other entertainment or educational enterprise.

TELLS ALL TIME



(Radio World Staff Photo)

SO THAT you may be able to convert your time to those remote parts of the world where the DX stations abide, a novel clock, such as shown above, may be employed. If it is 12 P. M. in N. Y., at a moment's glance you may see that it is 5 P. M. in London. But be sure to get the day right or you'll be all wrong. Recourse to the encyclopedia will give one ready knowledge of the mere matter of time.

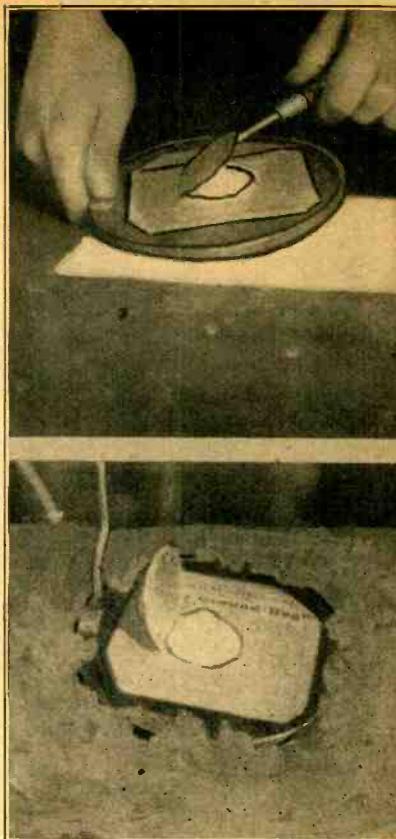
WRNY AND WSB LISTINGS

The following are correct listings of two stations which were erroneously listed in the Nov. 6 issue:

WRNY—Experimenter Publishing Co., N. Y. City—373.8 meters—802 kc.

WSBC—World Storage Battery Co., Chicago, Ill.—288.3 meters—1,040 kc.

SYNTHETIC GROUND



(Radio World Staff Photos)

IF YOU live in the country and cannot obtain moist earth for a ground or haven't the time to keep the earth moist, a ground such as shown above may be employed with wonderful results. It is known as the "Yale Ground Hog" and consists of two saucer shaped pieces of copper, filled up with special chemical compounds which have the property of attracting and retaining moisture. In the top photo, we see the special compartment which allows the chemicals to come in contact with the earth, being opened before it is placed into the earth, while below we see the ground being placed in the earth.

DOCTOR TALKS! TO GIRL ON MARS

Though Planet Is Only 42,000,000 Miles Away, Radio Messages Fail—Telepathist "Speaks" to Girl Friend, Camaruru

Using super sensitive multiple tube receivers which tuned from 10 to 50,000 meters, radio fans as well as professional and amateur astronomers throughout the world, made concentrated attempts to get signals from Mars when the planet was 42,000,000 miles away from the earth, a point of utmost proximity.

Some fans say they heard a mysterious letter M on a very high wavelength, probably about 25,000 meters, while others say they heard this signal at about 75 meters. Many experienced radio engineers laid this signal to a joke on the part of some amateur with a high-powered transmitter.

Dr. H. Mansfield Robinson, well known English telepathist, claimed that he was the first one to send a message and receive an answer from Mars. He stated that he spoke to a girl named Camaruru, whom he states is a great friend of the director of the largest radio station on the planet. Sir Oliver Lodge, the famous English scientist, said that it is impossible to get in touch with this red planet, since neither the Morse Code nor the English language is understood there.

Many scientists insist that there is no animal life on Mars and are confused about the Camaruru matter, but promise to give it "serious consideration."

Radio University

When writing for information give your Radio University subscription number.

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., New York City.

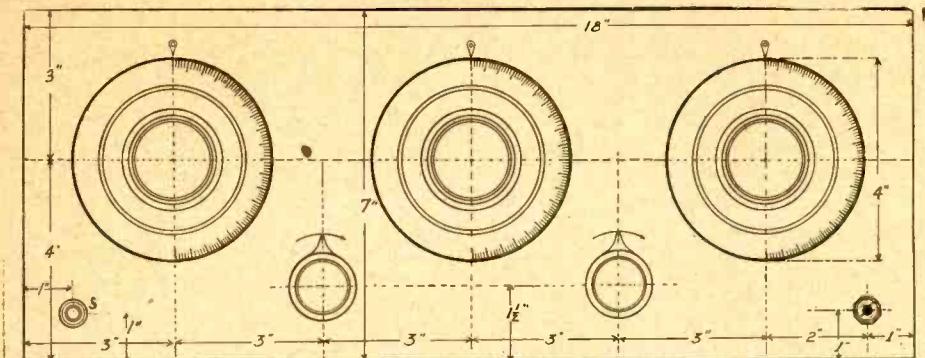


FIG. 457.
The panel layout for the receiver requested by Larry Dowels.

I AM going to build the 1-tube reflex receiver shown in Fig. 429 and described in the Radio University columns of the Sept. 18 issue of Radio World. (1)—Can a 3-circuit tuner, consisting of a 10-turn primary and a 40-turn secondary wound on a $\frac{3}{4}$ " diameter tubing with a radio frequency transformer to match be used? The tickler for the tuner is wound on a $\frac{1}{4}$ " diameter tubing and consists of 36 turns. No. 22 double cotton-covered wire is used for the primary-secondary windings, while No. 26 single silk-covered wire is used for the tickler. There is no spacing between the primary and secondary windings on either the tuner or RFT. (2)—How should the primary and secondary of the tuner be connected?—Fred James, Newport, R. I.

(1)—Yes. (2)—The beginning of the primary winding is brought to the antenna post. The end of this winding is brought to the ground post. The beginning of the secondary winding, which is nearest the ground post connection, is brought to the A minus post. The other terminal of this winding is brought to the grid post of the socket.

* * *

I WOULD be very pleased to have a panel layout for the 5-tube receiver shown in Fig. 443 in the Radio University columns of the Oct. 16 issue of Radio World. I wish to use a single rheostat for both RF-AF tubes and a jack at the output.—Larry Dowels, Newark, N. J.

In Fig. 457, the panel layout for this set is shown. The panel is of the 7×18 " type. The single circuit jack that you have is in the right hand corner, while the filament switch is in the opposite corner. You will note that provision is only made for two rheostats, as you desired.

* * *

I HAVE two Remler variable condensers, one is of the .0005 mfd. type, while the other is of the .00035 mfd. type. I am contemplating building the Diamond of the Air, using these condensers. Will you please tell me how many turns of No. 20 d.c. wire to wind on 3" diameter tubing, to constitute the radio frequency and tuning coils?—Peter S. Berg, Rice Lake, Wisconsin.

The primaries for both condensers consist of 10 turns. The secondary for the .0005 mfd. condenser consists of 44 turns. The secondary for the .00035 mfd. condenser consists of 59 turns. Allow a $\frac{1}{4}$ " space between the windings. You will have to use a $\frac{1}{4}$ " diameter tubing for winding the tickler, which consists of 36 turns, using No. 26 single silk-covered wire. This tickler is inserted in the tubing where the .0005 mfd. variable condenser is employed.

* * *

I WOULD like to build the 4-tube

Diamond of the Air. I have some 3" diameter tubing, a .00025 mfd. variable condenser and a .0005 mfd. variable condenser. Can I use an RF coil containing a 10-turn primary and a 65-turn secondary with the .00025 mfd. variable condenser and a tuner coil containing a 10-turn primary and a 45-turn secondary with the .0005 mfd. condenser? (2)—How many turns and what diameter tubing should be used for winding the tickler? I expect to use No. 24 silk over cotton-covered wire for the primary and secondary windings and No. 26 single silk-covered wire for the tickler. (3)—Would two audio transformers of the $\frac{3}{4}$ to 1 ratio type be O. K. to use?—Gordon Whelpley, 3623 East 131 St., Cleveland, Ohio.

(1)—Yes. (2)—A $\frac{1}{4}$ " diameter tubing containing 36 turns. (3)—The results will be very satisfactory.

* * *

I BUILT the 1926 Model Diamond of the Air, but have not been very successful. I rebuilt the set, but with no improvement. I am using all the parts specified. I hear signals in Jack 2, but when I try Jack 3, I don't hear anything. The tubes all light and I have checked the wiring many times. Where could the trouble lie?—John Kambarn, 364 West 51st St., N. Y. City.

First test Jack 2. Possibly when the plug is taken out, the inner terminals do not make contact with their respective outer terminals. If you will short the two top and the two bottom terminals, you will correct this, if it is the cause of the trouble. Test the plate resistors for open circuits. Also test the AFT for short or open circuits. These tests can be made with the aid of a $\frac{1}{2}$ volt battery and a pair of phones connected in series. Test the plate and grid terminals in the sockets in the AF circuit for proper contact.

* * *

WHO IS the program director of KGW, located in Portland, Ore.? How much power do they use? (2)—Who is the program director of station KOIL, located in Council Bluffs, Iowa? (3)—Is Beatrice Bangs an announcer at station WTIC, located in Hartford, Conn.? (4)—How much power does KYW, located in Chicago, Ill., use?—Joseph Thomas, East Pittsburgh, Pa.

(1)—Miss Meri Rice. This station, as last reported, uses 1,000 watts. (2)—Howard Martin, who is an announcer as well. (3)—Yes. (4)—As last reported, 3,500 watts.

