

THE 8-TUBE VICTOREEN

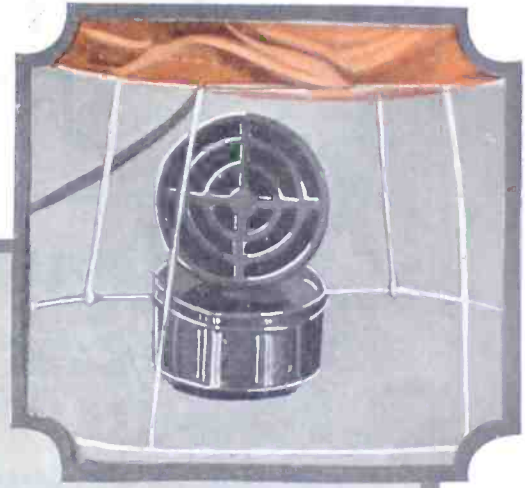
FEB. 20 15 CENTS

RADIO WORLD

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Vol. 8 No. 22 ILLUSTRATED Every Week

HOW TO BUILD A 3-TUBE
QUALITY RECEIVER



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- One Victoreen Oscillator Coil, No. 150
- Eight Kurz-Kasch Standard Bakelite Sockets
- Two .0005 mfd. Hammarlund SLF Condensers
- Two Kurz-Kasch E-Z-Toon Vernier Dials
- Two .00025 mfd. grid condensers, with mountings
- Two 2-megohm Grid Leaks
- One .001 mfd. Fixed Condenser
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- Two Victoreen 30 ohm Rheostats
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- One No. 103 Carter Single Automatic Filament Control Jack
- One Imp Battery Switch
- Seven Binding Posts
- Two 6 ohm Victoreen Rheostats

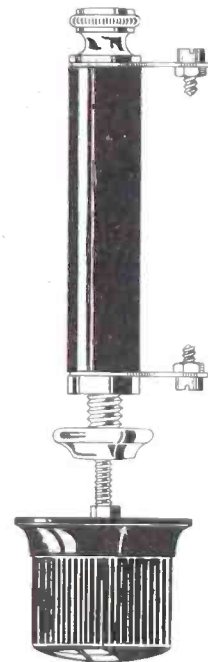
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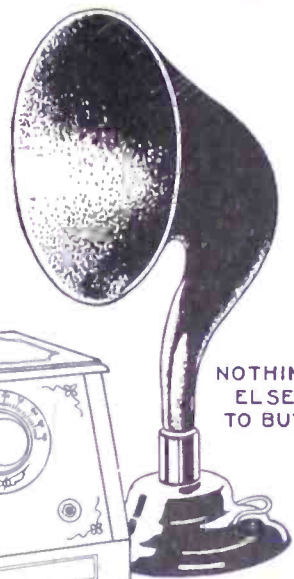
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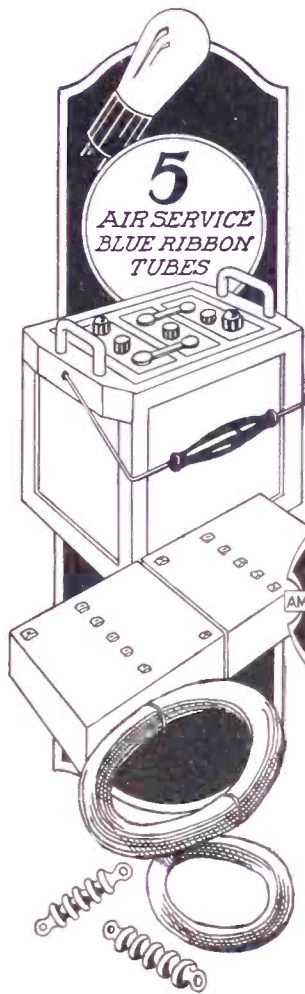
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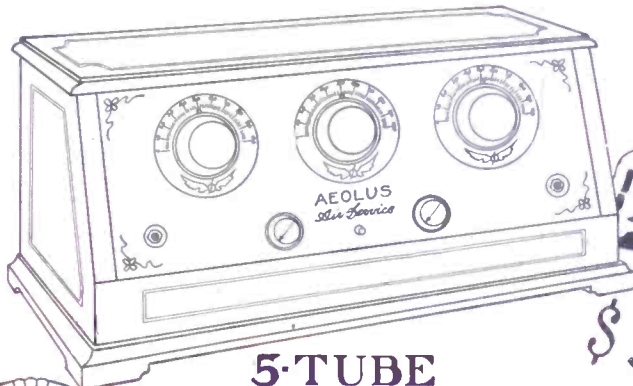
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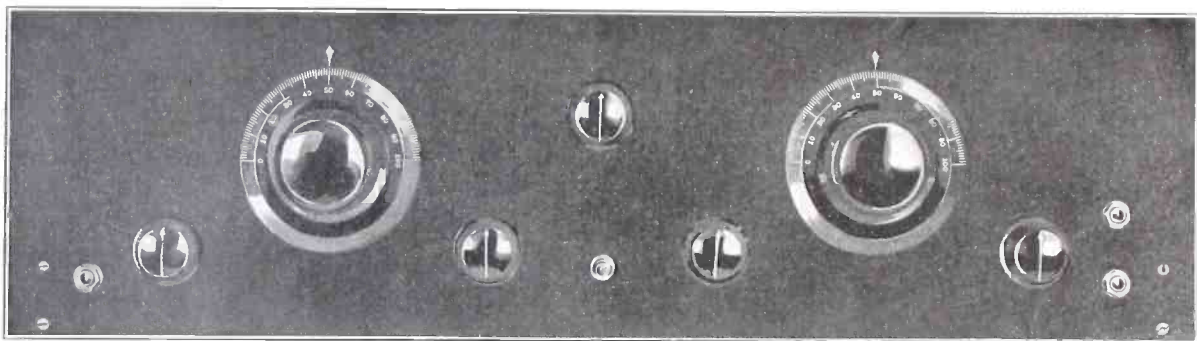
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The Victoreen

A Super-Heterodyne
Of Great Performance



THE FRONT PANEL VIEW of the Victoreen Super-Heterodyne. This set has eight tubes. As constructed by RADIO WORLD it has an antenna coupler, the jack at left being for optional loop operation. Vernier dials are requisite for accurate tuning.

By Herbert E. Hayden

THE Super-Heterodyne is at once the best set and the worst set. Built properly of parts of great merit, using an authentic circuit design, it usually will outperform any other set. If there is a slip-up in the wiring or placement of parts, or if poor parts are used, especially in the intermediate amplifier, the set may work most unsatisfactorily. Therefore you have to-day two camps among home constructors of Super-Heterodyne receivers—those who laud the Super-Heterodyne for its supreme greatness and those who complain bitterly that their 8-tube set does not do as much as the little old 3-tube set that came into the house at the time of Hector's puppyhood.

As to those personal experiences, lamentable or joyous, only the happy ones prove anything in respect to the circuit's merits. The fact that Super-Heterodynes, made by fans themselves, do outperform other sets made by those same fans, proves the preponderating advantages of this type of receiver. The disaffection of the other element recites only their own misfortune and is irrelevant as proof of anything except personal shortcomings, either in purchase or construction.

The fact remains, however, that, set for set, more trouble develops in Super-Heterodynes than in any other receivers, and this may be traced in many cases to an attempt to embody some "new" ideas in the circuit network, an expensive trace of freak hookup for which the constructor is brazenly asked to foot the bill. Many circuits, not confined to Super-Heterodynes, are only the representation of original theories of the author, who presents the hookup because he knows from his wide experience that it will work, only he is not so sure how the great multitudes of set-builders may be able to make it work, whether poorly, merely indifferently, fairly or excellently.

It can be said for the Victoreen Super-Heterodyne, the circuit wiring of which is shown in picture form in this issue, that it is a well-established hookup, with standard oscillator, insuring excellence here, where it is so dearly needed, and com-

prising intermediate frequency transformers, including the filter, that represent a very high grade of excellence. They are of air-core construction, with sharp resonance peak, and are tuned to 88 kilocycles (3,400 meters). This avoids picking up many spurious harmonics so prevalent on higher intermediate wavelengths (lower frequencies), and represents a happy compromise on a point of difficulty that long has been associated with Super-Heterodyne construction.

Avoids Interstage Feedback

The intermediate transformers are matched at the factory, so that in the state they are received they are ready for installation and thus save the constructor the performance of a task that in many instances requires laboratory equipment that he does not possess and cannot even borrow, not even unto the use thereof. The peak of sharpness exists in the input transformer, which is placed first in the chain of intermediate coupling devices. This is another moot question—whether to put the filter first or last. But in actual practice it has been found that in the Victoreen the filter had better be placed first. Thus the frequency band to be amplified at the intermediate wave is narrowed down and the amplification in subsequent stages is confined to the restricted channel that has been passed.

Upon the functioning of the intermediate transformers depends to a great extent the selectivity and the sensitivity of the receiver. Likewise, if feedback among the intermediate amplifiers is prevented, the distortion curse, present in many home-made Super-Heterodynes, is avoided from this over-generous source, and the distortion problem thus is largely swept over to the audio channel, where, with proper choice of parts, it is more easily solved.

The Victoreen intermediate frequency transformers, by their internal construction, avoid this troublesome feedback, which carried with it other ills too annoyingly known to many Super-Heterodyne constructors to need emphasis here, but including weak signals, trickiness of tuning and very moderate receiving range.

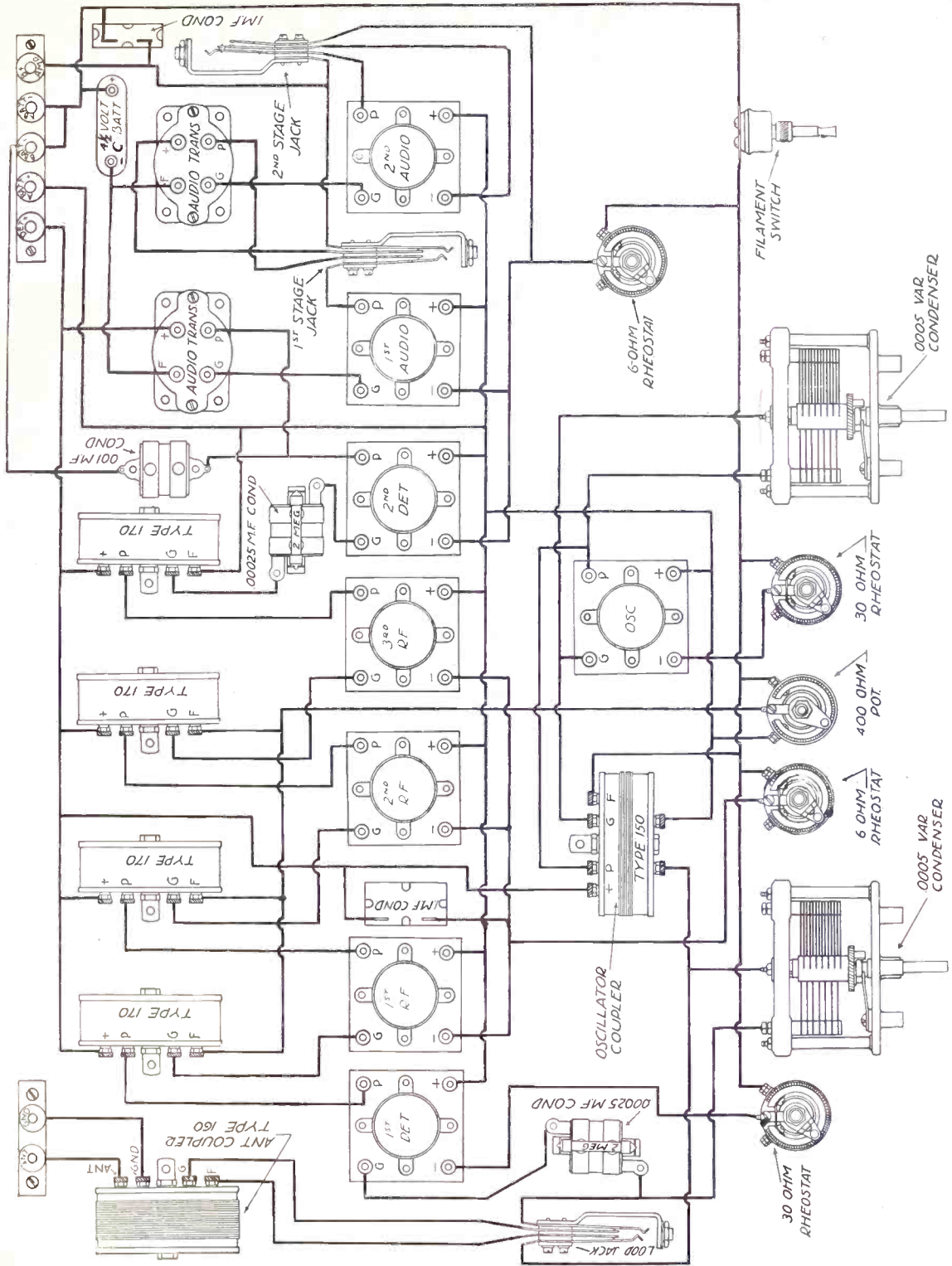
LIST OF PARTS

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- One 8 $\frac{3}{4}$ x23" baseboard.
- Two No. 104. Carter. double-circuit jacks.
- One No. 103 Carter single automatic filament control jack.
- One Carter Imp. battery switch.
- Seven binding posts.

Circuit A Model As It Is

The circuit is an extremely sensitive one and in the form presented is best suited for broadcast reception. The stations will be separated, even those on the low wavelengths in congested broadcasting centers like New York City, either on loop or outdoor aerial, due in no small measure to the selectivity inherent in the intermediate amplifier, but, of course, aided materially by the well-established method of frequency changing.

Either an added stage of tuned RF or another intermediate stage is feasible, of course, but in this hookup the resulting complications may be such as to baffle the general run of constructors of circuits, and result in sensitivity that may exceed the limitations at many locations. Stray noises would be picked up with greater facility; in fact, the set might be put in the critical class—a thing that cannot be said of it in



the 8-tube form, for it is exceedingly stable and enables operation with a negative grid bias on the intermediate amplifiers, conferred by potentiometer arm being put past the neutral point to the negative battery side. The neutral point is zero grid bias.

Make the Set Versatile

Therefore, we accept the circuit as it is because of the fullness of its efficiency and the absence of any need of faltering it. Like-

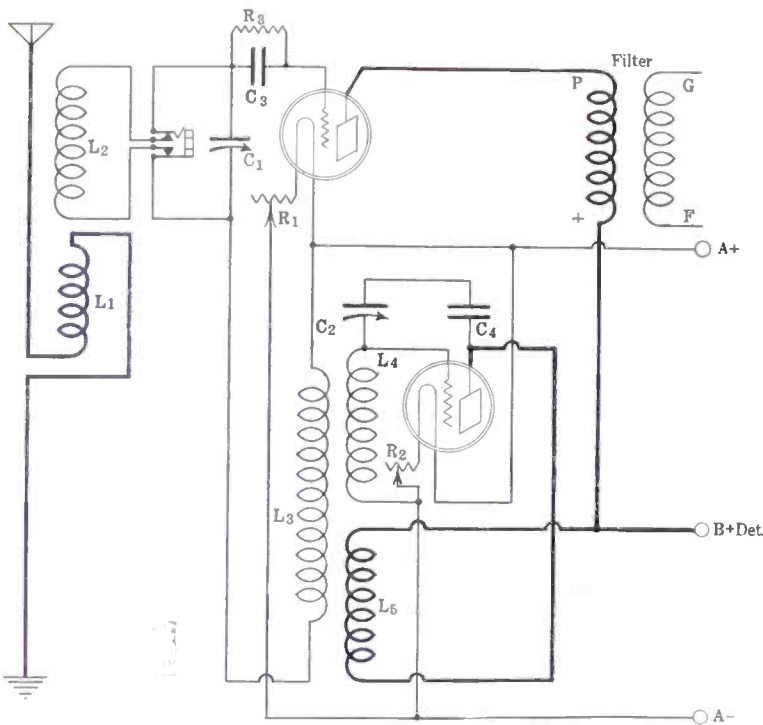
wise we shall abide by a safety-first constructional layout, whereby the oscillator coil is on the right-hand side, fairly far removed from the antenna coupler, if one is used, or the loop. On the point of the antenna coupler it is well to advise readers to include this in the hookup, for there is nothing like having an option, lest one change one's mind concerning lack of desire for an outdoor aerial. Usually greater distance reception can be accomplished if an outdoor antenna is used, or even a wire

strung indoors, as compared to a loop, although anybody desiring a set that affords remarkable loop reception will find his needs met by this receiver.

Theory of the Set

As a foundation for a better understanding of the construction of the set, and particularly the reason for the particular way of laying out the parts, which will be discussed more fully and illustrated by photo-

How the Frequency Changer Is Wired in the Receiver



The Frequency Changer of the Victoreen

graphs, let us consider briefly the theoretical side of the receiver.