* * *

I HAVE built a receiver very similar to the 2-tube regenerative receiver shown in the Radio University columns of the Oct. 30 issue of Radio World. I use two stages of transformer coupled AF

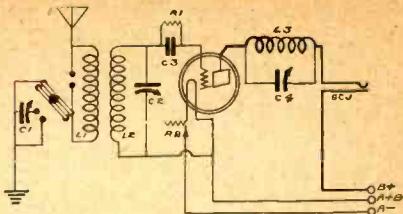


FIG. 456

How to use a series-parallel switch is illustrated in the above corrected diagram requested by Peter Vincent.

amplification, instead of one, and use ballast resistors to control the filaments of the AF tubes. The rotary coil is only $1\frac{3}{4}$ " in diameter instead of 2" and contains 30 turns of No. 22 DCC wire. The stationary coil as well as the rest of the parts are the same as per data in the magazine. Now my trouble lies in the detector tube, which will not oscillate. I have tried higher voltages, higher and lower grid leaks, reversed leads of the rotary coil, but to no avail. I get local stations, but with no pep behind them. I think this is the non-oscillatory state of the tube, which oscillates in other receivers.—William Logan, Canton, O.

The trouble lies in the rotary coil. It should contain at least 36 turns. Try a .001 mfd. fixed condenser across the first AFT.

* * *

HOW CAN a series-parallel switch be used in a 1-tube receiver, such as that shown, to tune in the higher wavelengths? That is, I have a 100 foot antenna, with which I receive excellent results on the low wavelength stations or those below 360 meters. I do not wish to take this antenna down, nor do I wish to change its length. The primary L1 contains 10 turns. The secondary L2 contains 44 turns. Both are wound on a 3" diameter tubing, using No. 22 double cotton covered. The plate coil L3 consists of 35 turns, wound on a 3" diameter tubing, using No. 22 double cotton covered wire. The secondary and plate coil are each shunted by a .0005 mfd. variable condenser. The filament of the tube, which is of the —01A type, is controlled by a 20 ohm rheostat. A 6-volt A battery is used for lighting the tube. C3 is a .00025 mfd. fixed condenser. R1 is a 2 megohm grid leak. I use a 45 volt B battery. I have another .0005 mfd. variable condenser. Can this be used?—Peter Vincent, Kalamazoo, Mich.

The condenser you have can be used and should be hooked up as per Fig. 456.

* * *

I HAVE two .0005 mfd. variable condensers. Can I have the circuit diagram of a 4-tube receiver, employing a stage of tuned radio frequency amplification, a tuned detector stage with the .0005 mfd. condensers, and two stages of transformer coupled audio frequency amplification. The first tube should be reflexed, so that it also acts as an audio frequency amplifier. Please give the circuit constants.—Frank Krammen, Plattsburg, N. Y.

A circuit diagram of a receiver containing the requisites you mention, is shown in Fig. 458. The primaries, L1 and L3, consist of 10 turns, while the secondaries, L2 and L4, consist of 44 turns. Each primary and secondary is wound on a 3" diameter tubing with a $\frac{1}{4}$ " spacing between the windings. No. 24 double cotton covered wire is used. Both rheostats R2 and R3, in the RF-AF and detector circuits are of the 20 ohm type, controlling the filaments of —01A type tubes. The filaments of the straight audio amplifiers are controlled by a single ballast resistor, R4, of the $\frac{1}{2}$ ampere type. C3 is a .001 mfd. fixed condenser. C4 is a .00025 mfd. fixed grid condenser. The grid leak is of the 4 megohm type. AFT1

and AFT2 are low ratio, 3 to 1, audio frequency transformers. AFT3 in the reflex stage, may also be of the 3 to 1 ratio type or higher, e. g., 4 to 1. S is the filament switch. The plates of the RF-AF, detector and AF tubes are connected to individual B posts, e. g., the detector plate, B plus 1, equals about 45; the RF-AF plate, B plus 2, equals about 67½ volts, while the AF plates, B plus 3, equals about 90 volts. The audio output is taken via a single circuit jack. The F posts of both audio frequency transformers are connected to a C minus post. No connections are provided for the use of a power tube. The C plus post is connected to the A minus post. Note the connections of the grid returns of the detector and the RF-AF tubes; the detector going to the A plus and the RF-AF going to the A minus. This set is very simple to tune. Both distant and local stations should be received with good volume and quality. The filament control of either the RF-AF or the detector tube is not critical, only one adjustment being necessary. As a matter of fact, ballast resistors can be used here with the same results.

* * *

WOULD YOU please publish a circuit diagram of a 5-tube receiver using a stage of tuned RF amplification, a non-regenerative tuned detector and three stages of resistance coupled amplification supplying all plates with one B voltage? Please give data for the coils, resistors, etc. I wish to use two .00035 mfd. variable condensers.—James Fitzpatrick, White Plains, N. Y.

Such a circuit is shown in Fig. 459. The primaries consist of 10 turns. The secondaries consist of 70 turns. Each primary and secondary is wound on a 2½" diameter tubing, using No. 22 double cotton-covered wire, with ½" spacing between the windings. C1 and C2 are the .00035 mfd. condensers. The filament of the RF tube is controlled by a 20 ohm rheostat. The filaments of the detector and AF tubes are controlled by a single 6 ohm, 1½ ampere rheostat. The resistors in the plate circuits of the AF amplifiers are of the .1 megohm type. The first grid resistor R5 is of the 1 megohm type. The second grid resistor R7 is of the .5 megohm type, while the last grid resistor R9 is of the .25 megohm type. The fixed condensers C5 C6 C7 are of the .25 mfd. type. C4 is a .00025 mfd. fixed bypass condenser. The familiar .00025 mfd. and 2 megohm grid leak combination is used. As you requested, a single B voltage is applied, e. g., 90. If this voltage causes the RF tube to oscillate, break the lead and run to a separate B post, supplying it with 67½ volts. The C battery is of the 4.5 volt type. A filament switch may be inserted in series with the A plus post. The -01A type tubes should be used throughout or the -01A tubes can be used in the RF and the detector stages, high mu in the first two AF and a low mu in the last AF stages.

* * *

WHAT IS the approximate inductance of the primary and secondary windings of an AFT at 1,000 cycles wound as per:—the primary consists of 4,500 turns, the secondary consists of 11,000 turns, both being wound with No. 40 enameled wire. The laminations are 1¾" by 2¼" and is of the silicon steel type, the core being 10 mil thick. The closed core is used. (2)—What is the resistance of the primary and secondary windings of such a transformer?—William Forrest, Long Island City, N. Y.

(1)—The inductance of the primary is about 8 henries, while the inductance of the secondary winding is about 50 henries. (2)—The resistance of the primary winding is about 1,100 ohms, while the resistance of the secondary winding is about 3,680 ohms.

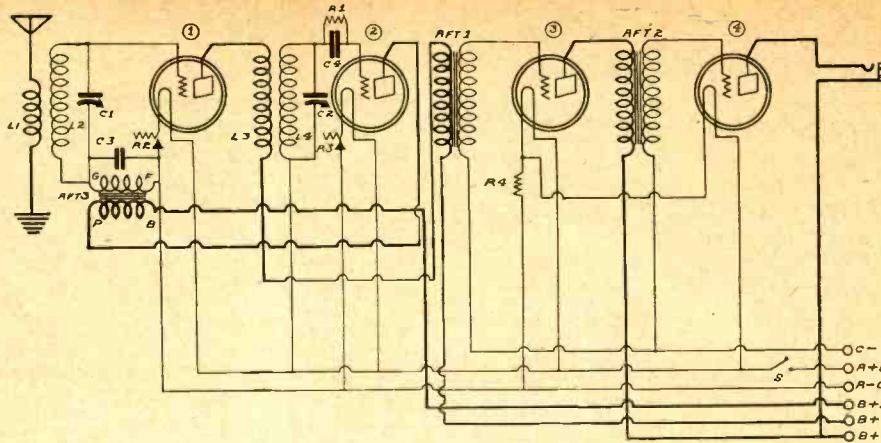


FIG. 458
The circuit diagram of the 4-tube receiver, requested by Frank Krammen.

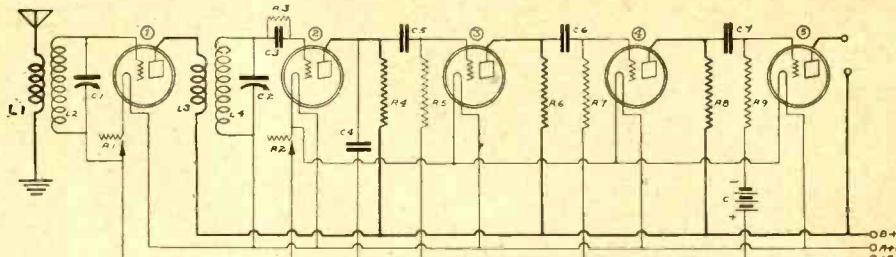


FIG. 459
The circuit diagram of the 5-tube receiver, using three stages of resistance coupled audio frequency amplification.

I AM building a wave trap and have a .001 mfd. variable condenser. How many turns should be wound to constitute the primary and secondary turns of the coil? What size wire should be used? How should it be connected, when used in conjunction with a standard five-tube neutrodyne manufactured receiver?—P. Barnes, Clifton, West N. Y., N. J.

The primary should consist of 10 turns. The secondary should consist of 33 turns. Wind on a tubing 3" in diameter and use No. 22 double cotton-covered wire. Allow a ¼" space between the windings. The beginning of the primary winding is connected to the antenna post, the antenna connection from the set being disconnected. The end of this winding is connected to the antenna post on the set. The beginning of the secondary winding is connected to the rotary plate post of the .001 mfd. variable condenser, while the end of this winding is brought to the other or stationary plate terminal of the condenser.

but when I installed them, I was greeted with scratchy and noisy signals. The connections were not changed at all. Nothing was touched in or outside of the set. The tubes were tested in another set and worked O. K. The A battery is fully charged and operates tubes in other sets satisfactorily. The antenna and ground is O. K. Every connection is solid, this being checked by electrical tests for continuity. Could the trouble be in these B batteries, which when tested with a voltmeter, give the correct voltage?—John Marls, New Orleans, La.

Suggest you place a pair of phones directly across the plus and minus posts of the B batteries. If you hear any noise, then you have found the trouble. It would probably be due to a dead cell in the series of cells. The required voltage is obtained because of an over sized cell. The dead cell introduces a high resistance in the circuit. Suggest you place a new grid leak in the set.

* * *

I BUILT a 3-tube regenerative receiver, using a 3-circuit tuner and two stages of transformer coupled audio frequency amplification. The results were great. Recently I bought new B batteries,

BY PLACING the A plus and B minus together, do I gain the 5 volts of my storage A battery in with my B battery supply?—Charles Mann, N. Y. City. Yes.

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Name

Street

City and State

WLWL'S BEAT ANNOYS FANS IN CLEVELAND

**Listeners' League Charges
N. Y. Station, on 384
Meters, Interferes with
Local Broadcaster,
WTAM, 389 Meters, De-
spite 300 Miles That In-
tervene**

Asserting that the new wave taken over by WLWL, the broadcasting station of the Paulist Fathers in New York City, is causing interference with the programs from their local station WTAM, the listeners League of Cleveland has transmitted a note of complaint to the directors of WLWL and similar communications to Secretary Hoover and the National Association of Broadcasters. The letter to the station reads:

"Our members and listeners in general throughout this district are clamoring for relief from the serious interference you have caused. Your broadcasting on 384 meters with high power interferes with WTAM on 389 meters. The latter station is an old favorite in the Middle West and listeners resent your intrusion."

"You now broadcast on the same wavelength as WMBF of Miami Beach, Fla., thereby excluding them from us. Your wavelength also is reported as varying usually above 384 meters.

"Your interference is cost you the good will of listeners in the Middle West, so we are calling your attention to this condition, and trusting that you will eliminate this interference at once."

Station WLWL was one of the last broadcasters to make the shift in wavelength after the authority of Secretary Hoover was removed by the Attorney-General's ruling and at the time of the change the station was almost alone in its wave channel of 288 meters. An announcement of WLWL officials, at that time, stated that the move was made in defense of its own position.

When asked if such a letter had been received in New York, an official of the station said, "Station WTAM and WLWL are working harmoniously to eliminate interference. With two such high grade stations over 300 miles apart a separation of 10 kilocycles allows for a high standard of reception."

H H K Mystery Solved

WASHINGTON

The location of a mystery station has at last been cleared up by the Department of Commerce. For the past few weeks a number of fans have been hearing a station which signed itself "HHK" at Port Au Prince, Haiti. According to the records the call HHK was assigned to Siam. Recently it has been learned that HHK was reassigned to a Government station at Port Au Prince, which operates on 361.2 meters.

THEIR MUSIC THRILLS NATION



CESARE SODERO, director of the WEAF Grand Opera Company, which is heard in tabloid Grand Opera presentations, through stations WEAF, WJAR, WCCO, WCAE, WCSH, WLIT, KSD, WDAF, WRC and WSAI, every Monday evening at 10:00 P. M.



FRANCES SEBEL, lyric soprano of the WEAF Grand Opera Company, who is heard in the Grand Opera presentations, by this company, through WEAF, WJAR, WCCO, WCAE, WCSH, WLIT, KSD, WDAF, WRC and WSAI, every Monday evening, at 10:00 P. M.

Two Waves Used By Station WOK

As an explanation of the use of two wavelengths by station WOK, C. J. Cory, president, made the following statement:

"The Government established several years ago a series of high powered lanes in the Chicago district, these lanes being established so as to allow 50,000 cycles separation between all Chicago stations. Roughly, the lanes are as follows: 217, 226, 238, 250, 265, 275, 302 and so on.

"WOK has been using half time on 217 until recently, when a new transmitter was installed, destined to operate on a higher wave. Half time on the band of 238 being occupied only by WHT for one and a half hours each evening it was decided to put the new transmitter on the 238 band for the present. WOK is, therefore, operating one transmitter part time on 217 and another transmitter part time on 238.

"The operation on 238 in no way crowds any other station in the Chicago district, as it is 60,000 cycles above 226 and 60,000 cycles below the 250 meter band. The reach of one transmitter on 238 meters enables WOK to reach a large number of listeners who own antiquated sets unable to tune down to 217 meters. The use of the 238 bands by WOK is with the full knowledge of the department, they having formerly suggested that WOK use this position."

MUSIC FROM NAA

WASHINGTON

The powerful naval station, NAA, at Arlington, Va., will send out some snappy music besides the usual broadcast of time signals and weather reports. Prominent among the concerts, to be sent out will be that of the Pan-American programs of the Army band. This station uses 1,000 watts. The programs are sent out on 435 meters.

FAR EAST LIKES RADIO

Having completed a long tour through the Orient, Dean Emery R. Johnson of the Wharton School of Finance and Commerce of the University of Pennsylvania, announced that the automobile and radio were the two most powerful influences in the modernization of the Far East. Large stations are being erected rapidly, he said. The stations that already exist are very popular.

FORTY ST BEING

82 Others Contemplated, Survey Shows—Chicago —Congress

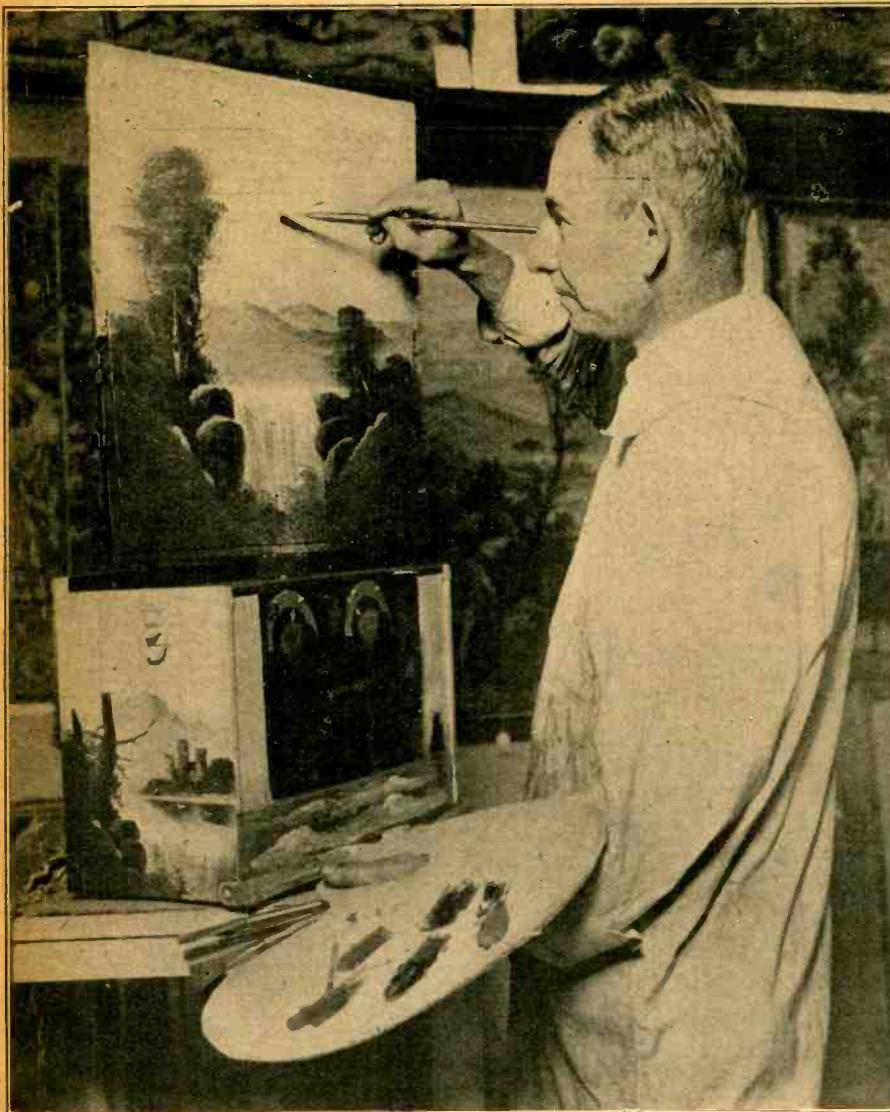
WASHINGTON

A check-up just completed by the Department of Commerce reveals that 40 new stations are actually under construction and that 82 others are contemplated, construction of which may begin immediately.

The survey was made for the information of officials of the department and for members of Congress who are anxious to learn the extent of the damage caused by the breakdown in radio regulation. Radio inspectors throughout the country were requested to check up in their districts and report the number of new stations since regulation failed, the number that have changed location, power, wavelength, stations under construction and those contemplated.

The Department plans to prepare such

PUTS ON ARTISTIC TOUCH



ONE of the unique exhibitions at Chicago recently was the artistic painting by Henry P. Englehardt, done on a radio set.

STATIONS ERECTED

Department of Commerce District the Most Active Gets Report

a summary twice each month so that Congress may be fully informed of developments.

The survey shows that up to October 15 there was a total of 63 new stations; 25 stations changed their location; 63 stations increased their power; 62 stations changed their wavelength, in the majority of cases from the old class A to the class B band between 280 and 550 meters. 40 stations are under construction, and 82 new stations are contemplated.