The Super-Heterodyne principle employed involves the tuning of the first LC combination to the frequency of the broadcast program desired to be heard; i. e. the wavelength of the station. All fans are familiar, more or less, with the phenomenon of tuning, whereby a variable condenser is used to make a circuit responsive to a given frequency to the exclusion of other frequencies. This is done by rotating a variable condenser to a given setting, so that the rate of charge and discharge of the condenser at that setting, in conjunction with a coil, corresponds to the frequency of the desired station's carrier wave.

Tuning to Station's Wave

Therefore we tune to the signal frequency. The condenser is across the loop or the secondary of the antenna coupler. But notice in the diagram that the grid return of the loop or antenna coupler secondary, instead of going direct to battery, is made through a coil which is in inductive relationship to two other windings. Thus the coil through which this grid return is made is a coupling coil that delivers the input component of the first tube to the pair of coils, which are connected to the oscillator tube. One of the two coils directly connected to the oscillator tube is in the plate circuit of that tube, and induces oscillation, while the other is in the grid circuit. Moreover, plate and grid are capacitatively coupled by means of the second tuning condenser, which governs the frequency of the oscillator. Thus we have established two contributing frequencies—one the frequency of the incoming wave, the other the frequency of the oscillator. The coupling of the inductive system of the one with that of the other results in the mixing of these two frequencies, whereupon another phenomenon takes place, that of heterodyning.

A new wave is created and it is equal to the difference between the two frequencies.

It is known as the intermediate frequency. Suppose the incoming wave is of a frequency of 1,000,000 cycles per second (1,000 kilocycles). That is equal to about 300 meters. Now, if the loop or secondary of the antenna coupler is tuned to that frequency, and the oscillator is made to generate a wave of 1,088,000 cycles, the resultant beat note would be the difference between the two, or 88,000 cycles. If the oscillator frequency were made to be 912,000 cycles, accomplished by shifting the oscillator tuning condenser a few degrees, the same beat note would be set up, since you still subtract the lesser from the greater.

It is clear, therefore, that the frequency changer consists of two tubes; the first, often called the modulator or first detector, and the second the oscillator. Attempts to combine this dual function in one tube, by the so-called autodyne method, have caused fans considerable difficulty, and it is safer to abide by the plan as outlined in the diagrams.

The Double Tuning Phenomenon

The signal that the first tube handles, therefore, is neither that of the incoming wave nor that of the oscillator tube, but the difference between the two. Whether the higher or the lower oscillator frequency affords better results your own experience will prove, for it sometimes happens that there is a marked difference in volume and sensitivity, depending on which method is utilized. Also the two ways of obtaining the intermediate frequency explain why a station can be brought in at a given setting of the original tuning condenser and at either of two settings of the oscillator condenser.

The intermediate frequency having been established, the amplification now proceeds through the intermediate amplifier chain, consisting of three tubes. These tubes are linked by transformers. The first link in the chain is the input, or filter, sharply tuned to the intermediate frequency, fol-

lowed by the four other transformers. The fourth one simply couples the final intermediate amplifying tube to the "second detector." This tube is identified by the second grid leak condenser combination.

Different makes of transformers are tuned to different frequencies, although all transformers of a given make are tuned to about the same frequency.

As tubes best amplify at the higher waves (lower frequencies), the Super-Heterodyne offers the best form of multi-stage amplification obtainable, and without adjustable tuning for each stage. The fact that the transformers are not varied as to inductance or capacity does not mean they are not tuned. Most certainly there is excellent tuning present, but, due to the conversion of the original wave to a permanent new one, that tuning is at a given wavelength all the time. So, no matter how many stages of intermediate amplification you may have or desire, the number of controls remains two.

A Splendid Oscillator Circuit

As to the method of obtaining oscillations, or, as the technical phrase is, generating them, the Hartley system is used in modified form. The tuning condenser in the oscillator circuit is connected from plate to grid, thus avoiding excessive oscillation at the higher broadcast frequencies, present in some forms of oscillator hookups that have a fixed tickler with no frequency control of the plate circuit. The fixed condenser, not shown in the pictorial diagram, but included in the schematic representation of the frequency changer, is not necessary, and is not included in the list of parts, but may be added by any one who feels it advisable to include it as an item of safety, for its presence avoids tube blowout otherwise possible if the oscillator tuning condenser is shorted. This fixed condenser is .006 mfd.

That the Hartley system as modified is one of the best methods for Super-Heterodyne work has been established for a long time, and I am informed that a set like the one I am describing was built in the Bureau of Standards, even unto the placement of the oscillator coil as it has been placed in the set I built.

Low B Battery Consumption

Now let us consider the panel and the instruments thereon. The selector and oscillator condensers, the potentiometer, the switch and the jacks must be there, let us agree, hence we have only the rheostats to consider. It is well to have all four of them there, because the tubes may be underheated with ample results. Instead of the usual five volts at the filament terminals of the -01A tubes you will get exceptionally fine results at 3½ volts, and while the main object is not the reduction of A battery consumption, it is well to remember that despite its eight tubes, this set, under the rheostat system outlined, may be operated at a total B battery drain of only 19 milliamperes, which is considerably less than the drain caused by the operation of many five-tube receivers in use to-day. This economy is established through the rheostat setting, and the four rheostats are included because of the potential difference that experience has proven may be well established for efficient operation in respect to the tubes these rheostats govern.

Next Week's Description

The photograph published on page 3 shows the panel view. Next week the preparation of the panel for mounting of parts will be discussed, also the baseboard layout and some of the wiring. Meanwhile fans may safely prepare to construct this receiver, for it is one of tried and proven performance and if directions are followed is bound to give boundless satisfaction.

(This concludes Part I of the article on how to construct the Victoreen. Part II will be published next week, issue of February 27.)

Pilot Light Popular As Fascinator

THE pilot light is growing in favor with home constructors of radio sets, although manufacturers have not yet taken to this device with any avidity. The pilot light is usually included in an A battery switching arrangement, so that the switch turns the set on or off as a whole, the light burning when the set is on and being extinguished when the set is off. In other words, the pilot light responds to the same switch action as do the radio tubes.

Most pilot lights are designed for use in conjunction with sets employing 5-volt radio tubes. While the pilot light is normally rated at 6 volts, it will light sufficiently at 5 volts to serve the purpose of illuminating the colored glass window behind which it is perched. At that voltage, also, it draws less current. As a rule a pilot light will draw less than .25 ampere at 5 volts, and it furnishes a fascinating attraction. A red light shows on a switchboard in most studios when the carrier wave is on the air and a program is being impressed on the wave. Hence the ruby pilot light in a receiver would be made to coincide with the designation for transmission in a studio.

The pilot light may be connected directly across the A battery leads for 6 volts, or across the filament side of a rheostat and to the battery side of the other A lead.

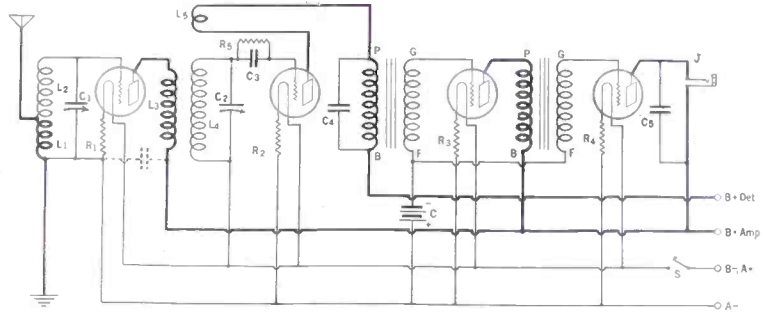
Freak Photo Solves Puzzle, "Who Is Chief?"



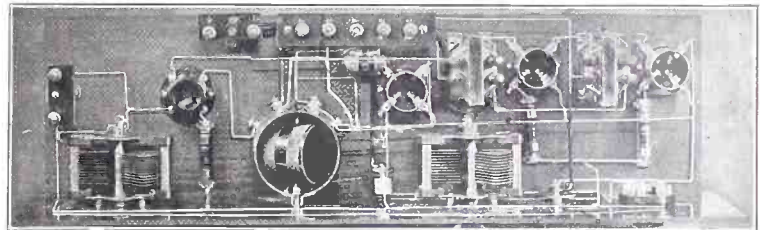
You have heard of two-faced persons, but this is not a photograph of one, because it is a picture of TWO men and because each and both of them are frank and fearless. The two men were photographed separately and the composite made by piecing one-half of one

negative to one-half of the other. There were so many requests for the identity of the "chief announcer" of WLW, the Crosley station, Cincinnati, that the question was answered equivocally by this joint picture. At left is 50% of the face of William C. Stoess, studio director, while at right Louis John Johnen is shown in equal proportion. He is program director. So you see the "chief announcer" is a mixture of the two.

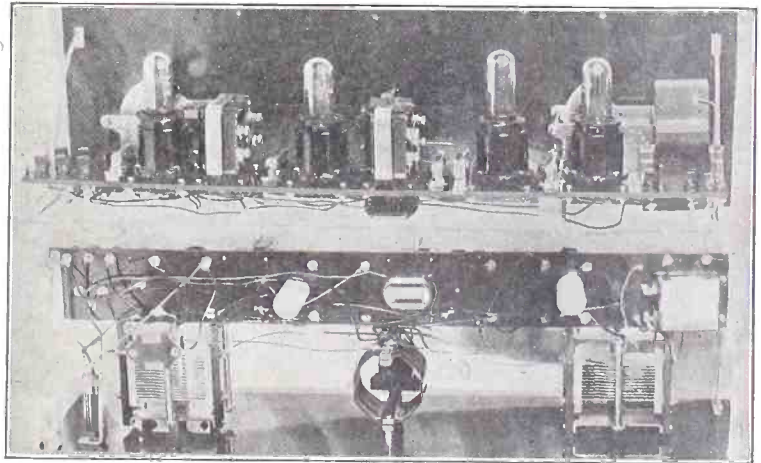
A 4-Tube Model Set For Dry-Cell Operation



CIRCUIT wiring of a form of the Browning-Drake receiver with neutralizing condenser omitted.



TOP VIEW of the 4-tube set.



THE REAR VIEW is shown on top and the bottom view below.

Radio Movie Machine Announced As Perfected

LONDON. The development of television (radio movies) to a practical state is announced. Jolin L. Baird, who says he has perfected television after years of continuous research, has been giving practical demonstrations here. When he speaks before the transmitting apparatus in his laboratory his words can be heard and the movements of his face clearly seen in another room. His lips may be seen enunciating each word, and shadows change with changing expressions.

As soon as the Government's permission can be obtained a limited number of tele-

visors will be constructed and sold by a company already formed for the purpose.

Baird declares his invention does not resemble in any way the telephotographic transmission of photographs or still pictures.

The essential thing about television is a living scene, viewed the instant it is taking place.

An article on Low-Loss Coils Analyzed by the Bureau of Standards, appeared in our Jan. 16 issue. Sent on receipt of 15c, or start your subscription with that number. RADIO WORLD, 145 W. 45 St., N. Y. C.

THE circuit network of the Browning-Drake set, without neutralizing condenser, is shown herewith; also photographs of the assembled set, using 99 type dry cell tubes. This set gives ample volume when these tubes are used. By a slight shift in the C battery wiring a power tube (UX120) may be used in the last stage, or, without any shift, both audio tubes may be the 120. The negative bias then is 22½ volts and the plate voltage 135. Otherwise use 90 volts for B+ amp. and 4½ volts negative bias.

The coils used are of the pickle-bottle type. The wiring of the leads was done with flexible celatsite. The tuning condensers are .0005 mfd.

Notice that no rheostats are used. R1, R2, R3 and R4 are 4½-v. No. 99 Amperites, but if a 6-v. storage battery is used they are 6-v. No. 99 Amperites.

The coils were of Eastern Co. manufacture. The winding directions for the run of coils are applicable, as set forth frequently in the University Department.

Quality Stressed in 3-Tube Set

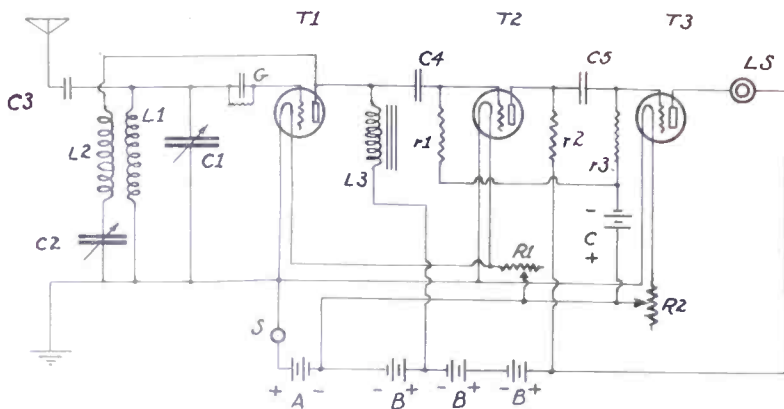


FIG. 1—A simplified 3-tube circuit designed for ease of construction, operation and superb tonal quality. Note the combination of impedance and resistance coupling for the audio amplification. Honeycomb coils are used for tuning.

By Brainard Foote

LISTENERS who prefer moderate volume, combined with almost perfect reproduction, will be interested in the simple entertainment receiver to be described. The faithfulness of its tone output is dependent upon the system of audio frequency amplification, which, in this set, is a combination of a stage of impedance-coupled amplification and a stage of resistance-coupled amplification.

In addition, the use of the half-ampere power tube is considered in the last stage. Since this tube requires about 135 volts of B battery, the use of resistance coupling calls for no additional plate voltage. Impedance coupling is adopted for the first stage since this provides superior detector action and greater detector output. Moreover, with a good impedance coil for the first stage, the quality is good.

A plain honeycomb system of tuning is shown, with a primary coil made unnecessary by the expedient of employing a small fixed condenser as the coupling medium. Thus the assembly of the outfit is not difficult. The output of volume is not so great as can be obtained by the use of more tubes and more audio amplification, but on this very account its tone qualities are better and its operation more pleasing.

A receiver of this character will operate a good loud speaker, either of the horn or cone type, to advantage. Those liking the depth and richness of music may prefer a cone type speaker of the larger size, whereas one wishing stress to be laid on the melody (as distinguished from the harmony) may desire one of the larger

horn speakers. It is possible to effect a useful combination of both types by simply connecting them in series. The set and amplifier described will, however, include in its electrical output, all of the musical frequencies, both high and low.

Circuit Data

Fig. 1 gives the symbolic diagram. Lettering of the units corresponds with that of the plan view of Fig. 2. C3 is the coupling condenser whereby the energy picked up by the antenna is delivered to the set, L1 being a 50-turn honeycomb coil and C1 a .0005 mfd. variable condenser. Regeneration is handled by the "shunt" plate circuit L2 and C2, L2 being another 50-turn coil and C2 another .0005 mfd. variable condenser. The two coils are mounted by means of two honeycomb coil mounts, as illustrated in Fig. 2. These are fastened by a screw at one end only, so that they may be swung apart or brought closer together to find the proper coupling relation. They should be as far apart as possible, so long as sufficient regeneration is to be had on the longest waves.

G forms the combination grid leak and condenser, a .00025 mfd. condenser and 2-megohm leak. T1 and T2 are two 01A type tubes, whereas T3 is a power tube of the 112 type, taking $\frac{1}{2}$ ampere at 5 volts. L3 is the coupling impedance for the first stage. It may be a special impedance coil made for the purpose, or, with as good results, the secondary winding of a large sized audio transformer. This stipulation is made to insure the use of an impedance coil having enough turns of wire

and core iron to pass all the audio frequencies. In Fig. 2 the impedance L3 is shown as the secondary winding of the audio transformer. The primary is left unused.

C4 is the coupling condenser for the first stage. A condenser as small as .002 mfd. will answer fairly well here, but better results are obtained both as to volume and range of musical tones if the condenser is made at .01 mfd. or even up to 0.5 mfd. A grid leak resistance r1 of 1 megohm or $\frac{1}{2}$ megohm is required to properly bias the grid of tube T2 and to prevent it from becoming choked with negative impulses. Instead of the impedance just described, a coupling resistance is adopted for the second stage, since this is even better than an impedance when it comes to passing all the musical frequencies.

Power Stage

Resistance r2 should be approximately 100,000 ohms (0.1 megohm). Such resistances can be purchased in the form of an ordinary grid leak and all the essential resistances may be snapped into regular resistance clip-holders. These holders which come with the resistances, r2 should be well made in order that the heating effect of the B battery current that must pass through it may not alter its resistance and cause noises or distortion. Condenser C5 is just like C4. The grid leak r3 should have a resistance of about $\frac{1}{4}$ megohm (250,000 ohms) to properly bias the last tube and prevent overloading or choking.

Tube T3 is a $\frac{1}{2}$ ampere power tube, used because its greater power will result in somewhat greater volume of output and a very marked gain in tone quality, since overloading is eliminated. A jack is provided for the loud speaker connection, the loud speaker LS being indicated in Fig. 1 at this point and jack J being shown in Fig. 2.

Now for a few remarks about the battery and filament circuits. Rheostat R1 takes care of lighting the detector and first stage tubes T1 and T2, while rheostat R2 handles the power tube. It is possible to use low voltage on the tubes for the first couple of months while they are new and then light them normally when necessary for proper volume. New tubes usually perform perfectly when lighted at a lower voltage than normal.

Since both rheostats are mounted on the panel, one under the other, one of them will be concealed in the plan view, as in Fig. 2. The terminal posts of the under rheostat R2 are indicated by dotted circles. A snap switch S, located at the left end of the panel, serves to turn the set on and off. Thus the rheostats may be maintained at the proper points permanently.

A $4\frac{1}{2}$ volt C battery is employed, as indicated. Three 45-volt B units are required. If one prefers, he need not purchase the largest size B units inasmuch as the drain on the B battery is not particularly great with a three-tube set. The larger units will probably prove slightly more economical in the long run, nevertheless. The detector tap is located at the 45-volt point. $22\frac{1}{2}$ volts would ordinarily be sufficient, but with the impedance L3 in its plate circuit the detector would not receive sufficient plate voltage unless the tap is placed at a point higher than $22\frac{1}{2}$.

Dry Cell Use

The set will perform with dry cells very nicely, with reduction in volume. The 99 type tubes serve at T1 and T2 and the 120 in the T3 socket. It will then be nec-

Rheostats Use Current, Tiny In Most Circuits

IN discussion of current drain one encounters data confined almost exclusively to the plate and the filament of tubes. For instance, -01A type of tube draws $\frac{1}{4}$ ampere from the A battery at 5 volts on the filament. As the filament heating is increased the plate current drain is made larger and as it is decreased the plate current drain is lessened. The plate drain, of course, is from the B battery. As the source is a 6-volt storage battery, and the filament should be supplied with only 5 volts, 1 volt must be "dropped," and this is accomplished through a rheostat or

other resistor, in this particular example 4 ohms. A fact often overlooked is that not only does the filament draw current from the A battery but so does the rheostat or other resistance. If the rheostat were considered alone, i. e. simply hooked up in one leg of the A battery, this would be a drain worth considering, but as it is in series with the filament of the tube, the drain is very slight, hence is seldom even mentioned. Nevertheless its existence is an interesting sidelight.

The major drain is known as the "load" on the circuit.

Real Music From This Receiver

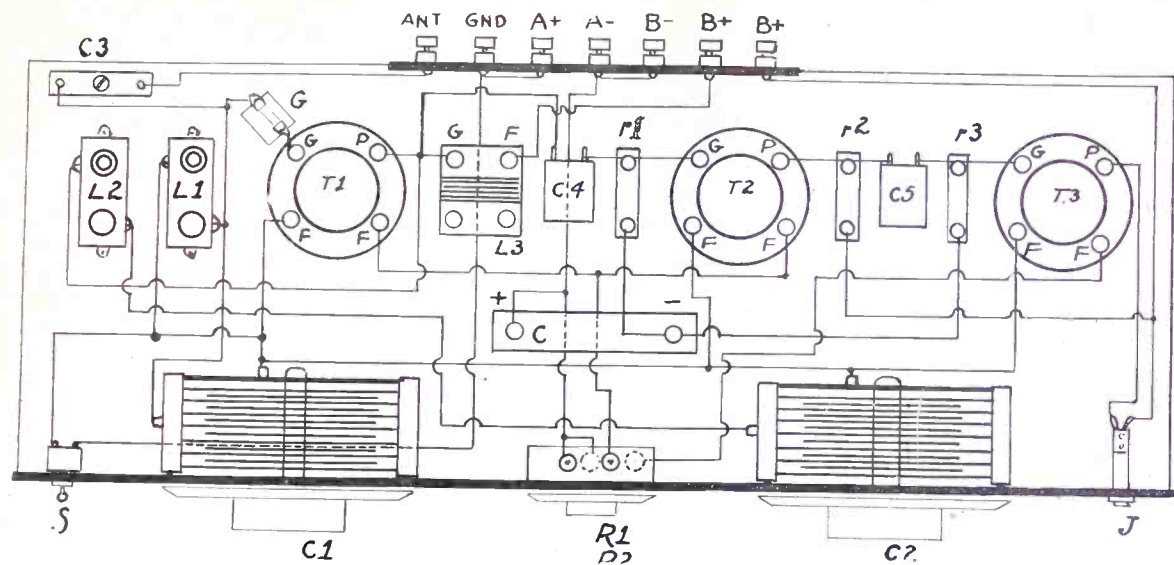


FIG. 2.—The chief aim of this set is faithful reproduction of broadcasting. This is a plan view. On the panel are mounted a snap switch, two variable condensers, two rheostats and a jack for the loud speaker. A set of this character gives one a new idea of loud speaker reproduction, with moderate volume sufficient for an average room.

essary to insert a separate 22½ volt C battery for the 120 type tube. Resistance r3 is disconnected from the larger C battery shown in the sketches and connected to the negative terminal of the 22½ volt C battery, whose plus post is then joined with the negative filament wire at any convenient spot. A 2-stage amplifier of this character is not critical in the least, so that the extra C battery may be located outside the set if necessary and fairly long wires run to it, without starting audio frequency oscillations.

A word should be said as to condenser C3. This may be a midget variable condenser such as is used as a vernier condenser with good results. Or, it may be a small enclosed condenser having a knob or screw for adjustment such as is made for grid condenser purposes. A regular variable condenser, situated behind the set between the aerial binding post and the aerial lead-in, will also do. It is left almost at the zero point. In that case, condenser C3 is left out, and the wire from the antenna post run directly to the grid condenser. The capacity at C3 should not be too large, or it will not be possible to tune in on wavelengths under 250 meters. The arrangement makes it easy to use a small aerial, an indoor aerial or a telephone "plate" for reception, since condenser C3 is merely adjusted to a value low enough to allow the short wave stations to be brought in.

Inasmuch as this is to be a set for local reception in the main, one need not waste too much thought on "low-loss" wiring, coils and the like, for the improvement gained by using these things is not felt on local reception from fairly strong stations. Ordinary "bell" wire will do very well for the wiring, and it simplifies the work, besides providing a strong cover of insulation to avoid accidental short-circuits.

Suggestions

Besides furnishing a receiver capable of delivering superb quality in connection with any good loud speaker, it makes an ideal type of receiver for use by deaf persons. It is important, in such cases, to have the phones connected in the proper

direction, as they will have to bear an abnormal input. Often the manufacturer of lower priced phones fails to get both headphones connected up properly. Then, with the cord in one direction, one phone will rattle, and when the cord is reversed, the other one rattles. In such a case, simply reverse the wires to one of the phones, then finding the correct direction by reversing the cord in the plug again.

Set condenser C3 at the largest capacity that will bring in the station of the shortest wavelength that you wish to hear—still allowing the detector to operate with sensitivity. Should the detector fail to oscillate (i.e.—whistle) even though you set condenser C2 at maximum, reverse the connections to coil L2. Ordinarily, providing the two coils are of the same manufacture, the connections given are right. It should not be necessary to bring C2 much over half scale for stations from

360 to 455 meters, approximately, nor over one-third scale for the shorter wavelengths.

Condenser C1 does the tuning, and its dial numbers for the various stations should be recorded for future reference. Do not record these dial positions until you have decided upon the best position for C3 and have left it there to stay.

For storage battery tubes, the A battery consists of a 6-volt storage battery, of course, while with the 199 type dry cell tubes, the "A" battery is formed of three dry cells in series, or a single 4-volt storage battery. For storage battery tubes, rheostat R1 should be about 10 ohms in resistance and R2 about 6 to 10 ohms. For dry cell tubes, R1 should be 15 to 20 ohms and R2 15 to 20 likewise. A suitable size of panel is 7 x 14 or 7 x 16 inches, with cabinet to match. Binding posts are best placed at the rear, on an insulating strip.

Wrong Position of Parts Causes Many Troubles

PLACEMENT of parts is an important item in the construction of any receiving set. How the set will function may depend on this item to a controlling extent. If parts are so placed that stray feedback is occasioned, lessened sensitivity, decreased selectivity, poor volume, almost uncontrollable oscillation or even utter failure of signals may result. This applies particularly to coils, where truant induction causes trouble. The field of one coil enters that of another, and this backing-up stream has caused more trouble than any other item in set construction. It accounts also for the fact that the tube that theoretically carries the heaviest load—for instance, the detector—is stable, compared with the first radio-frequency amplifying tube, which handles the feeble emf. as it comes direct from the antenna.

In a Super-Heterodyne, for instance, the intermediate frequency transformers

should not be so located that when one's hand is placed a few inches above two of them, at a point representing mid-distance, howling results. By locating one's hand in this fashion a rough method of determining which stage is the most troublesome may be utilized, for where the lesser proximity causes equal or greater body capacity effect, evidenced by howling, the greater strays may be deemed to exist.

If a Super-Heterodyne must be operated with the potentiometer on the positive side, particularly at the positive terminal, the set is not functioning at its best, since over-amplification or feedback necessitates the introduction of this method of introducing losses to enable reception. A potentiometer is a "losser" only when operated past the neutral point, and is in a fair sense a "gainer" when set within the negative angle.

RADIO WORLD'S

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Reports for the Guidance of Its Readers

Address problems to Laboratory Director, RADIO WORLD, 145 West 45th Street,
New York City.

The Choice of Parts

Leaks, Condensers and Jacks

[Part I of this discussion of the selection of parts was published last week, issue of February 13. Part II, the conclusion, follows.]

CONTINUING the discussion of the various parts that comprise a receiver, the item next in line is the leak. This includes the variable grid leak, the fixed leak and the coupling resistor. The purchase of the grid leak specified by an author in his article presents two problems. First, has the author selected the leak mentioned because he found it best suited for the work or is it his favorite, even as you and I have certain pet items? Either way, the answer to the problem itself if not of such great significance, because the choice of the variable grid leak does not necessarily have to be the one specified. The item of importance is the purchase of a variable leak which is of high quality and with the required resistance range. This does not mean that where a variable grid leak is specified one can substitute a fixed leak. Not by a long shot. If a variable leak is specified, one should be used. In this respect the author's say-so means more than the fan's ideas. The author no doubt found that it is essential to the satisfactory operation of the receiving unit that a variable leak be used. Hence use one.

As to fixed leaks, that is leaks with a fixed value of resistance, any leak with that value of resistance can be used. It need not be of the manufacture specified. If the unit specified is superior it would be very unwise to use any other.

The purchase of coupling resistors presents a problem entailing portions of facts appertaining to transformers and portions of facts dealing with leaks. While the products of all manufacturers of coupling resistances are more similar than the products of transformer manufacturers, the exact choice insofar as resistance value is concerned must be decided by the fan after he has assimilated the thoughts of the author. This is so because of the variance in likes and dislikes of the public. Very frequently an author states that a certain resistance value for the coupling resistor is conducive to better results, or should we say better quality, sweeter music? That is, he thinks so, having experienced that lower amplification affords music to his liking. This does not signify that the fan will agree with the likes and dislikes of the author, and the use of a 30,000 or 50,000-ohm coupling resistances when 100,000 ohm units afford greater amplification may be preferred by the constructor.

The majority of radio fans who are constructively inclined are readers of various radio publications, and in practically all cases have read various literature prior to the decision to construct any one type of receiver. And during the course of their observations they have assimilated a certain degree of knowledge relative to the various parts which

comprise a receiver. Once again these fans have the opportunity of pitting their knowledge and thoughts against those of the author.

Where standard equipment is specified, the predominant item is again the electrical constant and the quality of the equipment. Units of different manufacture but of similar electrical values and equal quality are interchangeable and can be used with perfect safety.

Variable Condensers

Variable condensers present a more imposing problem, full of difficulty. Two paths are available. They are governed by knowledge and knowledge only. The fan is a novice; it is wisest and most economical to follow the author's selections. The more experienced fan however has a greater working range. He who can distinguish between straight-line capacity and straight-line frequency condensers and is more fortunate than the fan who cannot. And where the specifications just call for a certain type of condenser of a certain capacity it is not imperative that the make specified be used. Other units of equal capacity and equal efficiency may be substituted.

But where the author states that with the condenser specified and the coil specified a certain allocation of wavelengths is obtained on the tuning dial, the items specified should be used if the same allocation is to be obtained. This is especially true with straight-line frequency condensers. Where a definite wavelength range is to be covered with a certain coil it is best to adhere to the specifications of the author. Hence when the coils in the receiver are to be constructed by the fan, he need not use the exact manufacture of condenser specified.

Coil-condenser combinations should therefore never be divided. One should be sure that the two are watched. Few manufacturers make the same type of coil. While a single layer inductance may be designed to function with a .0005 mfd. condenser its operation will not be the same as that of a spider-web coil designed for use with the same capacity, due to electrical variations in the coil at the various frequencies.

The Number of Plates

Furthermore where the author recommends a certain condenser and mentions that it consists of a certain number of plates and has a certain capacitance value, it is not essential that the condenser purchased have the same number of plates, providing that the total capacitance is as specified. This should not be construed as meaning that a 2-plate condenser can replace a 23-plate unit, even if the capacitance of both is the same. It does mean that 17-plate unit with a total capacity of .0005 mfd. is satisfactory if a 23-plate one is not obtainable. There is of course a variance between the two sizes insofar as the

number of plates is concerned. The one with the fewer plates will necessarily utilize larger plates and thus require more space, or will have the plates closer to one another. This means that trouble due to moisture and lint finding its way between the plates and causing leaks is augmented. When the plates are fewer in number and closer together the space required to house the condenser is conserved. This selection is left to the discretion of the fan.

The selection of a type of condenser, whether straight-line capacity, straight-line wavelength or straight-line frequency, should be left to the author. If he specifies one type, that type should be used. Then statements relative to the dial tuning will best be understood and followed.

Binding Posts

Binding posts are frequently specified. This item has no bearing upon the operation of the receiver, other than assuring good connections. It is an item related to the fan's pocket book. The more expensive binding posts are better looking, easier to adjust. A 5-cent binding post will function as well as a 10-cent item. It may not be as convenient or last as long.

Jacks and Switches

Jacks and battery switches are interchangeable. The paramount factor again evolves itself into one of financial expenditure and space conservation. For ordinary circuits the capacity of a jack is negligible, but the insulation is important. Also the resiliency of the contacts. These facts must be considered when making the choice. In battery switches, the plunger type is not superior to the cam type. Both types are satisfactory.

Parts Placement

Last but not the least we have the layout of the parts and the wiring. Here only one choice is available. Follow unreservedly the author's layout. A deviation from the specified parts arrangement is sufficient cause for the author to refuse to be responsible for the results. Also the experiences of the author are included in the layout, experiences which were costly, annoying, wearying. The reader obviates all of these items by faithfully following directions. While other parts arrangements may afford satisfaction, a deviation from the specifications removes all right to dispute the commendatory statements made by the designer of the receiver.

Interesting Facts on Batteries and Tubes

HOW OFTEN should a storage battery, with a capacity of 100 ampere hours, being used three hours per night, be charged?

This battery should be charged every 10 days.

* * *

WILL THE battery last longer if it is charged at a low rate, at 2 amperes, than at a fast clip, at about 6 amperes?

Yes. The battery will last much longer if it is given a slow charge.

* * *

IS THE hard tube, such as the —01A tube as good a detector as the soft tube or the —00 type?

The soft tube is more sensitive as well as more critical tube to adjust than the —01A. The strength of the signals obtained with both these tubes is equal. Roughly, the results obtained with both these is equal.

Definitions for the Novice

The Radio Primer

INTO WHAT two classes are all substances divided?

All materials are classified as conductors and insulators. * * *

WHAT IS a simple definition of a conductor?

A conductor is a substance or material through which an electric current will flow easily. * * *

HOW ARE the list of important conductors arranged in order of their ability to pass an electric current?

They are arranged thus: 1, copper; 2, aluminum; 3, platinum; 4, iron; 5, carbon; 6, graphite. * * *

HOW ARE the list of important non-conductors or insulators arranged in order of their ability to hold back the flow of current?

They are arranged thus: 1, dry air; 2, shellac; 3, paraffine; 4, amber; 5, glass; 6, India rubber; 7, silk; 8, paper; 9, oils. * * *

WHAT IS a circuit?

Any substance which allows current to flow easily, when joined together, and completing a path through which an electric current can flow, from and back to a given source or point of initial impulse. * * *

WHAT IS an open circuit?

Any circuit is open when the elements that compose the conducting path are broken or placed apart so that no current can flow. * * *

WHAT IS a closed circuit?

Any circuit is closed when the elements that compose the conducting path are brought in contact with each other so as to allow the passage of the current. * * *

WHAT IS a short circuit?

A short circuit is a distinct path which a current takes, when that path offers less resistance to the flow than the proposed one. * * *

WHAT IS a grounded circuit?

A grounded circuit is one in which the conductors have made an accidental contact with the ground or with some metal making contact with the ground. * * *

WHAT IS a ground?