Greatest activity is shown to be in the ninth district, with headquarters at Chicago. In the Chicago district, 22 new stations have been licensed, four have changed location, 24 have increased their Boston, has five new stations and three with increased power.

stations are preparing to increase their power and 21 new stations are contemplated.

The second district, with headquarters at New York, is second with 11 new stations, 12 contemplated new stations, 6 stations with increased power, 8 stations with changed wavelengths, 2 stations under construction and 10 stations preparing to increase their power.

The fifth district, with headquarters at New Orleans, is next with 10 new stations, 5 stations under construction, 9 stations planned, 11 stations preparing to increase their power, 3 stations having changed locations and 4 changed wavelengths.

In the eighth district, with headquarters at Detroit, there are 6 new stations, 10 with increased power, 3 with changed wavelengths, 1 under construction, 1 preparing to increase its power, and 27 new stations planned.

The seventh district, with headquarters at Seattle, has 7 new stations, 9 with increased power, 7 with changed wavelengths, 2 under construction, 6 planned, and 3 preparing to increase power.

The sixth district, with headquarters at San Francisco, has 2 new stations, 4 with increased power, 12 changed wavelengths, 4 stations under construction and four planned.

The first district, with headquarters at Boston, has five new stations and three with increased power.

ONE STATION LENDS OTHER USE OF PLANT

WEBJ Sends Out Programs of WRNY, Which Is Moving Its Antenna to the Other Side of the Hudson

WRNY broadcast its program over WEBJ's radio transmitter for three days recently.

WRNY was moving its own equipment from the Hotel Roosevelt, where it had been located for 17 months, across the Hudson River to the Palisades, opposite 181st Street, New York City. Its studios, however, will remain at the Roosevelt. Heretofore when a station moved its transmitter to a distant point it had to go off the air for several days, as it takes a good deal of time not only to move the machinery, but also to re-erect it, tune it up, and perform numerous other details on it before the broadcasting can be resumed.

Not wishing to curtail its activities for even one minute, WRNY decided to find out if there was any station available in the metropolitan district which uses only part time, and whose transmitter could be employed during the moving period. Arrangements were finally made with WEBJ, which station consented to have WRNY's programs go over its transmitter.

A land line connected the Hotel Roosevelt studios with the transmitter of WEBJ, which is located at 129th Street and Third Avenue, New York City, and WRNY's programs thus emanated from WEBJ's aerial at that point. WEBJ's wavelength normally is 273 meters but for three days it was raised to 374 meters, the wave of WRNY. This was probably the first time in the history of broadcasting that such a plan was put through.

WLWL, through Father Cronin, also tendered its equipment, as the station is on the air for only part of the day. It is particularly significant of the harmony existing between the New York broadcasters that both WEBJ and WLWL offered the use of their transmitters at no monetary consideration, simply as a matter of courtesy and good will to the listening public.

The negotiations with WEBJ were made between Charles J. Wolfe, General Manager of WRNY, and G. P. Geer, General Secretary of the Third Avenue Railways System, which owns WEBJ, W. J. Quinn, Chief Electrical Engineer of the Company, and Harry A. Bruno, Program Director and Announcer of WEBJ.

PORtugal HEARS SYDNEY

SYDNEY, Australia.

E. T. Fisk, director of the Amalgamated Wireless of Australasia, announced that radio signals from Sydney were received aboard the specially equipped steamship Jervis Bay which was steaming off the Portuguese coast. This is a record for such communication.

A THOUGHT FOR THE WEEK

THREE'S many a radioist today who knows the beauties of Chopin and Bach but whose musical education, prior to the coming of radio, was confined to an intimate knowledge of "Hello! Hello! Be my Baby" or "There's Always a Glass For Every Drop." Verily, radio has done its share.

RADIO WORLD

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HENNESSY RADIO PUBLICATION CORPORATION
145 WEST 45th STREET, NEW YORK, N. Y.
(Just East of Broadway)

ROLAND BURKE HENNESSY, President

M. B. HENNESSY, Vice-President

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1 Page, 7 1/2" x 11"	462 lines.....	\$300.00
1/2 Page, 7 1/2" x 5 1/2"	231 lines.....	150.00
1/4 Page, 8 1/2" D. C.	231 lines.....	150.00
1/4 Page, 4 1/2" D. C.	115 lines.....	75.00
1 Column, 2 1/2" x 11"	154 lines.....	100.00
1 Inch.....	10 lines.....	10.00
Per Agate Line.....		.75

Time Discount

52 consecutive issues.....	20%
26 times consecutively or E. O. W. one year.....	15%
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WEEKLY, dated each Saturday, published Wednesday. Advertising forms close Tuesday, eleven days in advance of date of issue.

CLASSIFIED ADVERTISEMENTS

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

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

Marconi Sends Messages on Beam

After years of experimenting, William Marconi presented his latest development in radio transmission, the Marconi beam system. He sent a radio wave in a limited path toward a specific objective, instead of radiating in all directions. At the very first test, held between London and Montreal, messages were exchanged at a rate of 200 words per minute.

The service between London and Montreal will be operated by the British Post Office Department. The Marconi Co. plans, however, to operate beam systems with the companies in the United States and other portions of the world. A transmitting station is now being constructed in England to convey messages to the United States, the Radio Corporation of America having control in this country.

The Thrill of Mystery



A POWERFUL ray of light, upon which audio frequencies were impressed, was directed toward a special receiver at the recent Chicago Radio Show. The light wave is not changed to the slower radio waves and then changed back again to audio waves in the receiver. The light wave is used as the carrier and the audible frequencies impressed directly, the resultant still being light. The receiver then amplifies and rectifies the light rays and reproduces audio waves. Tremendous amounts of power are used, so that the light can travel a distance. One of the advantages claimed for this experimental system is that if the light is powerful enough and used in an open space, little or no distortion will take place.

ACH day brings new evidence that electricity is only meagerly understood. Indeed, we must define it even today by what it does, rather than by what it is. We engage in scientific groping, more or less, to penetrate its mysteries and to wring from its half-willing recesses the rewards we seek. In general life we always use it more than we understand it. Much of its thrill comes from what it hides, rather than what it reveals. We classify agencies and effects, and some we call electrical, others mechanical, yet some day we may come to know electricity as far more pervading than is the common belief. Today we take vibrations and when they ascend to a certain level we refer to them as electrical, while if they are somewhat slower than our arbitrary demarcation point we deem them mechanical. Who can say that sound itself may not win its place in the electrical field, even as light became known as electricity, its true form, only after years of intense study?

Can we put things to greater uses, really, than we have any notion of at present? Take light, for instance. It is electrical, being of exceedingly high frequency, far beyond the radio frequency that we know in transmission even at the shortest waves. Now successful experiments have been conducted with a light ray modulated with sound waves. (Not to be confused with Marconi's directional beam transmission.) Some crude attempts have been made also to send light rays with telephony impressed upon them. Light dissipates fast, for any such practical purpose, but some genius of tomorrow may rise from the ranks of the tinkering schoolboys of today to invest light with far more enduring, penetrating and useful qualities than we can find in it at present.

A few months ago some workmen, high up on a building on which a searchlight was playing, engaged in whispered conversation that was heard by a group surrounding the searchlight 200 feet away, and the only explanation offered was that their voices had been transmitted on the beams of light. We need not be too proud, therefore, of our electrical achievements, great as they are. Nature casts hints that we seize upon without giving her credit.

Misplaced Regrets

ANNOUNCERS even at large broadcasting stations have fallen into the habit of expressing regret at the interruption of a program due to an S O S. Obviously only the very slightest regret, if any, need attach to the program interruption. An S O S comes out of the sky, so to speak, and usually even the stations do not know what is the specific occasion. Nevertheless they shut down, because the S O S always is fraught with dire possibilities, and life and limb are somehow in jeopardy in almost every instance, even if no ship is in immediate danger of sinking.

Small stations for a long while have patronized the program artists by emphasizing what the public missed because an S O S halted broadcasting. The humane emotions that possibility of disaster should engender seemed hollowly absent. Larger stations usually show better sense, but this has been abandoned lately even by some of them.

For instance, when the Peruvian submarine R1 recently was helpless 180 miles southeast of Cape May, with engines broken down, and the Navy sent out an S O S, even the announcer at WEAF deplored the artistic loss to the public due to the short cessation of broadcasting. While such remarks may sound consoling to advertisers who buy time on the air—for whose benefit they are usually made—they tend to make broadcasting appear commercialized to the point of apathy if not cold-bloodedness.

Politics on the Air

THIS has been the greatest radio year in political history, because candidates did more talking into microphones than ever before. The flexibility of even great chains, whose programs were made up and announced long before some candidates had arranged to speak at the same time, enabled a station to carry the speech locally, while the rest of the chain went on with the announced program. No doubt future political campaigns for State offices and the like will be more expertly arranged, so that all advance programs will contain announcement of the political orators and their subjects, without any suggestion of disruption to accommodate an exigency.

For national candidates, such as President and Vice-President, where the interest is countrywide, the radio offers still greater service since any chain may well carry the program and hold all the hearers' interest.

The Usual Compromise

THE manufacturers are preparing for the Christmas radio trade. They have selected the models that they will push to the utmost, and this has been done with due regard to the divided household authority surrounding the purchase. The husband furnishes the money, the wife makes the selection. What could be sweeter?

Radio Is Called Musical Uplifter

Radio will make America the music center of the world, in the belief of Frank Reichmann, vice-president of the Chicago Broadcast Listener's League and an acoustical engineer.