A ground circuit as it is known in electrical circles, is one in which the earth forms part of the connecting path. * * *

WHAT IS a battery or line wire?

A line wire is a piece of conducting material which has one end at the battery or source of electricity and the other at an apparatus terminal. * * *

HOW SHOULD bell wire, which is used as lead-in wire or ground wire, be run or placed in the home?

It should not be run in the same pipe which carries light or power wires, nor within six inches of it, unless enclosed in an extra non-conductor. Insulated staples should be placed over the wire for holding. The wire should not be run in damp places. This applies to lead-in wire only. All splices should be soldered and covered with tin foil so as to protect the wire from the corrosive action of the tape which usually goes over the connection. * * *

HOW IS the light long line distinguished from the heavy short line in the schematic form of battery representation?

The light long line always represents

B Battery Makeshift



IF your B battery voltage is less than it should be, and you want to have your set supplied with greater voltage to run out the evening, connect a couple of C batteries in series with the B battery. (Hayden.)

the positive terminal of a cell or battery. The short heavy line always represents the negative terminal of a cell or battery. * * *

WHAT IS a series connection?

When the positive post is connected to the negative post of the next cell, a series connection is obtained, e.g., plus to minus, minus to plus, etc. When this is done, the pressure or the voltage is increased. That is, if four cells are connected in series, the voltage from the entire four will be four times that of the single cell, granting all are equal. The amperage remains the same, if equal originally. * * *

WHAT IS a parallel connection?

When the plus posts of all the cells are connected to the minus posts of all the cells they are said to be connected in parallel. With this type of connection, the pressure or voltage is no greater than with one cell, but the current or amperage is increased. * * *

WHAT IS a series multiple connection?

Any combination of the series and the parallel connections, whereby the voltage and the amperage are increased, is known as a series multiple connection. All the following computations are based on 1½ volt batteries which have a current capacity of 15 amperes.

When three cells connected in series, are connected in parallel, with 3 more cells connected in series, 30 amperes at 4½ volts are obtained.

In order that the voltage or pressure may be increased with the above connection, more cells must be added in series to the sets. That is, more cells will have to be connected in series. The parallel connection of the two series batteries remains the same.

In order to increase the amperage, more series batteries will have to be added in parallel. No more cells in series are to be added.

If 6 cells, connected in series, are connected in parallel, with 6 more cells connected in series, still 30 amperes are obtained but 9 volts, or an increase of 4½ volts are at hand.

If, however, three cells, connected in series, are connected in parallel to three more 3 cell batches, then the voltage of 4½ remains, but the amperage jumps up to 60 or an increase of 30 over the original batch. * * *

WHAT IS a kilowatt equal to?

A kilowatt is equal to 1,000 watts. A station operating at 5 kv. (abbreviation for kilovolt) is operating at 5,000 watts. * * *

WHAT IS a horsepower equal to?

It is equal to 746 watts. * * *

WHAT IS the mil and what is it equal to?

The mil is the unit of length in measuring the diameter of wire and is equal to .001 of an inch.

WHAT IS meant by a circular mil and what is it equal to?

It is the unit of area for measuring the cross section of wire. The area of the same is equal to that of a circle, which is .001 of an inch in diameter.

The area in circular mils can be found by squaring the diameter of the same. No. 14 Brown & Sharpe gauge is equal to 64 mils in diameter. This is obtained from special wire tables. Therefore, squaring this sum would equal 4096, which is equal to the area in circular mils. * * *

WHAT IS the average or rather approximate energy that incandescent lamps require?

A lamp which employs a Carbon filament requires 3½ watts per candle power. A lamp which employs a Tungsten filament requires 1 1/3 watts per candle power.

A lamp which is Nitrogen gas filled, requires from ¼ to 1 watt per candle power.

A 16-candle power lamp, with a carbon filament requires about ½ ampere at 110 volts and one ampere at 55 volts. * * *

OF WHAT use is a high reading voltmeter in connection with a radio receiver?

When the soft type of tubes are being employed, such as the 200, the best voltage that this operates at, as shown by characteristic curves, is about 20. Any variation from that voltage will have a tendency to decrease the signals strength. With the hard tubes, such as the —01A type, the intensity of signal strength is largely dependent upon the voltage applied to the plate, which varies from 40 to 100. If the volume is low and you are sure that there is nothing the matter either with the set or the antenna, etc., the voltmeter to test the B battery comes into great use. Therefore with this type of meter a check on the B batteries, which supply the plate voltage, thereby giving one more or less volume according to the condition of the battery, is at hand. * * *

WHAT IS residual magnetism?

Residual magnetism is that small portion of magnetism, which remains in the iron core of an electromagnet after the current has ceased to flow through its winding. * * *

WHAT IS B. & S. gauge wire?

B. & S. means Brown & Sharpe which is the same as American Wire Gauge, (A. W. G.). This is the standard for copper wire. * * *

WHAT IS a cleat?

A cleat, which by the way, is no more used, is a two-piece support for wire in open or outside work. * * *

WHAT IS the cause of decrement?

Decrement is due to resistance in the antenna circuit and to what is termed re-radiation. Radiation is due to too close a degree of coupling between the closed and the open circuits. It is also due to a low degree of efficiency in either the generating (transmitting) or rectifying (receiving) circuits. * * *

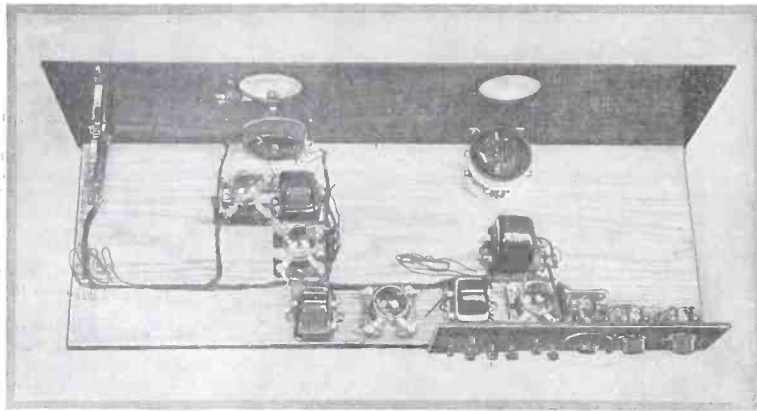
WILL A swinging antenna when used in conjunction with a receiver cause the signals to fade?

Yes. * * *

WHAT IS selectivity?

Selectivity is the efficiency of a receiver to tune in one station at a time, without any interference from another despite only slight difference in wavelengths.

The Completion of the Fenway



THE LAYOUT with the three medium-frequency and detector stage tubes shown in place.

By Leo Fenway

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PART III

THE Fenway 4-tube and the Fenway 9-tube receiver, both combined into one, has come along at a tremendous pace. It was obvious that it would do so. Its complication and initial cost are largely discounted by its astonishing powers and its simplicity of control. The 4-tube arrangement itself makes an ideal receiver for all ordinary purposes, as both local and distant stations can be brought in with good loud speaker volume using only the first two and the last two tubes of this receiver. And, by merely turning the Yaxley switch, the nine-tube set automatically jumps into service. Because of these features, and because there is no guesswork connected with the Fenway, the set has achieved immense popularity.

By this time you know, if you have read the preceding articles in this magazine, that the Fenway has a stage of tuned radio frequency with regeneration, a first detector, three stages of medium frequency amplification, working at from 5,000 to 10,000 meters, and a second detector. I am now going to tell you about the rest of the set—the audio frequency amplifier. For this assembly you will need the instruments specified in the accompanying list of parts:

LIST OF PARTS FOR AUDIO STAGES

- Two General Radio audio transformers, type 285L, 1 to 2 ratio, or 1 to 6.
- One Yaxley filament control jack, No. 3.
- One Micamold .04 fixed condenser.
- One Eby binding post, B battery plus.
- One Ray-O-Vac C battery, No. 261-R.
- Two Cunningham standard tubes, type CX301A or one Cunningham C301A and one Cunningham or RCA X112.

The diagram published last week showed the complete receiver, including audio. It should be noted that no resistances are used to control the temperature of the two audio tubes. This is not a mistake. The tubes, whether they are power tubes or otherwise, should be connected directly to the 6-volt storage battery.

The common desire of radio manufacturers and home set-builders is now to attain better quality of radio reception to accompany the marked improvement in broadcasting. How can this better quality be achieved on the Fenway? Very easily. By merely holding to the quality that is now at the second detector. Distortion seldom takes place with one stage of audio frequency. When the second stage is added that the quality ever

mushes. Therefore, if transformer-coupled audio is to be used, higher grade transformers are more essential than ever before.

Good Audio Amplification

The General Radio, type 285L, transformer retains the splendid quality of the Fenway super, sustaining both high and low notes with a uniform amplification. In fact the evenness and quality of amplification produced by General Radio transformers in this set are truly remarkable; and, of course, there is a notable increase in volume.

Resistance or impedance audio amplification will also go hand in hand with this set, so it only remains for the set-builder to choose his own kind of audio end. But for loud speaker operation with remarkably faithful reproduction I must strongly recommend General Radio, 1-to-2 ratio transformers.

These transformers should now be mounted as shown in the photographs. The primary side of the instruments should be toward the subpanel; the grid post or terminal of the last transformer should be connected to the last socket (grid) with a lug—a connection that short being desired.

The Yaxley single control jack should now be connected. The filament control part of it connects thus: One soldering lug is connected to plus A, the other to the plus A of the last audio socket. Now try the plug in the jack with the A battery connected to the set and see if the last tube lights. If, when the plug is in the jack, this tube does not light you have probably connected to the wrong prongs. In that case you will have to try again. The other two prongs on this jack should be connected one to the plate of the last audio socket, the other to the B battery plus, 135 volts.

The C battery should be connected right behind the two audio tubes. A wire is connected from the plus of the battery to one of the copper cans and another wire is connected from the 9-volt tap of the battery to the F binding post of both audio transformers.

Wiring the Meters

So far the Jewell voltmeter and milliammeter have not been connected, and these should now be wired into the electrical circuit as shown last week. The milliammeter should read about twenty-six mills, with a power tube in the last audio stage, when the set is working perfectly. Make a note of this. If the milliammeter reads lower on nine tubes than it does on, say, seven tubes, it indicates that some of the tubes are "duds." A

low milliammeter reading might also be caused by resistance in the wiring, but this is hardly likely, provided you have followed instructions. (Incidentally, you may or may not know that the hand of the milliammeter fluctuates when the set is in operation; as the music or speech rises the hand climbs higher and higher, and as sound diminishes the hand recedes.)

Another B battery plus binding post, mentioned in the list of parts for this assembly, belongs on the subpanel. This post carries the 135 volts of B current. This high voltage goes to the last jack, to the B plus on the last audio transformer, to one terminal on the voltmeter and to one side of a .5 mfd. condenser.

Now put all nine tubes in the set and test the complete outfit. The home-made wavemeter should be used for this purpose. (It is hoped nobody failed to build that wonderful little buzzer-driven coil and condenser, described in the first article of this series!) After the set has made a good showing with the wavemeter, test it out on a broadcasting station. Of course you realize that there are three variables to adjust, condensers C1, C2 and C3. Volume controls cannot be classed as variables.

Tuning in a Station

Set condenser C1 at any given point, then bring condenser C2 up to the same dial reading; now slowly turn the oscillator condenser from 5 to 10 points on each side of the dial readings of the other two instruments. If no signal is intercepted change condensers C1 and C2 to another setting, say, five points higher, and again slowly turn the oscillator condenser from 5 to 10 points each side as before. This process should be repeated until a station is picked up—which won't be very long, provided there is one on the air!—changing the settings of the first two condensers, reading from left to right on the panel, about 5 divisions each time and SLOWLY turning the oscillator from a point at least 10 divisions below to an equal amount above the other two instruments.

When a station is picked up on the Fenway it can be received at two settings of the oscillator condenser—NEVER MORE THAN TWO!—the lowest setting on the dial being the adjustment of the oscillator that gives a frequency of 55,000 or 30,000 cycles higher than the frequency of the incoming wave. (The difference between 55,000 cycles and 30,000 cycles is the difference between Silver Marshall transformers and General Radio, Silver Marshall transformers being around the first figure and General Radio around the latter).

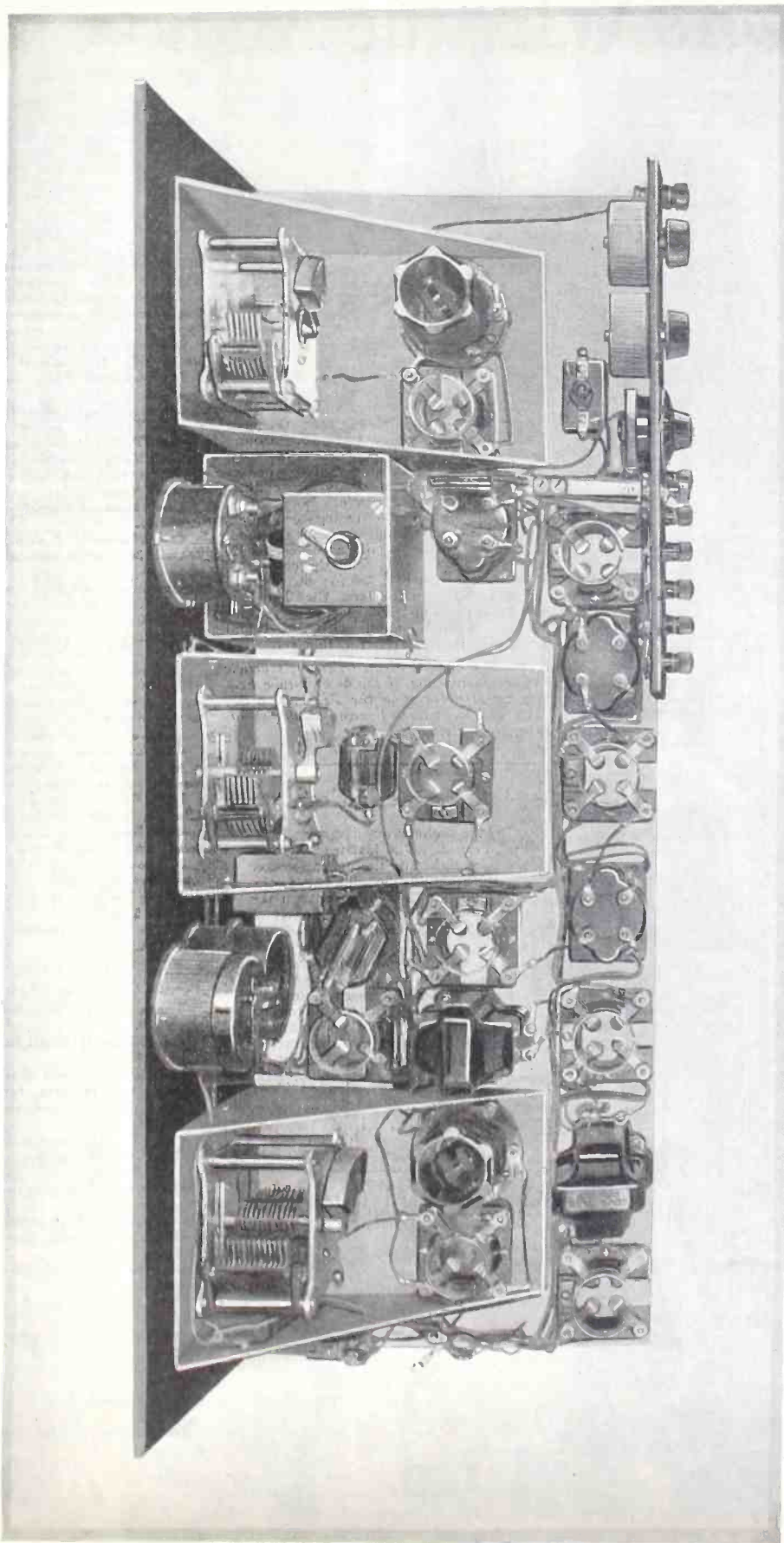
The signal intensity is about the same at either setting, but it not infrequently happens that owing to interference from other broadcasting stations or spark transmitters one setting is somewhat better than the other.

Avoid Harmonic Trouble

If your oscillator picks up harmonics stop right there, and find out the cause of it. A right-working Fenway WILL NOT pick up harmonics. Your trouble may be in the shielding, or in the coils, or in the tube itself. Whatever it is, locate and eliminate it at once. It is useless to go on testing, when harmonic troubles are staring you out of countenance.

The first volume control should be advanced as higher waves are intercepted. The Royalty resistance should be a little more than one-half way on. It is wiser to increase volume with the potentiometer than with the resistance, as the more neg-

The Top View of the Completed Fenway



HOW THE completed Fenway looks when a top view is taken of the assembled set. The photograph shows the author's personal set.

How to Wire the Audio Circuit

ative are the grids the less B battery will be consumed. But don't hesitate to advance the Royalty if necessary, for remember you have only 67 volts connected to it.