"The countless opportunities for young artists to broadcast in the smaller stations throughout the country encourage the student musician," Mr. Reichmann said, "while the broadcasting by the best singers and musicians of the country in the concerts from the larger stations and the chains makes it possible for the musical beginner in the smallest town to hear the best artists and learn the best in music."

Not only is broadcasting educating the American public to a better appreciation of music, Mr. Reichmann explained, but it is educating the music students of the country to a higher appreciation of the nation's great artists.

With broadcasting in the United States covering more hours of programs and reaching a larger number of listeners than all the broadcasting stations in the rest

of the world the early supremacy of American artists is a foregone conclusion, is Mr. Reichmann's summary of the situation.

Pallophotophone Called Infringement

Charges that the Pallophotophone, a new talking motion-picture system, developed by the Radio Corporation of America, the General Electric Company and the Fox Film Corporation, is an infringement of patents held by Dr. Lee De Forest, inventor and patentee of the Phonofilm principle, were made in New York City by representatives of the De Forest Phonofilm Company.

The Phonofilm Company claims prior rights to patents covering the method of projecting talking motion pictures where sound is photographed on the same film. The new device is the invention of Charles A. Hoxie, an engineer of the General Electric Company, and consists of recording and reproducing parts with a motion-picture machine working in synchronism with the sound recorder.

KINDLY STAND BY

THE necessity for reduction of the number of broadcasting stations is directly proportional to the number of heterodyne whistles caused by one station's wave beating with that of some other station on a neighboring channel. From a reception point in New York City about half of the local stations in one test were afflicted with these annoying whistles, the steady, high-pitched, ineradicable nuisances that mar reception. Even WJZ was thus cursed when a certain other station was on the air.

The peanut whistle therefore is doing harm to radio. It became so prevalent only after the Department of Commerce found it had no power to regulate broadcasting, wavelengths, time on the air, wattage and the like. Thus stations felt free, as indeed they were free, to skip around the wavelength spectrum until they lighted on some spot most favorable to themselves. It is true that in many, if not in most instances the local inspector, representative of the Department of Commerce, was consulted. While his omission of dissent often was advertised as "official approval," it is hard to see where any power of approval resided. To minimize the evil the inspector lent his good offices in a gratuitous consulting capacity. The change he was powerless to prevent, he was likewise powerless to approve. There was to be a jumble and he tried to make it as bearable as possible.

* * *

When our best stations are rendered less effective and even somewhat annoying because of squatting neighbors, we are justified in feeling that these troublemakers, almost always stations of no artistic account, are in need of strict disciplining. And when Congress convenes next month, no doubt something finally will be done toward investing some agency with full authority to protect the listening public, and yet to do so without injustice to any stations.

* * *

Either there must be fewer stations or there must be a reassignment of the broadcast belt of wavelengths, so shorter waves are used, because there are more channels over a given stretch of meters at lower wavelengths than over the same metrical stretch at higher ones, as are used now. Against the proposal to utilize lower wavelengths are two strong arguments: (1) The electrical difficulties of transmission and reception, and (2), the wavelength range of sets now in use, or at least already manufactured or in course of production.

Systems of neutralization are predicated more or less on the present wavelength range. The industry would be severely hurt by any such change.

* * *

There seems to be a trend toward manufacturing sets to be placed in furniture of certain designs calculated to disguise the fact that the cabinet or console houses a radio set. A sounder trend would be to accentuate the fact that the container houses a radio set, and this would be consistent, also, with the concealment of unsightly accessories within the graceful piece of furniture. One of the most attractive designs is a set in a handsome cabinet of long-standing familiarity, placed atop a matched table which has ample room for housing batteries or eliminators.

—H.B.

Barawik Joins The Ranks of Set Producers

CHICAGO
The Barawik Company, one of the pioneer supply houses, has added, in addition to the regular line of parts, accessories and supplies, a line of factory-built

S. HAMMER RADIO CO.
303 Atkins Avenue, Brooklyn, N. Y.
Please send me FREE, Your NEW
RADIO CATALOG

Name
Address
City State
FILL OUT AND MAIL



World Radio Storage "B" Battery
12 Cell—24 Volt **275**

Proved value. Thousands of users find reception almost magical. Clear, true power—instantly and unendingly. Wise economy. Sturdy construction—Solid Rubber Case protection. Recommended for most anything. Endorsed and listed as standard by famous Radio Institutions including Pop. Radio Laboratories, Pop. Sci. Inst. Standards, Radio Eng. Lab., Lefax, Inc., and other Radio authorities. What more could be said? Extra Offer: 4 Batteries in series (96 volts) \$10.50.

Send No Money Just state number wanted and we will ship same day order received, by express or C. O. D. Pay expressman after examining batteries. 5% discount to cash with order. Remember—you save 50% on World Batteries.

WORLD BATTERY COMPANY
1219 So. Wabash Ave. Dept. 82 Chicago, Ill.
Makers of the Famous World Radio "A" Storage Battery
Prices: 6-volt, 100 Amp. \$10.00 120 Amp. \$12.00 140 Amp. \$13.00.
All 12-volt, 100 Amp. \$15.00 120 Amp. \$17.00
Set your radio dial at 288.3 meters for the World Storage Battery Station WSBC. Variety-New-Talent—Always Interesting & JERRY SULLIVAN—Director and Announcer—hi-CAW-go!

"How to Make a 36-inch Cone Speaker," by James H. Carroll. In **RADIO WORLD** for August 28, 1926. Mailed on receipt of 15c. **RADIO WORLD**, 145 West 45th Street, New York City.

sets of their own design and manufacture.

Under the direction of one of radio's greatest engineers, a complete line of receivers has been put on the market under the well-known Barawik trade-mark. This line consists of three distinct models—the simple 5-tube RF circuit with three-dial control in new designs of table models, built-in speaker models, and period console models; a two-dial model of six tubes, made up in various styles of cabinets and consoles, and a single-dial control model with 6 to 10 tubes, and in all the popular period furniture designs.

The complete line has been designed to meet the needs of its thousands of customers the world over who desire modern factory-built sets at moderate prices, and yet have the privilege of selection of the set desired, in the cabinet or console preferred by the customer.

A special catalog has been issued illustrating the new line and describing the individual construction features of the various models available. In writing for the catalogue mention **RADIO WORLD**.

Victoreen Rheostat

A rheostat with several distinctive feature is offered in the new Victoreen

Build It Yourself
Parts Complete **\$14.15**
Including Unit



In one evening and for 1/5 retail cost you can build the finest 3 foot Cone Speaker. Marvelous tone quality; every instrument in an entire symphony orchestra is clear, musical and distinct, even the very lowest. And the cost for ALL the parts—2 sheets Alabamra FON-O-TEX, Penn Back Rings, Unit Mountings, special Ambroid Cement and genuine

Penn Cone Speaker UNIT

designed especially for 3 foot Cone Speaker—is but \$14.15.

PENN Cone Speaker Unit is adjustable to the audio output of any set. Unit alone, \$9.50.

If your dealer cannot or will not get the parts for you, we will ship on receipt of price. Pamphlet, "How to Build a 3 foot Cone Speaker for \$14.15," sent for 10c., stamp or coin.

PENN RADIO SALES CO.
104 Fifth Ave. Suite 2021, New York City
Exclusive Selling Agents for G. R. Penn Mfg. Co., New York

manganin rheostat. Genuine manganin wire is used with double the usual number of turns of wire. This permits as fine an adjustment.

The Victoreen rheostat has a zero temperature coefficient no matter how warm the unit becomes the resistance remains absolutely constant.

Another feature of this rheostat is a third terminal which simplifies wiring.

The Victoreen rheostat is made with four resistances, 6, 10, 20 and 30 ohms. The distributor is the George W. Walker Co., Cleveland, Ohio.

Shore Electric Moves

The Shore Electric Co. well known choke coil and transformer manufacturers, have moved into a new spacious factory, located at 124 Cypress Ave., N. Y. City. They were formerly located at 64 University Place. New automatic machines for winding transformers and chokes have been installed. These wind the necessary number of turns, space the windings with insulation cloth, impregnate each layer and finally impregnate the complete winding. Many other new features, such as special lamination testing machines for measuring comparative strength, thickness and electrical ability and special automatic lamination insertion machines; binding, marking and stamping machines, have also been added. The company is contracting for the rights to manufacture the well known Hiler double impedance. They will continue making high grade power transformers for A and B eliminators, for filament and plate supply, for bell ringing purposes, for step-up work, etc., also choke coils, output chokes and audio frequency transformers.

LOOK UP DOWN INC.

SUPERHETERODYNE SPECIALIST
Complete parts for infra-dyne—Fenway Four, etc.
FREE Handsome Leatherette Bag and Data Book.
Send Ten Cents to Cover Mailing Cost.
CHAS. W. DOWN, M. E.
2030 Broadway N. Y. C. Phone: Trafalgar 5979



SICKLES

Shielded Tuned Radio Transformer

The ideal coil for the Na-aid Localized Control Tuning Unit, and for Truphonic Catacomb Assembly. Widely adaptable to all leading control units. This transformer is compact, sturdy, sharp-tuning. Prevents both outside and local interference.

PRICE \$2.00

Send for catalog

OTHER SICKLES

No.	Coil	Prices
24.	Browning-Drake	\$7.50 Set
18A.	Roberts Circuit	8.00 Set
25.	Aristocrat Circuit	8.00 Set

THE F. W. SICKLES CO.

140 UNION STREET
SPRINGFIELD :: MASS.

HOW TO BUILD THE BERNARD, the beautiful 6-tube thumb-tuning set, fully described and illustrated in the Oct. 16 issue. Send 15c for a copy. Namepieces for affixing to front panel free to all on special request. **RADIO WORLD**, 145 W. 45th St., N. Y. City.

IT HOWLS

Now it doesn't!

MC DONALD HOWL ARRESTER
(TRADE-MARK)

"It Stops that Howl!"

Slip one of these live rubber jackets over each trouble-making tube . . . and the Howl stops.

Remember the name! You can get it for every size tube. It sells for 75c each. Just ask your dealer, or write.

Sole Selling Agents for the U. S. A.

SPARTAN ELECTRIC CORPORATION
350 West 34th Street, New York City

Manufactured in the U. S. A. by the
SCIENTIFIC PRODUCTS CANADA, LTD.

"It Stops that Howl!"

R. C. L. In New Home

Due to the great expansion of their business during the past year, Radio Construction Laboratories, well-known to the trade for expert construction and testing work, have been compelled to move to vastly larger quarters at 156 Chambers Street, New York City. Here, with new machinery and the most modern testing facilities, they are equipped to handle any class and quantity of radio work. This laboratory is an authorized service station for the improved Browning-Drake, Samson, Daven, Victoreen, Bremer-Tully and Infradyne and can service other circuits. A special branch of the laboratory is qualified to test, build and repair any kind of alternating current eliminators and power packs. Their service is used and recommended by many of the leading authorities in radio. The acoustical branch handles speakers and phones and telephonic equipment as applied to radio uses. No charge is made for consultation and all work is under the direct supervision of R. C. Siemens, one of the pioneers in radio and a widely known Super-Heterodyne expert.

Change in Waves

Nearly every broadcasting station in the British Isles has changed its wave-length to conform to the general program for the allocation of wave-lengths throughout

New and Improved
FRESHMAN
MASTERPIECE

AT AUTHORIZED
FRESHMAN DEALERS ONLY

HARD RUBBER

SHEET-ROD-TUBING
Special Hard Rubber Parts Made to Order
RADION HARD RUBBER
PANELS ANY SIZE

Send for Price List
WHOLESALE RETAIL
NEW YORK HARD RUBBER TURNING CO.
212 Centre Street New York



VICTOREEN
Super Coils

Send for Folder
Geo. W. Walker Co.
6528 Carnegie Ave.
Dept. B Cleveland, O.

BLUE PRINTS

for

1927 VICTOREEN

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

Blue Print for

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

RADIO WORLD

145 West 45th St., New York City

Europe, reports Joseph D. R. Freed, president of the Freed-Eisemann Radio Corporation. Daventry, on 1600 meters, using 25 kilowatts of power, and Cardiff, on 353 meters using 1½ kilowatts, remain the same.

The changes follow:

Location	Call	kw.	Change in meters
Aberdeen	2BD	1.5	From 495 to 481.8
Belfast	2BE	1.5	" 440 to 326.1
Birmingham	.5IT	1.5	" 479 to 481.8
Bournemouth	.6BM	1.5	" 386 to 306.1
Bradford	2LS	2	" 310 to 294.1
Dundee	2DE	.2	" 315 to 288.5
Edinburgh	2EH	.5	" 328 to 288.5
Glasgow	5SC	1.5	" 422 to 405.4
Hull	.6KH	.2	" 335 to 288.5
Leeds	2LS	.2	" 321 to 297.0
Liverpool	.6LV	.2	" 331 to 288.5
London	2LO	3.0	" 365 to 361.4
Manchester	2ZY	1.5	" 378 to 384.6
Newcastle	5NO	1.5	" 404 to 312.5
Nottingham	.5NG	.2	" 326 to 288.5
Plymouth	.5PY	.2	" 338 to 288.5
Sheffield	.6FL	.2	" 306 to 288.5
Stoke-on Trent	6ST	.2	" 301 to 288.5
Swansea	5SX	.2	" 482 to 288.5

THE **DX** MARVEL ANTENNA

Do you want the best of reception?
Do you want your receiver to deliver 100%?
Do you want your operating cost cut?
The "DX" MARVEL ANTENNA does it.
As necessary to your receiver as good tubes.
It is scientifically correct and 100%

SELF-DIRECTIONAL

It gives the best because it is the best.
Ideal for apartment house dwellers.
It is designed and built to meet every need
and condition.

FOR

Distance, Volume and Selectivity

IT HAS NO EQUAL
Connect Your Receiver to One and Know What
Ideal Reception Is

EAST OF THE ROCKIES... \$10.00 POST
WEST OF THE ROCKIES... \$10.50 PAID
IN CANADA... \$11.50 PAID

Manufactured by

THE DX LABORATORIES
39 Soper Avenue, Oceanside
ROCKVILLE, N. Y.

HOW TO BUILD THE BERNARD, the beautiful 6-tube thumb-tuning set, fully described and illustrated in the Oct. 16 issue. Send 15c for a copy. Namepieces for affixing to front panel free to all on special request. Radio World, 145 W. 45th St., N. Y. City.

MAKE MONEY EVENINGS

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

O G FISCHER, 122 W. Austin Ave., Chicago, Ill.

Send for Latest **RADIO CATALOG** and GUIDE

Hot off the press—latest Radio Catalog and Guide for 1927, brimful of new ideas, 164 pages of special hook-ups with information—all free. Shows savings as high as 50% on sets and supplies. Be sure to get this thrifty illustrated book before you buy. It means money in your pocket. Standard guaranteed goods.

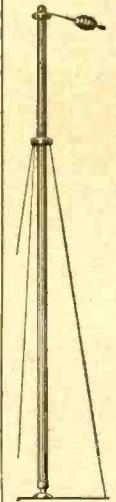
Write letter or postal now. Also please include name of radio friend.

BARAWIK CO., 560 Monroe Street, Chicago, U. S. A.

Bring in
Every
Station
on the
Air
With a

WAVE-X Condensing ANTENNA

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



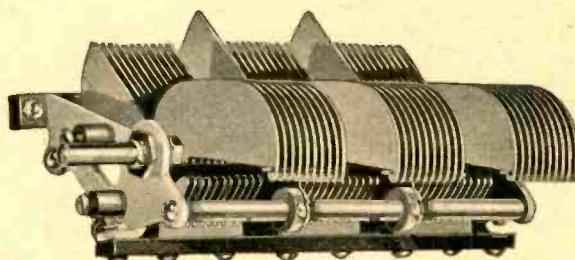
REDI-MAST FOR AERIALS

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

THE ZINKE CO.

1323 S. Michigan Ave., Chicago

THE PRESSED METAL MFG. CO.
Waukesha, Wis.



CONTINENTAL LO LOSS

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

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

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

Price \$9.50 Capacity .00035

Licensed under Hogan Patents 1014002

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

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

CHECK-UP GIVES SINGLETROL PEP

If after you have completely wired up the Singletrol described in the Oct. 30 and Nov. 6 issues and connected up the batteries, without obtaining any signals, yet the antenna and the ground are O. K., first check up on the wiring diagram care-

"B" BATTERY ELIMINATOR Only \$795



MONEY-BACK GUARANTEE

No more worry with "B" Batteries! Hook up a Roll-O "B" Battery Eliminator and forget battery troubles forever. This wonderful new invention means better reception, sharper tuning. Gives you more real pleasure from your set.

Completely Equipped—No "Extras" to Buy

Operates perfectly on direct or alternating current, giving up to 90 volts current, and using the full wave of the power supply. Simple directions enclosed—anyone can plug it in to any kind of set up to six tubes. Constant voltage gives set more power. Costs no more than set of good "B" Batteries. Solidly built in beautifully finished metal case, with genuine Bakelite top.

SEND YOUR ORDER NOW

Send \$100

Don't blame your set because run down "B" Batteries won't let it work right. Order your Eliminator NOW. Write name and address on a piece of paper, pin a dollar bill to it, and mail it TODAY. Pay postman balance (\$6.95 plus a few cents postage) when he delivers your Eliminator. Use it ten days. If not more than satisfied, return it and get your money back.

Roll-O Trick Charger, for either "A" or "B" Batteries, only \$3.95 (plus few cents postage). Send \$1.00 with order—balance C. O. D. Satisfaction guaranteed or money refunded.

THE ROLL-O RADIO CO.
Dept. P-9 Third and Sycamore, Cincinnati, O.

fully, marking each diagram lead gone over as O. K. with a red pencil. It is taken for granted that the filament circuits are rightly wired. Any deficiency in this circuit, would be due to a disconnected or broken wire in the rheostat, broken bus leads or in a worn out resistance wire. Now test the B supply, through the plate coils and primaries of the audio frequency transformers and jack. These continuity tests can be conducted with the aid of a pair of phones and a single 1½ volt A battery, connected in series. Test the grid returns through the secondaries. Test the fixed condensers, C5, C6 and C7. They

may contain an open or a short. Test the variable condensers, but in doing so, disconnect one of the leads going to the condenser. Test the secondary windings of the audio transformers. Test the core, seeing that it makes no contact with either the primary or secondary windings, or both. Be sure that all the grid returns of the RF and detector tubes are brought to the minus C post and to one terminal of the bypass condensers. Take out all the tubes and sandpaper the prongs, also tightening the grip on these prongs. Be sure that the grid leads are not running parallel to the plate leads. The grid leak, in this set is not connected across the fixed grid condenser as in most cases. One terminal goes to the grid post and the other goes to the A plus post. See that this connection has been followed. The cable wiring needs some attention, also. Although in most cases, the colors follow, it is best to test each lead for proper continuity with the battery and phones, so that as to be sure you do not reverse the

C A R T E R

New "Tip" Jack



Takes any standard cord tip or Carter "Imp" Plug. Good contact, minimum space required. Only two parts—heavy contact spring and nickel-plated mounting thimble. Mounts in ¼" hole.