Of course when the set is in operation the covers should be on the cans. This is important. If the cans remain uncovered the effect of the shielding is practically lost.

Use of 99 Type Tubes

The 99 type tube can be used in the Fenway with remarkable results, in fact a portable Fenway has already been completed, using this type of tube, and the results with it are little short of marvelous. A type X120 tube is used in the last stage, with 135 volts of B battery and 22 volts of C battery. The 99 type tubes will need a suitable resistance in the audio circuit, such as a 99 type Amperite. Also, with these small tubes a C battery of from one and one-half to three volts should be used in series with the middle arm of the potentiometer and the grid returns of the medium frequency transformers.

The plus of the battery is connected to the potentiometer, and the minus of the battery to the transformers. Two 10-ohm rheostats should replace the two 6-ohm rheostats if three volt tubes are used. The remainder of the set is just the same as for standard tubes.

When buying standard Cunningham tubes for the Fenway they should pass the following plate currents: With a grid bias battery (C battery) of four and one-half volts and with ninety volts of B battery on the plate, the tube should read at least four milliamps—preferably five. X112 tubes with a grid bias battery of six volts and with ninety volts of B on the plate should show a reading of two and four-tenths.

A cone type speaker is recommended for the Fenway, but almost any kind of horn works well. A Western Electric amplifier and speaker performs beautifully with this set.

Loop Operation

"Will a loop work satisfactorily on the Fenway?" Well, the Rev. William H. Moser, Ph. D., of the Eighteenth Street Methodist Episcopal Church, New York, reports hearing California stations five consecutive nights, in his location, on the Fenway, using a very small loop. What could you do with a big one? If your loop is a three tap loop, remove the antenna coil from the socket and connect the inside end of the loop to post 6 of the coil socket, the center tap to post 4 or 5 and the outside end to post 3. If it is a two tap loop simply connect to post 6 and post 3. With some forms of standard loops it is necessary to add a few turns of wire in order to cover the band of from 220 to 550. Whereas, on the lower waves, it is necessary to remove turns, leaving, say, about eight turns on the loop for the 100 to 230 meter band

and about four turns (on the loop all told) for the 35 to 100 meter band. Belden or similar stranded loop wire should be used.

After the set is finally tested and you are satisfied that it is functioning O. K. get a cabinet. Get one that opens only from the front. Have two holes in the back (very small ones at that!), one for the antenna and one for the ground wires. There should also be an opening for a part of the subpanel to come through. But the rest of the cabinet should be entirely closed. If you must "play around" some more build another set. But let that set alone.

The Silver-Marshall special coils for the low waves are numbered 110-B and 110-C; for the special coupler, No. 111-B and 111-C.

And so our pleasant task is ended. We've told you about a radio set that conquers dead spots and annihilates distance. We've explained that that set could be built from parts costing around one hundred and fifty dollars. The various steps in the construction of the set have all been explained and fully illustrated in the 3-part article.

The General Radio tuning condensers shown in the photographs are not the models specified in the list of parts. Use 334N or 247N, as these tune with the coils cited in the list of parts. As for the General Radio audio transformers, the 2-to-1 is listed, but the 6-to-1 will give great volume. The set is loud enough with 2-to-1 and the 2-to-1 is preferred for this set.

[Parts I and II of Leo Fenway's article on the construction of the 4- or 9-tube Fenway were published in the February 6 and 13 issues. Next week Fenway trouble shooting will be discussed.]

Reconciliation

In the schematic diagram, published on page 9 in last week's issue, the pilot light and the potentiometer should be connected directly to the A+, and not indirectly through the 6-ohm rheostat as indicated, although the set will function either way.

Also, two .5 mfd. condensers were shown connected into the B+67 circuit. This is wrong. One condenser should appear in that circuit and the other should go from the B+45 to the ground. Connect this last condenser to the B+45 at the oscillator. The connection to the Royalty resistor, marked A+67, should read B+67. The remainder of the full circuit diagram is correct.

HERMAN BERNARD, managing editor of RADIO WORLD, broadcasts every Friday at 7 p. m., from WGBS, Gimbel Bros., N. Y. City, 315.6 meters. He discusses "What's Your Radio Problem?" Listen in!

LISTS OF PARTS

for Foundation Unit

One antenna coil, interchangeable for waves from 35 meters to 550 meters, Silver Marshall, type 110-A. (L.)

One special coupler, General Radio, type 268. (This coupler to be rewound as shown in Fig. 4.)

One special oscillator coupler, Silver Marshall, type 111-A (L3L4L5).

Two Silver Marshall "Sockets," type 515, for above two couplers.

Three General Radio straight-line wavelength variable condensers, type 334-N, or type 247-N, .00035 capacity (C1, C2, C3).

One Bakelite panel, 8x28x3/16", drilled as per Fig. 2. (National Radio Panel Co.)

One General Radio rheostat, type 301, 6 ohms.

Three Airgap vacuum tube sockets.

One Yaxley A battery switch.

One Yaxley pilot light.

One Yaxley double circuit jack.

Three National Velvet Vernier Dials, type B, (new).

One Micamold grid condenser, .00025 capacity.

One Micamold .5 mfd. fixed condenser.

One Micamold resistor (grid leak), 2 megohm.

One Micamold grid leak mounting.

One Subpanel, Bakelite, 4x12".

One Gem safety fuse and fuse holder.

One General Radio tap switch, No. 171F.

Three General Radio taps, No. 138D.

One piece of Bakelite, 2 1/2 x 2 1/2 x 3/16".

Seven Eby binding posts, antenna, ground, minus A, plus A, minus B, plus B

detector and plus B amplifier.

One set of four special copper cans.

One hardwood baseboard, 9 1/2 x 27 1/2 x 3/8".

1/4 lb. No. 32 copper wire, double silk or

double cotton covered.

Fifty feet of Celatite wire or Western

Electric printing telegraph wire. Colors

used: Red, green, black, brown and yellow.

This item should be purchased in

the following lengths: Red, 15 feet; black

the following lengths: Red, 15 feet; black,

15 feet; yellow, 10 feet; green, 5 feet;

brown, 5 feet.

Three Cunningham standard tubes,

CX301A.

LIST OF PARTS

For 2d Detector and Long-Wave Amplifier

Three Silver Marshall transformers,

type 210.

One Silver Marshall tuned transformer,

type 211.

Or three General Radio medium frequency

transformers, type 271, and one

General Radio tuned stage transformer,

type 331.

Four Airgap vacuum tube sockets.

One General Radio potentiometer, type

214-A, 400 ohms.

One General Radio rheostat, type 301,

6 ohms.

One Royalty high resistance, type B.

One Yaxley single circuit filament control

jack, No. 3.

One Yaxley double pole, double throw

switch, No. 60.

One Micamold grid condenser, .0005

capacity, with clips. (Note capacity!)

One Micamold bypass condenser, .005

capacity.

Two Micamold bypass condensers, 0.5

mfd.

One Micamold resistor (grid leak), 5

megohms.

One Jewell double reading voltmeter,

No. 55.

One special Jewell voltmeter, 0-8-80-160

volts.

Four Cunningham standard tubes.

LINGUISTIC SHORTCOMINGS - By Dan Napoli



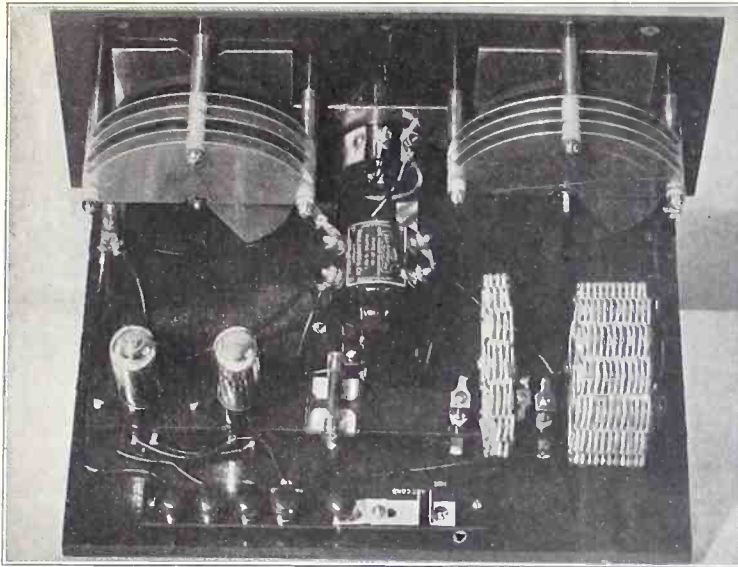


FIG. 1, receiver used at 2 AAU. Note the antenna series condenser (bottom center). The coils are interchangeable and permit a large band of wavelengths to be covered.

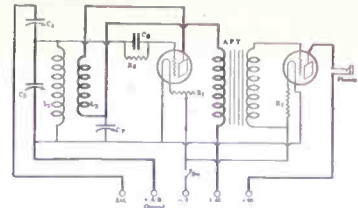


FIG. 2.

THE schematic diagram of 2 AAU's receiver. Note the odd method of feedback used. CA is the small condenser shown in Fig. 1.

whatsoever an excellent rectified ac note is procured. The tube is called the TBI.

Calls Heard

By 5 ACL, M. E. Lawson, 815 Stewart Drive, Dallas, Texas.

- 1 aao, 1 aau, 1 adi, 1 aei, 1 agx, 1 ahb, 1 ahv, 1 aja, 1 alp, 1 apl, 1 asu, 1 axa, 1 bal, 1 bay, 1 bec/ 1 bcr, 1 bgc, 1 bqi, 1 bqk, 1 bvl, 1 cab, 1 cal, 1 caw, 1 cjj, 1 cln, 1 cri, 1 ctl, 1 aw, 1 bs, 1 bv, 1 cu, 1 jr, 1 or, 1 pl, 1 qb, 1 sw, 1 sz, 1 xi, 1 va, 1 yb, 1 xm, 2 aan, 2 acs, 2 ahm, 2 ajq, 2 aky, 2 alw, 2 amj, 2 anm, 2 apm, 2 aqk, 2 asb, 2 bbx, 2 beo, 2 bkr, 2 box, 2 bsc, 2 ctf, 2 cjj, 2 clb, 2 cmx, 2 cpx, 2 crp, 2 cte, 2 cyx, 2 xas, 2 bw, 2 em, 2 fk, 2 gp, 2 gx, 2 kg, 2 ku, 2 mc, 2 mm, 2 nw, 2 pw, 2 py, 2 wb, 2 xe, 2 yw, 2 zv, naj, nar, nce, nfv, nism, nisv, nkf, nkf, npg, npm, nsf, ntt, npl, wir, wiz, wqo, wyd, cl el, c2 fo, c2 cg, c3aa, c3 ht, c3 xi, c3 zb, c5 go, c5 hp, c9 bj.

[Send all new QRAs, calls heard, news and questions to Irving P. Wolfe, Amateur Editor, RADIO WORLD, 145 West 45th St., New York City, or call 2 APJ on the air, 40 or 150 meters.]

Dah—Dit—Dah—Dit—Dah!

By Irving Philip Wolfe

2APJ

The receiver shown on this page is sure a wow! I tested it on a 10,000 mile reception and it sure was fb. The condenser is about .0001 and the following coils are used for the amateur waves:

L1	L2	Space betw'n	L1-L2	Wave lgth.
36	12	1 1/4 inches		124 to 206 m.
20	8	1 1/2 "		77 to 131 m.
12	8	1 3/4 "		49 to 84 m.
7	8	2 "		30 to 51 m.
4	5	1 3/4 "		10 to 32 m.

The last column shows the distance between the coils when using UX 201A tubes. For UX 199 the coils should be placed closer, otherwise no oscillation will take place. It may be necessary to vary the B battery voltage to obtain the best oscillation control. A single wire about 100 to 150 feet long (including leadin) is suitable as an aerial. A good ground or a counterpoise is advantageous, but in some cases not necessary. The small pieces of metal in the lower right-hand corner of the picture make up the antenna condenser. When operating above 150 meters the gap between the pieces of metal should be about 1-16 inch. For other wavelengths 3/8 to 1/2 inch will do.

The bad boy of the 3rd district, 3 BAD, has changed his QRA and is now located at 301 West York St., Philadelphia, Pa.

Ped Chadek, 9 AON, located at 630 W. Myrtle, Fort Collins, Colo., connected up with a Zeddie about a week ago. From now on AON hopes to be in constant communication with New Zealand. He is using a five-watt VT-14 with very low input.

On March 26 and 27 the Central Division will do its stuff at the Fourth Annual Michigan State Convention. The Park American Hotel in Kalamazoo will be the centre of activity. Convention fees will be 5 bucks and will include all meetings

and the banquet. Address James A. Wilson, 911 Lay Blvd., Kalamazoo, Mich.

9 PT, Chicago, sure has a wonderful note. While working him the other night there was plenty of QRM but that fluke note of his sure busts in. He is another bird that is using an "H" tube.

2 EV has also started in with the low power business and worked Texas with about 5 watts input. 2 AGT and I are now putting one of these sets into operation and by the time this comes out the 201As will be melting in their sockets with 140 volts of Roberts B Battery on them. A changeover system has been arranged so that we can change to 400 volts of pure AC from a special wound Shore Electric transformer. The change takes about 5 minutes (figuring time out for shocks, blowouts and loose connections) HI!!

In February QST, in the Traffic Dept., appears the following: "2 APJ is a new station." I have been on the air regularly since April, 1925 and always send in my traffic report, BUT after almost one year I am still a new station. I wonder how long I will have to have my station license before I will be accepted as not being a new station HI! (and then a few more of 'em).

Let me discuss an important article, the rectifier tube used at 2 APJ. This tube is a kenotron with a filament voltage of 7.5 and a plate voltage up to 1,000. The latter was put on the plate at a recent test at the station and the tube "stood up" excellently under the high plate voltage. With a 25 henry choke coil and about 8 mfd. of condenser an almost pure dc note can be had. At this station the tube filament is supplied with 10 volts and the plate with 750 volts. Without any filter

Determining Resonance

To determine the resonance of a circuit, a current square galvanometer, is connected in series with a wavemeter circuit. The wavemeter is placed in inductive relation to the circuit which is under measurement. It is then set in resonance to either of the radiated waves from a transmitter. Corresponding current readings are taken on the meter when the station, which you are trying to calibrate with, is on the air. Readings are then made at frequencies off resonance. Corresponding current is then observed and the resulting data is plotted in curve form on graph paper. The meter will deflect, when the top or peak of each wave is registered.

Prospects Are Bright For Inspection Funds

WASHINGTON.

Favorable action on the part of the House Appropriation Committee on the request of the Radio Section of the Department of Commerce for additional funds is forecast by members of that committee. The opinion prevails that the Commerce appropriation bill, which will be reported to the House within the next ten days, will provide for an increase of \$125,000 for the radio bureau for the next fiscal year.

GREAT B BATTERY ELIMINATOR ARTICLE concluded in Dec. 26 issue of RADIO WORLD. Herbert Hayden's 7-tube Super-Heterodyne also appeared in that issue. Send 15c for copy or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

HERMAN BERNARD, managing editor of RADIO WORLD, broadcasts every Friday at 7 p. m., from WGBS, Gimbel Bros., N. Y. City, 315.6 meters. He discusses "What's Your Radio Problem?" Listen in!

Sounds Well Imitated



SIMULATION of familiar sounds is expertly done for broadcasting. The chu-chu of the railroad, not to mention the blasting whistle and the bell, are imitated at WEEI, Boston, in the fashion depicted above. Left to right, Louis S. Whitcomb, Walter E. Meyers, Ralph L. Rogers and Leona Gorman. (WEEI Photo.)

Wedding Bells Soon



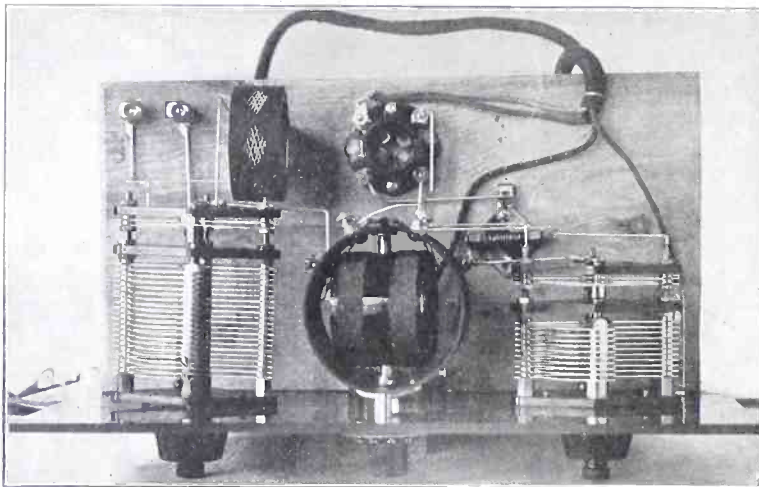
N. T. GRANLUND, announcer of WHN, New York City, and his fiancée, Rose Wenzel, dancer, told the world about their wedding plans, which include a ceremony in an airplane, to be performed by Mayor Walker. (International Newsreel.)

Baby Takes Kindly to Rad

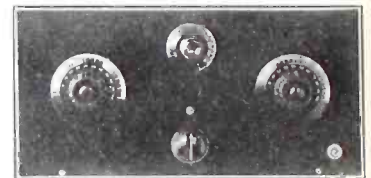


BOBBY McBETH twelve weeks old, shown here, is the son of H. F. McBeth.

Top View of the Loud 1-Tube Set



TOP view of the layout of the Loud Boy.



THE PANEL VIEW of the 1-tube Loud Boy, a set that is proving popular with fans.

Loud Boy Well Liked

In the February 6 issue of RADIO WORLD was published an article on how to build the Loud Boy, a 1-tube set. Fans who built it report excellent results. Several others requested that photographs of the top and the panel view be published. These are herewith shown.

Fans Should Calibrate Sets for Utmost Distance

MANY fans whose dearest ambition is to receive stations far away do not take the pains to facilitate the achievement of their aim. Possessors of any sets that can be logged, and that means nearly all sets in general use today, if desiring utmost DX reception, should procure some graph paper and draw the curve of dial setting, plotted either against wavelength or frequency, for each tuning dial. This would not include a dial actuating an inductive tickler. First tune in as many stations as possible, spreading the experiment over a week, if need be, and including stations on all possible wavelengths that you can receive. Mark down the dial settings and wavelengths. Then, using the graph paper, which is cross-sectional, mark off the dial divisions along the bottom and the wavelength along the side. For wavelength plotting, which is

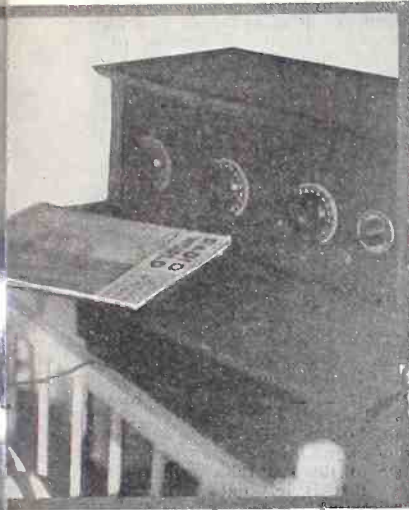
the more popular, eight squares deep and ten squares wide will enable easy plotting of wavelengths from 200 to 600 meters on dial readings of 0 to 100 or any other scale of dial readings. The perpendicular alignment is subdivided into tens. If the dial reads from 0 to 100 or 100 to 0, then horizontal alignment is subdivided into tens, also. Then each horizontal section will equal five meters and each vertical one division of the dial. Locate the stations on the paper by sharp pencil points. Then draw each curve and identify it with the proper dial and you will be able to tell in advance where any station within range will come in. The only important exception is that a station may be off its wave, which is an infraction of the Department of Commerce rules, and should be reported. The standardizing of tuning in this fashion is called calibration.

Sir Esme's Dinner

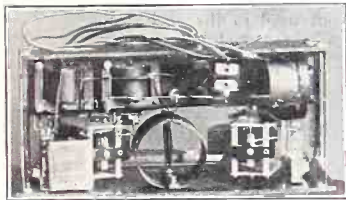


SIR ESME HOWARD, British Ambassador, at a dinner given at the Hotel Boston Society. Left to right, Alton B. Parker, of the New England Society, and Dr. J. C. University. Sir Howard spoke over

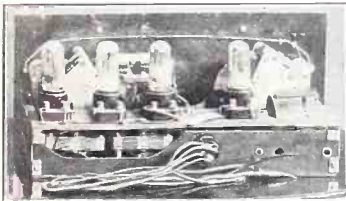
on Comfort of His Crib



his attitude toward the radio clearly.
906 Rice Ave., Lima, O.



THE 4-tube Diamond of the Air may be made on a 7x18" panel as shown above. The set shown uses 99 type tubes.



REAR view of the 4-tube Diamond, using dry cell tubes. This set was described in the January 23rd issue of RADIO WORLD. Note the Jones Multi-Plug for all external connections.

Speech Broadcast



to the United States, was guest of Brooklyn, N. Y., by the New England ... Dr. Edward E. Hicks, president ... Greer Hippen, president of Princeton ... radio. (International Newsreel.)

Veterans Honor Lincoln's Birthday



GEORGE W. DUGGAN, New York State Patriotic Instructor of the Veterans of Foreign Wars, who was one of the principal speakers on the Americanization program broadcast from the New York City Municipal station, WNYC, under the auspices of the Veterans of Foreign Wars in honor of Lincoln's Birthday. Through the courtesy of Commissioner Albert Goldman this was made possible. Katherine Dooley, child mascot of the Joseph P. Lynch Post, V. F. W., which meets at Fort Hamilton Reservation, Brooklyn, and Andrew Weiman, Jr., son of one of the Post officers, are "listening in." (Foto Topics).

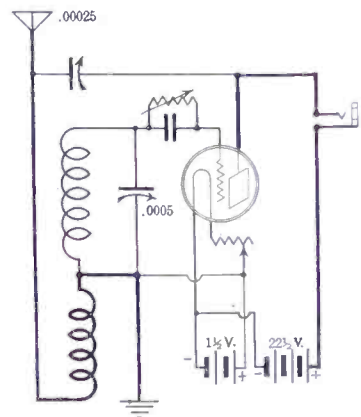
1-Tube Set Affords 1,000-Mile Reception

HERE is a circuit that has given very good results and should be of interest. During daylight I have tuned in WJZ with as much volume as it is heard here at night, also KDKA. At night I have heard 6KW, also WMBF, Florida; WJAX, Jacksonville, Fla., and WSMB, New Orleans. I am located at Toronto, Canada, so it is over 1,000 miles to any of these stations and I consider this pretty fair.

The first night it was hooked up Cuba was tuned in very well. The coil is wound with No. 20 DCC wire on a 3 1/2" tubing 4 1/2" high. Fifteen turns are wound. A small loop is made and the winding is continued on for 42 more turns, making a total of 57, tapped at the fifteenth turn.

The condensers are low loss. One is .00025, which is used as the oscillation control. The .0005 tunes the secondary. A dry-cell tube was used with good results. Other tubes should work just as well. In this case do not forget that a good variable leak will be needed. The panel is 7x14". The 11-plate condenser is on the left-hand dial. The 23-plate is for the right-hand dial. When you have your parts mounted and the coil made, the start of the 15-turn coil connects to the aerial, also to the fixed plates of the .00025. The rotor plates connect direct to the plate of the tube.

Next the tap that was taken off at 15th



WIRING DIAGRAM of the 1-tube set that accomplished much 1,000-mile reception.

turn connects to the ground and the rotor plates of the .0005 condenser go to positive A battery. The 42-turn section connects to the grid, also the fixed plates of the .0005.

W. MERCER,
887 Dundas St., East,
Toronto, Can.

Radio University

A QUESTION and Answer
 Department conducted by
RADIO WORLD for its Read-
 ers by its staff of Experts.
 Address Radio University,
RADIO WORLD, 145 West
 45th St., N. Y. C.

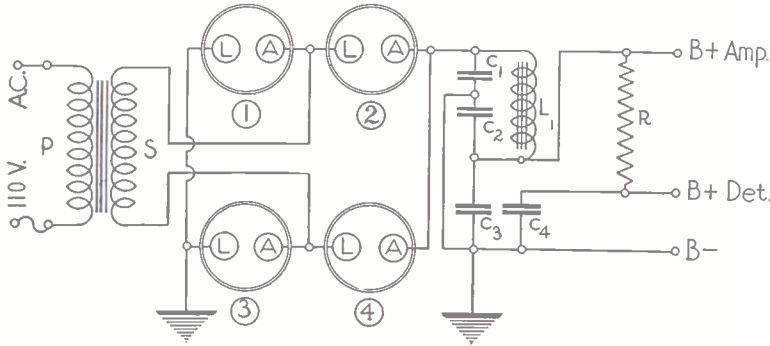


FIG. 263, showing the eliminator hookup.

PLEASE GIVE me the circuit diagram of a Chemical B Battery Eliminator, stating all the constants.—J. Latour, Canton, W. Va.

Fig. 263 shows the electrical diagram of such an eliminator. P and S constitute the AC step up transformer. The exact construction of this transformer was described by Lewis Winner in the Dec. 19th issue of **RADIO WORLD**. The primary, P, consist of 1,000 turns of No. 26 enameled wire, wound in a haphazard manner. The secondary, S, consists of 1,150 turns wound with the same kind of wire as used on the primary. The choke coil, L, consists of 6,850 turns of No. 30 enameled wire. The detailed construction of this coil was described in issue cited. C1 and C3 are 2 mfd. fixed condensers. C2 is a 4 mfd. fixed condenser. C4 is a 0.5 mfd. fixed condenser. All of these may be of the paper insulated type. R is a 100,000-ohm resistor. Pint preserving jars hold the liquid which make up the chemical cells. Saturated borax constitutes the solution. "A" stands for the aluminum rods, which are 1/4 inch in diameter. "L" stands for the lead rods, which are 3-16 inch in diameter. This eliminator is capable of delivering 112 volts at approximately 35 milliamperes. This of course depends upon the exact size of the plates and the solution which covers up the plates. Both the amplifier and the detector posts can be made variable by means of a variable resistor. Each of these is inserted in series with the posts.

I WOULD like to have a diagram of a 3-tube receiver, wherein the RF tube is regenerative with a variometer controlling the plate action of the tube, a crystal as a detector and two stages of transformer-coupled audio-frequency amplification are need. The results obtainable with this receiver should nearly equal that of a 4-tube set. The main purpose for my desire of such a set is for extreme quality of signals.—H. Desera, San Fidel, N. M.

Fig. 264 shows the diagram. The primaries, L1 and L4 consist of 8 turns each. The secondaries, L2 and L5 consist of 46 turns each. Forms 3 inch or 3 1/4 inch in diameter are to be used in winding these coils. Between the primary and the secondary windings, leave a 3/8 inch space. Use No. 24 double cotton covered wire. Wind the turns very tight. C1 and C2 are both .0005 mfd. variable condensers. L3 is a variometer of commercial make. R1 is a 3/4 ampere ballast resistor. J1 is a single circuit jack. Phone tip jacks may be substituted for the jack. S is a filament switch. The —O1A type tubes are used throughout the set. Both the audio-frequency transformers are of the low ra-

tio type. The plate of the RF tube receives 67 1/2 volts. The plates of the amplifier tubes receive 90 volts. There is no C battery employed, but the same may be used, if so desired. A 4 1/2-volt battery inserted in series with the F-posts of both AF transformers will fit this bill. The minus post of this battery goes to the F minus posts, while the plus of this battery goes to the minus A post. A 6-volt battery is used as the filament source of current. The antenna should be no more than 100 foot in length. It may be found that if the RF tube oscillates beyond control, by inserting a rheostat in the negative leg of the filament, the same will be under control.

IS THE Thordarson-Wade receiver described by Herman Bernard in the Oct. 3, 10 and 17 issues of **Radio World** as good as the 1926 Model Diamond of the Air in all respects? (2)—When the diameter of a coil is specified, is the outside diameter of the coils referred to? (3)—Will the operating efficiency of a coil be impaired if double silk covered wire is used instead of double cotton covered wire?—Dr. L. Breskman, 820 Main St., Dickson, Pa.

(1)—The sets are on a par. (2)—Yes. (3)—No.

CAN THE 1925 Model Diamond of the Air be built with the following parts?—Two .0005 mfd. Signal variable condensers; four standard sockets; one Simplex 3-circuit coupler with a 3 3/8" diameter for the stationary coil and a 2 3/4" diameter for the rotary or tickler coil; one Superadio radio-frequency transformer with a 3" diameter; two Karas audio-frequency transformers; one Marco filament switch; one 30-ohm Cutler-Hammer rheostat, one 6-ohm Cutler-Hammer

rheostat; one Marco No. 121, one Marco No. 123 jack and one Electrad Variohm grid leak, etc? (2)—Is there any special way that the coils should be placed? (3)—How many turns should be placed on a form 3" in diameter to constitute the primary and the secondary of a tuner. The number of turns on the tickler coil would also be appreciated. The diameter of the form upon which this is to be wound is 2". No. 24 double cotton covered wire is to be used.—C. H. Rawley, 153 Center St., Milton, Mass.

(1)—Yes. You will have to add five more turns to the secondary of the radio-frequency transformer. (2)—Yes. Place the tuner and the RFT at right angles to each other and about 6" away. (3)—The primary consists of 10 turns. The secondary consists of 45 turns. The tickler consists of 35 turns.

I HAVE built the 1926 Model Diamond of the Air as per instructions in the Sept. 26 issue. I then sent for a blue print, so that I could check the wiring of my set up. Both these diagrams differ. In the Sept. 26 issue there is an extra condenser of .25 mfd. capacity in series with the plate of the last tube, while in the blueprint that is left out. Also in the earlier circuit, there is a .001 mfd. fixed condenser from the tickler post to the A minus post, while in the print, it is left out. In the earlier circuit, rheostats were used instead of ballast resistors. A C battery is not used in the earlier circuit either. Do all these modifications increase the efficiency of the set?—James M. Riffe, care Cincinnati Gymnasium and Athletic Club, 127 Shillito Place, Cincinnati, O.

They increase efficiency or convenience.

IS THE Bruno 3-Circuit tuner (small size) all right to use in the 1926 Model Diamond of the Air? (2)—Is it all right to use a reputable manufactured SLF variable condenser in this circuit?—W. J. Dean 19 1/2 West State St., Mason City, Ia.

(1)—Yes, (2)—Yes.

I HAVE a set of Bremer-Tully coils which includes a radio-frequency transformer and a 3-circuit tuner and two .00025 mfd. variable condensers. Are these all right to use in the 1926 Model Diamond of the Air? (2)—Is this set sharp enough to tune out local stations within 1 mile?—William Aaler, 287 Locust St., Buffalo, N. Y.

(1)—Yes. (2)—Yes, provided all good apparatus is used and the directions as well as the diagrams are followed carefully.

IS IT possible to obtain maximum signal strength from a station, say in the northern portion of the country, if the antenna is pointed in that direction or

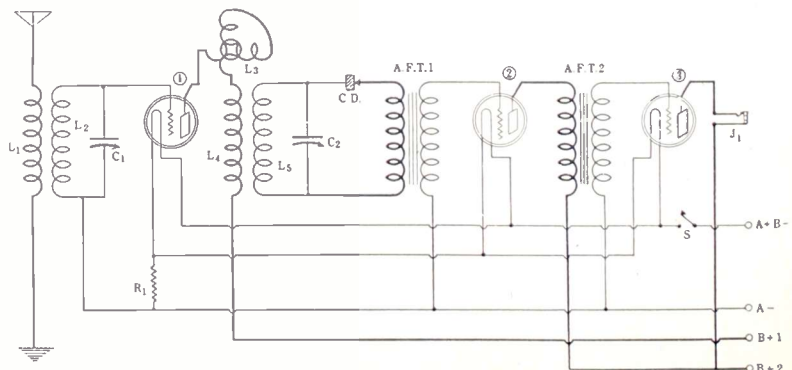


FIG. 264, showing the quality 3-tube set.

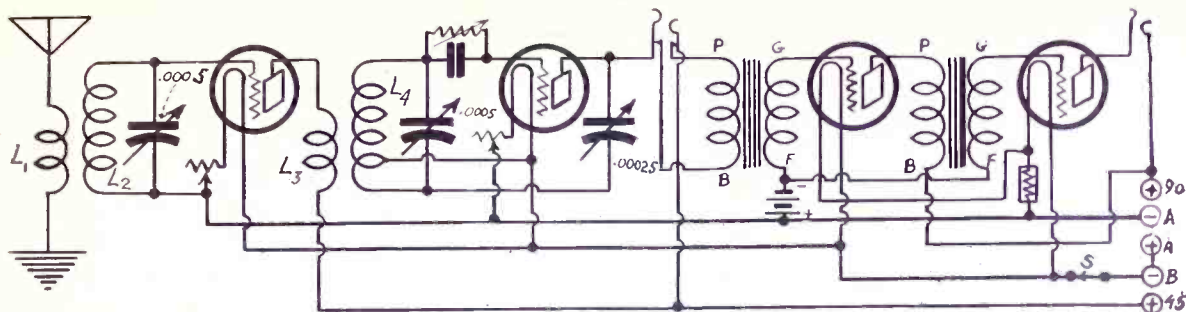


FIG. 266, showing the capacity regenerative controlled 4-tube receiver asked for by Robert Hart.

will the strength of the signals be practically the same if pointed in the opposite direction? The open end of the antenna is that point of the antenna which faces the station, etc.—Henry Spett, 746 Marcy Ave., Brooklyn, N. Y.

The strength of the signals, whether the antenna faces north or east will be the same, unless when your antenna is placed in either one of these directions, some physical object is in the way. This is what causes a great many fans to believe that the antenna placed in the same direction that the DX station is located, will give you maximum signal strength.