Any dealer can supply

In Canada—Carter Radio Co., Limited, Toronto

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

HOW TO BUILD THE BERNARD, the beautiful 6-tube thumb-tuning set, fully described and illustrated in the Oct. 16 issue. Send 15¢ for a copy. Namepieces for affixing to front panel free to all on special request. Radio World, 145 W. 45th St., N. Y. City.

A&B Battery \$2 Charger ONLY

SATISFACTION GUARANTEED

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

R. B. SPECIALTY CO.

Dept. 308 East Third St., Cincinnati, O.

G

An Everlasting "B"

PROVED

Fort Riley, Kan.
Am getting wonderful results with my Eliminator and good reports from those I have sold.

Floyd M. Farwell,
Wire Chief, Sig. Det.

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

Reg. Firth.

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

Alfred A. Michand.

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

Frank J. Huver.

40,000 Radio Users Demonstrate Reliability and Wonderful Performance

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

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\$12.50

Complete!

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

A, B or C battery polarities. When the antenna or ground posts are pulled up for inserting the antenna and ground wire be sure that the grip on the leads beneath the panel have not been loosened. It is very possible that the insulation on the coil windings may have been rubbed off and is touching a bus lead. Check this up.

LIST OF PARTS

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

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

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

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

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

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

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

J—One Electrad single closed circuit jack.

LS—One Bruno light switch, less bulb.

R3—One Electrad 2-ohm power rheostat.

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

R1—One Lynch 2-megohm metallized fixed resistor.

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

One 7x21-inch front panel.

One 9½x20-inch subpanel, hard rubber or bakelite.

Two American Radio Hardware Co. aluminum subpanel brackets.

One Lynch single mounting for grid leak R1.

One C battery.

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

Ten lengths of stiff Acme Celatsite, vari-colored.

ACCESSORIES

One Swan-Haverstick aerial kit.

One Fil-Ko lightning arrester.

One Vitalitone cone speaker.

RESULTS

RESULTS EDITOR:

I have built the Bernard described by Herman Bernard in the Oct. 16 issue of RADIO WORLD, and am more than pleased with the operation. I have logged Chicago and Florida stations, besides all the locals. The selectivity is all that one can desire. I always find RADIO WORLD in the lead when it comes to the presentation of efficient circuits.

LEONARD M. ORR,
311 South 3rd St.,
Vineland, N. J.



Alden Processed
NA-ALD
Sockets and Dials
UX POWER TUBES installed in any set without rewiring by Na-Ald Adapters and Connectordials. For full information write Alden Manufacturing Co., Dept. S-28, Springfield, Mass.

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The Guide to Radio prices and Radio Quality. Our vast resources and radio experience have been utilized to assemble in one gigantic institution, the best and newest things in radio. The Randolph catalog is the great radio market place—a masterpiece of merchandising that befits our house—

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CATALOG CONTAINS OVER 2000 ITEMS, from the most beautiful, fully equipped console radio set, down to the smallest part or tool for the set builder—kits, parts and supplies of every type and style. All beautifully illustrated and interestingly described. Also valuable data of today's most fascinating and most wonderful achievement—RADIO.

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LATEST 1927 MODELS

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R. F. D. Box

City..... State.....

HOW TO BUILD THE BERNARD, the beautiful 6-tube thumb-tuning set, fully described and illustrated in the Oct. 16 issue. Send 15c for a copy. Namepieces for affixing to front panel free to all on special request. Radio World, 145 W. 45th St., N. Y. City.

WORLD'S FINEST LOUD- SPEAKER

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

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—if they send renewals NOW!

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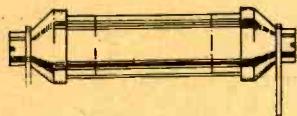
RADIO WORLD, 145 West 45th Street, New York City.
Enclosed find \$6.00 for which send me RADIO WORLD for twelve months (52 numbers, beginning and also without additional cost, Popular Radio, or Radio News, or Science and Invention, or Radio Dealer, or Radio (San Francisco), or Radio Age, or Boys' Life (or \$10.00 for two yearly subscriptions). (No other premium with this offer.)

Indicate if renewal.
Offer Good Until
November 27, 1926.

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Street Address
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Bretwood Bullet Condenser

for Your
Detector Grid Circuit



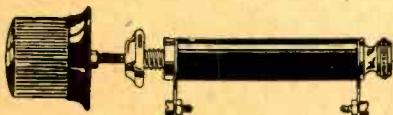
Capacity .00025 mfd. (actual size)

It Hits the Mark Every Time

Price 60 Cents

Just the Thing to Make Your
Detector Circuit as Sensitive as
Possible.

Let the Best Be None
Too Good for You!



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

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

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

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

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

Enclosed find \$1.50, for which send me one BRETWOOD Variable Grid Leak (or \$2.00 for leak with grid condenser attached) on five-day money-back guarantee. (Condenser alone, 60 cents.)

NAME

STREET ADDRESS

CITY and STATE

(Inquiries Invited from the Trade)

WBBM Discards Fill-In Programs

CHICAGO

Announcement of a complete change in program policy of WBBM has been made by Kelly Smith, station director. All evening programs now are made up entirely of special features.

There will be no studio programs from this station in the future except, temporarily, during the afternoon broadcast from four to six, central standard time.

I GUARANTEE

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

JOHN F. RIDER

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

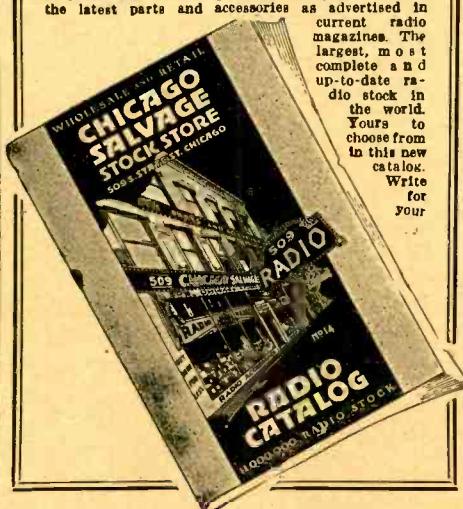
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Said Mr. Smith:

"In the past many stations have given studio programs consisting of a jumble of solos, both vocal and instrumental, that, when analyzed, was nothing but musical hash. It is our belief that the radio audience of today has become so discriminating that they will no longer listen to this kind of entertaining. Consequently, insofar as our night programs are concerned, we are dividing them up into periods, each a complete entertainment in itself and each different from the others."

Among the features that are to be included in the program are the Sunday and Wednesday night travelogues, conducted by Billy Spears, well known travel authority; the Monday and Thursday afternoon talks on interior decorating by Charlotte Voge and Leone Grandland; the Ultra-Modern composers' hour, under the direction of Lester D. Mather, concert pianist, on Tuesday; the "Bright Spots from Comic Operas," the Devon Comedy Four, the Isaac Walton League period and a frolic by the Belmont Theatre "gang" on Thursday nights; the Classical recital on Friday night; the "Log Cabin Days" review of old time songs on Saturday night; and the midnight sessions of the Nutty Club on Sunday, Wednesday and Saturday nights. In addition, dance music programs are being furnished by the Club Bellaire orchestra, the New Bismarck Hotel orchestra, and Vanity Fair Cafe orchestra.

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS.

10 CENTS A WORD
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A PAYING POSITION OPEN TO REPRESENTATIVES OF CHARACTER. Take orders shoes, hosiery, direct to wearer. Good income. Permanent. Write now. Tanners Shoe Mfg. Co., 11-710 C Street, Boston, Mass.

OVER TWO POUNDS BUILDER'S DATA, catalog, circuits—25c, prepaid. Twenty weekly mailings, newest "dope," \$1.00. Kladag Laboratories, Kent, Ohio.

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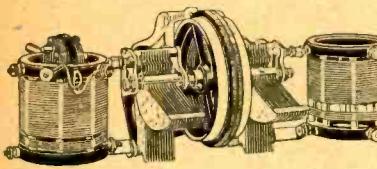
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6 TUBES—WONDERFUL TONE

Selectivity, Sensitivity and all good features. Tuned with your thumb. Beautiful enough to grace the finest home.



We can supply all parts for RADIO WORLD Circuits. Mail Orders Filled Promptly.

Circuit
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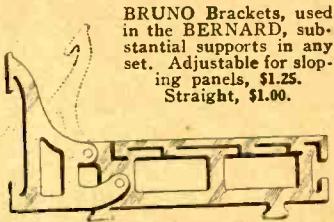
BRUNO UNITONE 2CB, used in the BERNARD. Price, complete, assembled, \$11.00. TK (illustrated), the same, with BRUNO 3-circuit Tuner, \$20.00. Model BD for BROWNING-DRAKE circuit, \$21.00. We can supply all BRUNO UNITONES.

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DIAMOND OF THE AIR

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

Complete kit of parts, with blueprint; ready to wire as specified by Herman Bernard.....



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Fixed Condensers and Resistors Specified by Herman Bernard in the "DIAMOND OF THE AIR"

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The 6-Tube Receiver of Exquisite Tone

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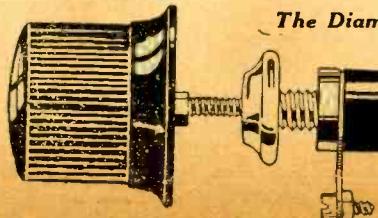
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AEROVOX products are also used in over thirty leading circuits and "B" ELIMINATORS.