PLEASE show a diagram of a 2-tube, 1-control receiver, wherein the first tube is employed as a non-regenerative radio-frequency amplifier and the second tube as either a non-regenerative or regenerative detector. The filaments of both these tubes should be controlled by rheostats, —Louis Klatans, Middleville, N. J.

Fig. 265 shows the electrical diagram of this type of a receiver. L1 and L3, the primaries of the tuned radio-frequency transformers, consist of 10 turns each. The secondaries, L2 and L4, of the tuned radio-frequency transformers, consist of 45 turns each. A form which is 3/4 or 3/2 inch in diameter and 4 inch high is used to wind the primaries and the secondaries, L1L2 being on one form and L3L4 on the other. The wire is No. 24 double cotton covered. There is a 3/8 inch space between the primary and the secondary windings. C1 is a double condenser, each half having a capacity of .0005 mfd. R1 and R2 are both 10-ohm rheostats, provided the -01A type of tubes are to be employed. C2 is a .00025 mfd. grid condenser. R3 is a 2-megohm grid leak. By inserting a .001 mfd. fixed condenser from the plate post of the detector tube to the arm of the rheostat controlling the filament of the detector tube this bulb may be made to oscillate more freely, thereby giving greater volume. About 67 1/2 volts should be placed on the plate of the radio-frequency amplifier tube. About 45 volts should be placed on the plate of the detector tube. A 6-volt battery should be the filament source of current. Two steps of audio frequency amplification can easily be added to this set, which will give very good volume on the loud speaker on signals from both distant and local points.

I WOULD like to have a circuit diagram of a 4-tube receiver, in which a step of tuned non-regenerative amplification, a capacity controlled regenerative detector tube and two steps of transformer coupled audio-frequency amplification are employed. The constants of all the parts would be greatly appreciated.—Robert Hart, Jackson, Tex.

Fig. 266 shows the electrical diagram of this set. The coils, L1L2 and L3L4, are wound alike, except that L4 has a tap. A form 3/2 inch in diameter and 3 3/2 inch high is used to wind the coils. L1 and

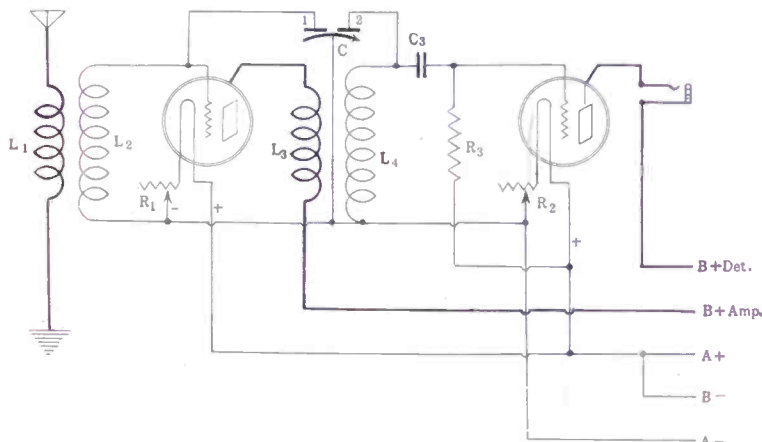


FIG. 265 shows the 1-control receiver requested by Louis Klatans.

L3, the primaries consist of 8 turns. L2 and L4, the secondaries, consist of 50 turns. There is a 1/4 inch separation between the primary and the secondary windings. The tap on L4 is made at the sixth turn from the filament end of the winding. The variable condensers should be of the SLF type. The fixed grid condenser is .00025 mfd. The grid leak is of 2 megohms. These of course are inserted in series with the grid post of the detector tube, which is the second tube from the left-hand side of the diagram. The jack on the output of the detector and the radio-frequency amplifier is of the double circuit type. The audio-frequency amplifiers should both be of the low ratio type. If 90 volts are to be used on the plates of the amplifier tubes, a C battery bias of 4.5 volts should be placed on the grid. If 135 volts are to be used, a

9-volt bias should be used. A ballast resistance of 1/2 amperes (No. 112 Amperite), is to be used in controlling the filaments of the last two audio-frequency amplifier tubes. S is a filament control switch. The jack from the output of the last audio tube is of the single circuit type. A 6-volt battery is the source of filament current. The rheostats that control the filaments of the RF and the detector tube is of the 20-ohm type. Use No. 24 double cotton covered wire.

THE 4-TUBE DIAMOND OF THE AIR, by Herman Bernard, appeared in RADIO WORLD dated Jan. 23, 1926, per copy, or start subscription with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

HERMAN BERNARD, managing editor of RADIO WORLD, broadcasts every Friday at 7 p. m., from WGBS, Gimbel Bros., N. Y. City, 315.6 meters. He discusses "What's Your Radio Problem?" Listen in!

Join RADIO WORLD'S University Club

And Get Free Question and Answer Service for the Coming 52 Weeks.

Have your name entered on our subscription and University lists by special number. Put this number on the outside of the forwarding envelope (not the enclosed return envelope) and also put it in your queries and the questions will be answered the same day as received. If already a subscriber, send \$6 for renewal from close of present subscription and your name will be entered in the Radio University.

[In sending in your queries to the University Department please paragraph them so that the reply could be written under or along side of each query. Write on one side of sheet only.]

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

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

Name

Street

City and State

A THOUGHT FOR THE WEEK
CANNIBAL KING has taken to radio
 —surely a case of "eating it up."

RADIO WORLD



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

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 PUBLISHED EVERY WEDNESDAY
 (Dated Saturday of same week)
 FROM PUBLICATION OFFICE
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SUBSCRIPTION RATES

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 Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order is automatic acknowledgment of their subscription order. Changes of address should be received at this office two weeks before date of publication. Always give old address also. State whether subscription is new or a renewal.

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 1 Column, 2 1/2 "x11" 154 lines..... 100.00
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Ten cents per word. Minimum 10 words. Cash with order. Business Opportunities ten cents per word, \$1.00 minimum.

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

FEBRUARY 20, 1926

Stations to Be Dropped If They Don't Toe Mark

There are 536 broadcasting stations in the United States. Although no announcement of a change of policy has been made, stations must now justify their existence before a renewal of their license is granted. This is in line with the recommendations of the recent radio conference to weed out the weak stations. It is expected the action will be upheld and authority for it incorporated in the radio legislation now pending in Congress.

Stations not giving the maximum service to the public, operating in the public interest or in any way failing to keep their schedules of transmission or quality of programs, are likely to be dropped when the time for the renewal of license comes along.

PART 2 OF RADIO WORLD'S B BATTERY ELIMINATORS appeared in RADIO WORLD dated Dec. 19. Other great articles in that issue. 15c per copy or start your sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

Maxine Brown's Voice Radioed, N. Y. to Moscow

When Moscow reported hearing radio station WOR at Broadway and Forty-first street, New York City, during the international broadcast tests recently, officials of that station started immediately to verify the report. Monday evening, January 25, when an S O S stopped the local stations from sending out programs from 7.30 to 10.45 P. M., artists were unable in most cases to put on their programs. Maxine Brown, however, sang

two numbers from WOR, "Then I'll Be Happy" and "Dinah" between 10.45 and 10.55 o'clock. Then the S O S came on again. It was her voice which was heard in Moscow, thereby establishing what is said to be a long distance record for broadcasting a song. In the international tests last year, Miss Brown was the only radio artist to be picked up in Europe from a Chicago station, WTAS, now WLIB, when London heard her singing.

Sunday Program Scope Stirs Fans' Discussion

THE question of the character of Sunday programs has been raised by some readers of RADIO WORLD, voting in the canvas to determine what type of programs meets the desire of the greatest number. L. G. Miller's plea for greater variety will be published. It would be interesting to ascertain what other readers think of the character of Sunday programs. As it is, the programs, for the most part, reflect the solemnity of the Lord's Day, and it is understood that this represents the preference of the majority of radio listeners.

Divided Opinion on Jazz

As for the general subject, the canvas thus far, while not conclusive, shows that the waltz, rendered by an orchestra, is quite popular. It has been assumed by many that the waltz was not so popular, but if the letters received from fans are any guide, the waltz ranks near the top. Several who filled out the coupon rated the instrumental waltz first.

Opinion is divided on whether there is too much jazz. Some persons emphatically oppose it in its entirety, while others feel that there is too much of it, but nobody yet has asserted in this canvas that not enough jazz is heard. A physician states

that jazz makes people happier, because of its enlivening effect, while another man opposes "anything of the Tin Pan Alley variety."

Some Who Replied

Among those who filled out the coupon and mailed it to Program Editor, RADIO WORLD, were Courtenay Bateman, Box 296, Columbia, S. C.; Ellis Silvergate, 5463 Delancey St., Philadelphia, Pa.; Omar T. Cruikshank, M.D., 1107 Island Ave., Pittsburgh, Pa., who favored jazz, when interspersed with good music, such as is presented during the Atwater Kent Music Hour; W. J. Erickson, 1552 Nott St., Schenectady, N. Y.; John Dempsey, 47 Morton St., N. Y. City; Ed. Manwood, 23 Broadway, Detroit, Mich.; D. M. Taylor, Cedar Rapids, Ia.; B. H. Vernet, 8909-97th St., Woodhaven, N. Y.; James McAllister, R. D. 3, McDonald, Pa.; Al. Thornquist, Mound, Minn.; E. B. Polk, Cheriton, Va.; L. R. Saunders, 1124 First St., S. W., Mason City, Ia.; Frederick W. Foertsch, 173 Westervelt Ave., Hawthorne, N. J.; Walter E. Carson, 3515 McClellan Ave., Detroit, Mich.; Frank Hall, Andover Ash Co., Andover, O.; E. Jedlicka, 229 Crescent St., L. I. City, N. Y. Fill out and mail this coupon today.

Program Editor, RADIO WORLD, 145 West 45th Street, New York City:
 My preference for entertainment and instruction on the radio is as follows, the numbers next to the listed items representing the order of preference:

- | | | |
|--|--|---------------------------------|
| Grand opera..... | Ringside..... | Football game..... |
| Jazz orchestra..... | boxing report..... | Hockey match..... |
| Talk..... | Classical instru-
mental solo..... | Recitation..... |
| State subject
of talk here..... | State kind here..... | Musical comedy
(stage)..... |
| Classical vocal
solo..... | Jazz songs
vocal..... | Short play
(drama)..... |
| State kind here..... | Waltz (orchestral)..... | Short play
(comedy)..... |
| Musical saw..... | Symphony concert..... | Banquets, with
speeches..... |
| Vocal duet..... | Instrumental duet..... | Sermons..... |
| Vocal trio..... | Instrumental trio..... | Market report..... |
| Vocal quartet..... | Instrumental quartet..... | Weather report..... |
| Questions and
answers on
world topics..... | Brass quartet.....
Bedtime story.....
Baseball game..... | Organ recital..... |

If you particularly dislike any of the above listed offerings, write "No" on the dotted line.

Other offerings (not listed above).....

Remarks (if any).....

Fill out and
 mail this
 coupon today!

Name.....
 Address.....
 City..... State.....

Rescue of Antinoe A Radio Triumph

WASHINGTON.

Another striking instance of the great value of the radio compass aboard ship has just been reported to the Lighthouse Service in connection with the rescue in a violent North Atlantic winter storm of 25 men from the sinking British steamer Antinoe by Captain George Fried and the officers and men of the United States Lines Steamship President Roosevelt. Captain Fried's radio message tells the story of the rescue:

"At 5:40 a. m. January 24 received SOS from steamship Antinoe; proceeded to her position by radiocompass bearings, which proved position 100 miles in error; alongside her at noon; wind west, force 10, with violent snow squalls and high rough seas; were rolling 35 degrees; took position quarter mile windward; pumped oil overboard with excellent effect."

The message then relates the numerous attempts to get a line aboard the Antinoe or to take off the shipwrecked crew, which eventually was accomplished although two members of the Roosevelt crew lost their lives in the effort.

Captain Tose, who with his crew was rescued from the Antinoe, included in his message the following:

"... Great credit is due to the wire-



THE wireless operators of the steamer Roosevelt and the Antinoe who stood at their posts while a new epic of the seas was being written. Left to right, Kenneth Upton, the American operator of the Roosevelt, and the operator of the steamer Antinoe. (International Newsreel)

less officers of the Roosevelt for getting our true position from a wireless compass as, owing to the impossibility of making astronomical observations, I had been able to give only our approximate position."

WJZ Expects All To Like Super-Power

WASHINGTON.

WJZ, the Radio Corporation station at Bound Brook, N. J., will be allowed a reasonable time to determine whether the blanketing effect of its super-power experiment can be eliminated. This was the conclusion of a recent conference between representatives of the Radio Corporation, members of Congress from New Jersey and officials of the Radio Bureau of the Department of Commerce.

The Radio Corporation officials asserted they were doing everything within their power to eliminate the interference and that they believed within three months every complainant would be satisfied.

Thinks That He Heard Overseas on Diamond

RESULTS EDITOR:

I wish to congratulate you on your wonderful circuit, the Diamond of the Air.

Sunday night, during the International Test at 11:55 P. M., I picked up a program on 480 meters. Due to considerable interference, I wasn't able to get the call letters. The nearest British station I could find to compare with wavelength reading was Birmingham 5IT.

The same night I also tuned in PWX, 6KW, KLDS, WKAQ and CZE, Mexico City.

I have also received stations KOA, KFKX, WOAW, WOS, WCCO, KCRG, WOAI and hundreds of others throughout the country.

F. B. LAURENCE,
West Main St., Branford, Conn.

White Bill Favored; Will Be Reported Out

The National Association of Broadcasters reports:

"It is stated on good authority that the White Radio Bill will be reported out of committee substantially in its original form. There probably will be a minority report opposing the placing of power in the hands of a Secretary of Commerce, or in an Advisory Committee, but which report will strongly advocate the establishing of a Communications Commission which will sit permanently in Washington for the purpose of handling radio and all other forms of communication.

"The pivotal point in radio legislation seems to rest upon what authorized person or body shall say who shall broadcast and upon what wavelengths and hours of operation." Obviously there are three logical suggestions, namely:

1. A Government official, such as the Secretary of Commerce.
2. A committee of outstanding citizens.
3. A permanently employed commission.

"Let us analyze these. Suggestion No. 1 has the disadvantage of placing unusual power in the hands of one person, but has the advantage of undivided authority, supported by data gathered by an extensive Government organization. Suggestion No. 2 has the disadvantage of placing great responsibility upon citizens who may not be qualified, or whose interest would not be sufficient. If employed in an advisory capacity to the Secretary of Commerce, it has the advantage of softening any criticism which might arise from decisions by the Secretary of Commerce, or of moderating decisions. Suggestion No. 3 has the disadvantage of establishing another Government commission, and would find objection in the minds of those legislators who are opposed to commissions in general. It has the advantage of

requiring a number of minds to meet before rendering decisions, and if organized upon a permanent basis would undoubtedly attract competent men who would give their whole time and attention to the problems which would be submitted to them.

"The Department of Commerce is paving the way for a fair and impartial handling of future broadcasting licenses, through adopting the policy of issuing temporary permits for present broadcasting. Therefore, if a radio law is passed, whatever authority is created for the handling of radio problems will have a free hand in handling the situation.

"The question is, what form shall this authority take."

It is being earnestly argued.

Commission Proposed To Regulate Radio

WASHINGTON.

Under a proposal by Representative E. L. Davis, of Tennessee, regulation of radio would be taken from the Secretary of Commerce and lodged with a commission which would have jurisdiction over communications, including the telephone and telegraph.

The proposal of Mr. Davis is being considered by the House Merchant Marine and Fisheries Committee which has the White radio bill under executive consideration. Mr. Davis is a member of this committee and he has intimated his intention to carry the fight to the floor of the House if his proposal is rejected by the committee.

Mr. Davis thinks the White Bill con-

Family of 22 Listens In

It is the joy of every program manager to know that those unseen thousands are enjoying what he has been responsible for putting on the air. Hundreds of fan letters each day express their likes and dislikes, but it remained for M. A. Abercrombie to poll the biggest vote on just one little post card. Mr. Abercrombie wrote in to WBBM, Chicago, stating that his family of 22 were enjoying WBBM every evening. It was stated that there were eleven boys and eleven girls. This last fact made the card all the more appreciated by WBBM because it was considered all the more unusual that such a large family could agree on the program that they liked best.

fers too much authority on the Secretary of Commerce in the control of a proven medium of propaganda and publicity.

The Commission proposed by Mr. Davis would be somewhat similar to the Interstate Commerce Commission which now exercises a supervisory authority over railroads. The commission would be appointed by the President, subject to the approval of the Senate.

Secretary Hoover is known to disfavor the Davis Commission proposal. Mr. Hoover believes the Davis Commission would be of a semi-judicial character, and he thinks most of the problems of radio are of an executive and not semi-judicial nature.

Others' comments are being sought.

THE RADIO TRADE

Radio Movies Prophesied By Powel Crosley, Jr.