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THE BRETWOODVariable Grid Leak
Certified for
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The Diamond of the Air Owes Some of Its Efficiency to This Leak

NORTH AMERICAN BRETWOOD CO., 145 West 45th Street, New York City

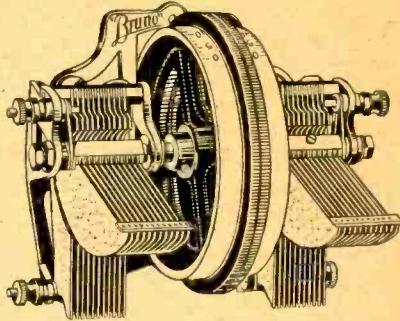
UNITUNE 2CB



used in the BERNARD .00035 mfd. straight-line frequency condensers mounted on an aluminum frame, a bronze panel plate and two drums, with scale. This unit is a handsome addition to any set. Price, complete, assembled. \$11.00

Frame, panel-plate and drums. \$3.50

CC Unitune, one .0005 mfd. SF condenser, 3 circuit tuner, with Bruno drum control, \$12.00



UNITUNE, RF, Basic condenser frame, Model 2C, and two BRUNO Low Loss RF Transformers, providing two RF stages, tuning from 200 to 550 meters. Price. \$17.00
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UNITUNE, TK, same as RF, except right-hand condenser holds standard BRUNO 3 Circuit Tuner for use in a variety of circuits. \$20.00
BD UNITUNE, for use in BROWNING-DRAKE. \$21.00

Send for BRUNO Booklet

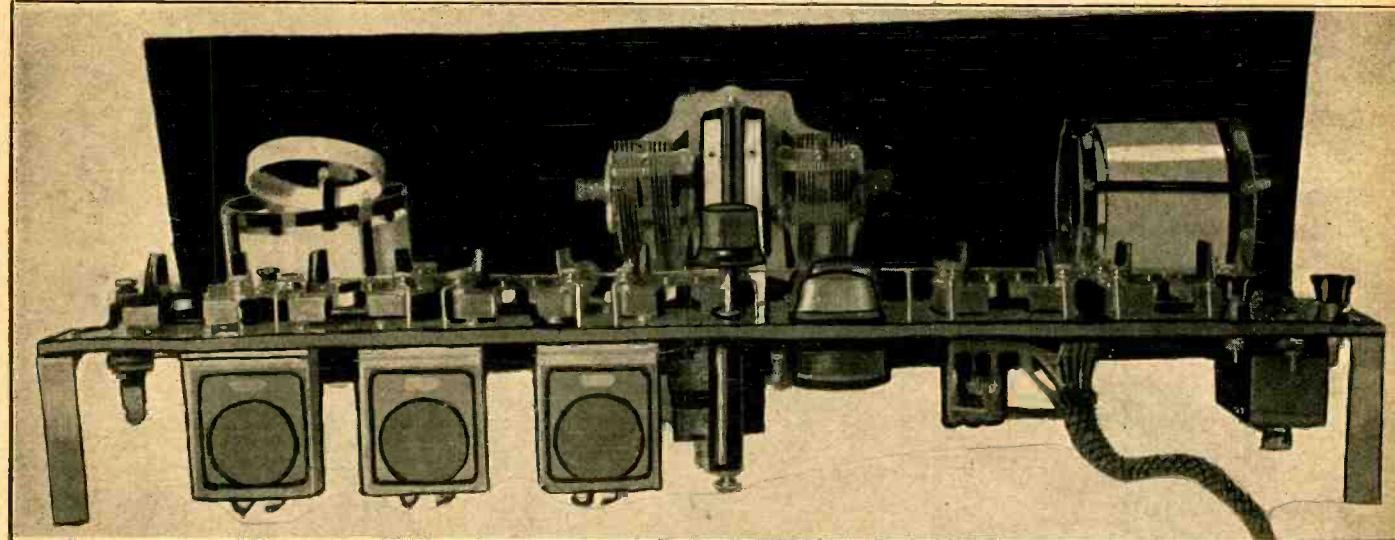
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40 Paynter Avenue Long Island City, N. Y.**Bernard**

BLUEPRINTS

Panel, Subpanel and Wiring. \$1.00

Price includes Herman Bernard's article on how to build this 6-tube tone marvel.
Or send \$6 for one year's subscription (52 numbers) and get blueprint, article and panel namepiece FREE!RADIO WORLD
145 West 45th St. New York City**THE BRETWOOD**Improves Any Set!
Price, \$1.50

A New Note of Beauty! The *Bernard* 6-Tube Kit Makes the Handsomest Set



VIEW OF SET made from the official list of parts, as printed below.
You Tune This Set With One Finger!

OFFICIAL LIST OF PARTS

Exactly as Specified by Herman Bernard and Bearing His Personal Endorsement

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

PB—One Singletrol radio impedance coil or an R3 transformer.

C3, S1, C6—3 Aerovox .00025 mfd. R2, C5—One Bretwood variable Grid Leaf 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, respectively 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 (or lesser maximum).

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

R9—One Electrad 2-ohm rheostat.

J—One Electrad single closed circuit jack.

One pair Bruno adjustable brackets.

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

One 20x4" drilled socket strip.

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

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

Two C. A. L. binding posts (Ant. and Grd.).
Three Lynch double mountings.
10 lengths stiff Acme Celatsite.

ACCESSORIES

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

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

The manufacturers whose parts are used in this receiver follow:

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

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

The manufacturers whose products are recommended as accessories are:

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

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

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International Distributors to the Trade

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RADIO NEWS RADIO WORLD



Give BST-5 Certificate of Merit

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

What They Say About The B.S.T.

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

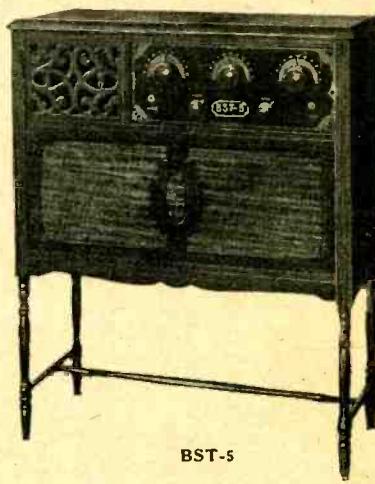
I had the set working in fifteen minutes and at the end of two hours and a half I had twenty-nine stations logged. The set brings in new stations almost every night.

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

G. C. PARRISH, Dallas, Oregon.



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.



RENAISSANCE MODEL CONSOLE

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

COMPLETE—
BST-5 RECEIVER,
Loud Speaker and Console } \$57.00

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.

28 Stations in 3½ Hours

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, WIZ, 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.

GUARANTEE

Satisfaction or Money Back

Each receiver is tested and retested, boxed and inspected before leaving factory, and guaranteed to reach you direct in perfect condition.

Workmanship throughout guaranteed the best. Assembled by experts.

Immediate Delivery

\$40.00

BST-5 in Console - \$57.00

Send Check or P. O. Money Order

GUARANTY RADIO GOODS CO., 145 West 45th St., New York, N. Y.

RADIO WORLD Guarantees the Responsibility of This Advertiser



*"When you buy your new
'B' batteries it will pay you to
follow the Eveready rules"*

MANY owners of radio sets who bought "B" batteries last winter are approaching the time when new batteries should be installed. For reception is improving steadily these evenings as the weather grows colder. There is more distance to be had at the turn of the dial. New features come upon the air and the riches of radio never were so profuse.

Think back—when did you buy your "B" batteries? If they were Eveready "B" Batteries, installed according to the now famous Eveready rules, you will know whether or not it would be worth while now to replace them. These are the rules and the results:

On all but single tube sets—Connect a "C" battery. The length of service given below is based on its use.*

On 1 to 3 tubes—Use Eveready

*Note: A "C" battery greatly increases the life of your "B" batteries and gives a quality of reception unobtainable without it. Radio sets may easily be changed by any competent radio service man to permit the use of a "C" battery.

No. 772. Listening in on the average of 2 hours daily, it will last a year or more.

On 4 or more tubes—Use the Heavy-Duty "B" Batteries, either No. 770 or the even longer-lived Eveready Layerbilt No. 486. Used 2 hours daily, these will last 8 months or longer.

Of course, if you listen longer than two hours daily, or if you

use a power tube, your "B" batteries will not last quite so long as given above. And if you listen less, they will last longer. For the most enjoyable and economical radio entertainment, buy Eveready "B" Batteries according to the Eveready rules.

For further information on batteries, send for the booklet, "Choosing and Using the Right Radio Batteries," sent free on request. It also tells about the proper battery equipment for use with the new power tubes. There is an Eveready dealer nearby.

Manufactured and guaranteed by
NATIONAL CARBON CO., INC.
New York San Francisco
Canadian National Carbon Co., Limited
Toronto, Ontario

Tuesday night means Eveready Hour—9 P. M., Eastern Standard Time, through the following stations:

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WJAR—Providence	WTAM—Cleveland
WEWI—Boston	WWJ—Detroit
WTAG—Worcester	WGN—Chicago
WF—Philadelphia	WOC—Davenport
WGR—Buffalo	WCCO—Minneapolis
WCAC—Pittsburgh	St. Paul
KSD—St. Louis	WRC—Washington

LEFT—No. 486.
for 4, 5 or more
tubes, \$5.50.

RIGHT—Eveready Dry Cell
Radio "A" Battery,
1½ volts.

EVEREADY
Radio Batteries
—they last longer