CINCINNATI.

The fifth birthday party of the Crosley WLW broadcasting station also marked the ten-thousandth hour of transmitted entertainment through the six broadcasting stations owned by Powel Crosley, Jr., since 1921. Mr. Crosley told of his entrance into the radio industry and the early experiences encountered in broadcasting.

"I can safely prophesy reception of broadcast entertainment eventually from every nation on the globe," said Mr. Crosley. "The only thing needed now is more power in the broadcasting station."

"I prophesy moving pictures and radio vision in homes within the next five years. This will be brought about by a vision microphone, set up to catch things you would like to see in various parts of the world—transmitted through a broadcasting station and received in your home on a moving picture screen."

"Another development that may come within a few years is the transmission of heat and energy by radio."

Mayor Seeks Way To Ban Squealers

BRADLEY BEACH.

Mayor Frank C. Borden, Jr., requested City Solicitor Joseph R. Megill for an opinion as to whether the Board of Commissioners had the power to enact an ordinance prohibiting the use of regenerative or squealer radio sets in the resort.

Mayor Borden said that fans had complained to him that improper use of sets was spoiling the reception of programs and has asked that the commission take some action.



RADIO vision and motion pictures in homes within five years are predicted by Powel Crosley, Jr. (left), who is showing a new radio set to C. Francis Jenkins, inventor of machines for transmission of pictures by radio. Mr. Crosley said that radio movies will be brought about by a vision microphone set up to catch things in various parts of the world and transmitted through a broadcasting station and received in homes on a screen.

Demonstration Rooms To Be Adjunct of Show

A new departure in radio expositions is promised in the Allied Radio Congress and National Radio Exposition scheduled for Chicago, September 27 to October 2. The exposition will incorporate as the new departure, the use of private demonstration rooms for exhibitors in which out-of-town dealers and prospects can be given immediate demonstrations of the manufacturer's product without leaving the exposition building.

The use of private demonstration rooms located in the same building with the exposition is expected to add an important psychological factor to the success of the exposition. It will enable the exhibitor to give conclusive evidence of the merit of his product without annoying other dealers or exhibitors and without losing touch with his prospect as he might if it were necessary to take a taxicab to another building where a demonstration could be arranged. The demonstration rooms at the exposition will be accessible by direct connections with the exposition floor.

The success of the First National Radio Show held on a profit-sharing basis and controlled by an exhibitors' committee was conclusively demonstrated when the exposition management was able to return substantial rebate checks to exhibitors.

Milo E. Westbrooke has been retained

as secretary-manager of the Allied Radio Congress. His office is at 440 South Dearborn St., Chicago.

Business Opportunities Radio and Electrical

Rates: 10c per word; Minimum, \$1.00; Cash with order

ESTABLISHED RADIO tube factory with business, automatic equipment; partners disagree; quick sal. Box 121, RADIO WORLD.

WELL-EQUIPPED RADIO TUBE FACTORY, transmitters and receivers; will sell with business; dissolving partnership. Box 33, RADIO WORLD.

MANUFACTURERS AND INVENTORS—Experimental work, models, dies, tools, instruments, light machinery, general manufacturing, inventions developed; customer's supervision in machine shop permitted; over 25 years' specialized experience. Manufacturers and Inventors' Electric Co., 228 West Broadway, New York.

PRINTING—250 ELEGANTLY PRINTED 20-lb. letterheads, \$1.50; cards, billheads, envelopes, same; 500 booklets, 8-pp., 3/4x6, \$15; Summer resort folders, labels, circulars; everything low. Call's Quick Print, 13 East 16th St., N. Y. C., Phone Stuyvesant 9504.

RADIO AND ELECTRICAL business for sale; established 27 1/2 years; situated in Yorkville section, doing \$50,000 to \$60,000 a year; owner wants to retire. Box 5, 1329 3rd Ave., New York.

\$100 WEEKLY UP. We want experienced radio men to operate branch assembly plants. Part or whole time. Barfield Radio Co., 13 Tillary St., Dept. W. R., Brooklyn, N. Y.

Literature Wanted

THE names of readers of RADIO WORLD who desire literature from radio jobbers and dealers are published in RADIO WORLD on request of the reader. The blank below may be used, or a post card or letter will do instead.

Trade Service Editor,

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

I desire to receive radio literature.

Name

City or town

State

Are you a dealer?

If not, who is your dealer?

His Name

His Address

P. F. Nelson, 1919 1/2 Ella St., Selma, Cal.
B. Samberg, 115 Stanton St., N. Y. City.
Earle E. Crilley, 596 Elizabeth St., Fond du Lac, Wis.
Charles J. Turner, 2526 Seventh Ave., Altoona, Pa.
H. A. Thomas, 1524 1/2 Broadway, Mattoon, Ill. (Dealer).
Clara Thune, 52 N. Swan St., Albany, N. Y.
L. Hatch, Circleville, N. Y. (Dealer).
Thomas W. Wilson, 915 South Main St., McPherson, Kans.
N. H. Libby, 23 Carey St., Portland, Me.
N. Staal, Ingerslevsgade, 128, Copenhagen, Denmark.
J. B. Ouineau, 605 Rugby Road, Brooklyne, N.Y. (Dealer).
Amos Radio Laboratory, 508 South Crouse Ave., Syracuse, N. Y.
W. H. Powell, 101 East Hampton Ave., Sumter, S. C.
Nels Johnson, Box 562, St. Helens, Ore.
F. Satterlund, 4243 43rd St., San Diego, Cal.
R. Montle, Box 287, North Platte, Neb. (Dealer).
Edwin T. Stoetzner, Miller's Mills, N. Y.
Spencer A. Dickson, 517 West 14th St., Topeka, Kans.
Harold Gregory, Portsmouth, Va.

Civil Service

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

ASSOCIATE RADIO ENGINEER, \$3,000
ASSISTANT RADIO ENGINEER, \$2,400

Receipt of applications for these positions will close April 30. The first rating of papers will begin March 15, 1926; thereafter papers will be rated as received until the close of receipt of applications. The examinations are to fill vacancies in various branches of the Government service throughout the United States. The entrance salaries in the District of Columbia are shown above. After the probational period required by the civil service act and rules advancement in pay may be made without change in assignment up to \$3,600 a year for associate radio engineer, and up to \$3,000 a year for assistant radio engineer. For appointment outside of Washington, D. C., the rates will be approximately the same. Promotion from lower to higher grades may be made in accordance with the civil service rules as vacancies occur.

The duties of appointees will be in connection with original research or investigation, or design and construction.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the board of U. S. Civil Service Examiners at the post office or custom house, any city.

Powertone Blueprint

The 1926 Model
1-Dial 5-Tube Set **50c**

This is the famous DX set as described in

**RADIO WORLD
COLUMBIA PRINT**

145 West 45th Street N. Y. C.

CAPITAL AND PLANT equipped for manufacturing metal goods or specialties desires connection with parties who have such articles to manufacture. Write for interview, Morris Levin, 350 Throop Ave., Brooklyn, N. Y.

Own Ears Safest Guide As to What Sounds Best

CONSTANTLY inquiries are directed to radio experts as to whether one thing is "better" than another, for instance, a cone type speaker or a horn speaker, impedance coupling or resistance coupling for audio amplification, etc. While scientific data may be presented on one side or the other, the ultimate answer rests with the prospective set-builder or set purchaser, because the element of personal taste is controlling. While resistance-coupled audio may show a flatter curve than impedance coupling, many may prefer impedance, because the kind of reproduction that results therefrom more keenly delights their ears, despite a lower distortion factor in resistance coupling. Also in comparison of speakers, while many prefer the deep-throated cones, others like the horn effect, particularly with transformer-coupled audio. There is no universally satisfactory answer to most radio inquiries that invite such comparisons. What a person likes best is the best for him. He should consult his own ears and be guided by them.

Orth and Edlin Join Roxy's Musical Gang

Roxy announces two additions to his gang. They are Don Orth, tenor, and Louis Edlin, violinist. Don Orth is taking a place in the popular quartet widely known over the radio and Edlin becomes

first violin of the orchestra. Roxy's gang now comprises Douglas Stanbury, Maria Gambielli, Jim Coombs, Adrian Da Silva, Leo Russotto, Anne Robinson, Beatrice Belkin, Celia Branz, Dorothy Miller, Anne Balthy, Joseph Stopak, Duke Yellman, Ted Quick, Louis Martin, George Sumner, Rudolph Adler, Max Newmark, Bodo Kammann, Murray Celbin, Herbert Holland, Frank Dinsmore, Herman Schmidt, Kris Kean, Ellis McDiarmid, Herman

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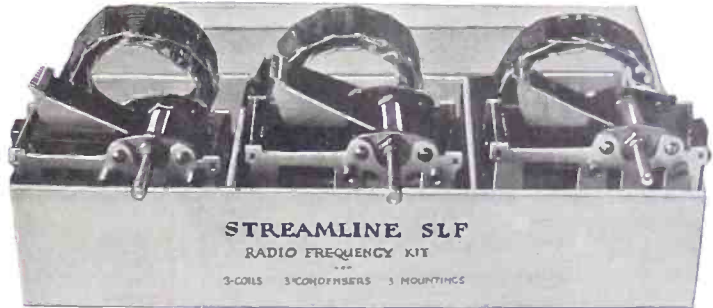
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Poor Reception Common; Federal Inquiry Asked

By Thomas Stevenson

WASHINGTON.

AN immediate investigation should be undertaken by the Government to determine the cause of unusually poor radio reception throughout the country. This is the opinion of experts who are trying to find some scientific theory to explain existing conditions.

That radio reception at present is poorer than it has ever been in the history of February broadcasting cannot be doubted. Letters are flooding the Department of Commerce and other agencies, all of which relate to freakish conditions all over the country.

One outstanding peculiarity seems to be that reception from Southern stations is much better than is usually the case while reception from Northern, Eastern and Western stations is far below normal.

The proper agency to make such an investigation is the Radio Laboratory of the Bureau of Standards. Without additional funds, it is not believed that Laboratory can go into the subject with the necessary thoroughness. However, it is the intention of the Laboratory to go into the matter to the fullest extent that its facilities will permit.

Dellinger Cautious

Dr. J. H. Dellinger, chief of the Bureau of Standards Radio Laboratory, will not say definitely what he thinks is responsible for present poor radio reception. He says it may be due to a number of things.

"It is not proper to jump to the conclusion that the recent exceptional radio conditions are due to sunspots, aurora, or any other one cause," says Dr. Dellinger. "There has been no visible aurora, as far as I am informed. Current discussion of aurora, and other hypothetical causes of abnormal radio conditions, nevertheless serve the very desirable purpose of drawing attention to the need of increased scientific study of these effects.

"If, in the current discussions of the effects of aurora on radio reception, the term 'aurora' be replaced by 'ionization' there will be distinct progress from mystery toward truth. It is now well established that the vagaries of radio wave transmission are determined by varying conditions of ionization (division of the air atoms into electrical particles) in the atmosphere up to about 50 miles above the earth's surface. At the top of the

atmosphere, particularly, the conditions of ionization favor the carrying of radio waves to long distances but also produce imperfections manifested as fading and static.

Aurora Often Innocent

"When there are large sunspots this ionization is increased, the upper atmosphere is made more turbulent, and the effects of the ionization extend clearly down to the earth's surface and produce magnetic storms, disturb the working of telegraph lines, etc. This may or may not be accompanied by aurora (northern lights); it usually is not, but it has become common to speak of these telegraph line disturbances as due to aurora; this is an error. The effects on radio reception are much less definite than those on telegraph lines. Ionization disturbances which knock out wire telegraph operation and produce an increase of static may

make radio transmission actually better at some frequencies while blanketing all transmissions at other frequencies.

"Sunspots are areas on the sun which throw out extraordinary volumes of electrical particles and disturbances. When they occur in winter they can make the

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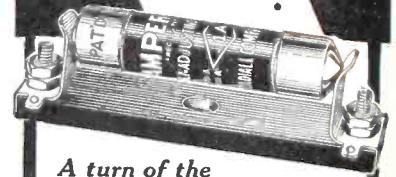
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static and other radio conditions as bad as are ordinarily met in summer only." Chief Radio Supervisor W. D. Terrell's theory in regard to present poor reception is somewhat along the lines of that of Dr. Dellinger.

Broadcasting of Heat Prophesied by Professor

PITTSBURGH.

The use of broadcasting for other purposes than transmission of sound is engaging the attention of several scientists. So far the nearest approach to sending packages "by air" is the air mail, but the technical difficulties, say, of transmitting heat, are less. Prof. S. E. Dibble, of Carnegie Institute of Technology, is studying the heat problem. He is president of the American Society of Heating and Ventilating Engineers and holder of the Ahrens professorship in plumbing, heating and ventilating. He holds that "it is no more improbable to broadcast heat waves than it was to broadcast sound waves."

The problem of sending heat to consumers via the air is now the problem of research men and laboratory workers, who must "discover instruments to control heat waves, especially a detector which will pick them up and hold and amplify them," says Professor Dibble.

Transmission of heat by atmospheric conductivity is essential because of the gradual exhaustion of the elements of fuel, said the professor, adding "the day is not far off, in my opinion, when we will see huge centralized heating plants broadcasting heat to homes, industries and office buildings."

The professor admitted that the problem "is only in the thought stage now" and "our hope is to incline the activity of research men toward this objective—heat transmission by air waves. We know that heat travels through space, through solids, and when we once learn how to pick up these waves and control them, heating throughout the world will be revolutionized."

Heat broadcasting will mean better health to the public, says the professor, because it will eliminate from the air the impurities of present-day heat-making systems.

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DIAMOND EDITOR:

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"Radio reception for me has been unusually bad for the past month or two," says Mr. Terrell, "and judging from letters lots of other people are experiencing the same condition."

"I have noticed recently that I can get Southern stations much better than any others. I wonder if there is not some kind of an electrical disturbance emanating from the South Pole which tends to push radio signals northward."

"The present trouble may be due to Northern or Southern Lights; to sunspots or to the aurora borealis."

"I believe present poor conditions will soon disappear and that we will not experience them again for several years. I hope when that time comes we will be able to combat it more efficiently than at present."

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MELOFORMER is made according to a new principle that does away with the laminated core—the construction that develops strays, creates distortion and induces noises due to interstage coupling. MELOFORMERS were used in the Victoreen Circuit described in this issue.

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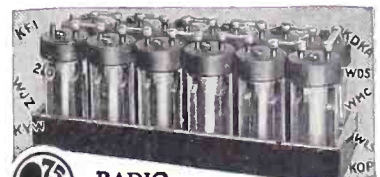
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WRNY Conquers Dead Spots by Moving

Since WRNY went on the air last June it has achieved some enviable records for distance. It has occasionally been heard in Australia, and has its own observers in England, France, on the Pacific coast, in South America and in Canada.

However, within the city of New York, its reception, until recently, was poor. The reason was that first, any radio transmitter located in the midst of massive steel buildings in New York has difficulty in being heard within the city, and, secondly, it has been found that there are many dead spots for such a local station.

When WRNY was first installed, the transmitter was located on the eighteenth floor at The Roosevelt Hotel. This necessitated a lead-in from the antenna which was too long for efficient operation of the set.

The transmitter is now situated directly under the aerial, on the twenty-first floor. The lead-in was reduced by some 60 feet of wire.

In their position on the eighteenth floor, the transmitting instruments and the lead-in from the aerial were enclosed in a bad pocket formed by the east court of the hotel, and this was responsible for a great loss of power and many dead spots within Greater New York.

When WRNY took to the air again, after the change, immediate improvement was noted. Some 60 radio set owners on

the upper west side in Manhattan were visited by the staff of the station. A record had been kept of certain listeners where WRNY had never been received before. Each one of the set owners reported loud reception, as loud as, or louder than most of the other local stations. The same held true in Brooklyn, the Bronx, and Staten Island, where there were also a number of dead spots.

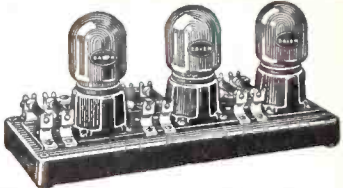
While the transmitter was on the eighteenth floor the antenna current was never more than 6½ amperes. In its new location, the transmitter radiates about 10½ amperes.

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| 8 Na-a-aid Bakelite standard sockets. | 1 .001 mfd. fixed condenser. | 1 Single automatic filament-control jack. |
| 1 Na-a-aid Bakelite standard sockets. | 1 1.0 mfd. by-pass condenser. | 1 .008 mfd. fixed condenser. |
| 2 .0005 mfd. Streamline SLF condensers, matched for Victoreen coils. | 1 400-ohm potentiometer. | 1 Battery cable. |
| 2 Bruno Slo-Moshen Vernier Bakelite dials. | 2 30-ohm rheostats. | 1 Filament switch. |
| | 2 6-ohm rheostats. | 7 Blinding posts. |
| | 2 Modern 4-to-1 audio transformers. | 2 Flexible leads for C battery. |
| | 1 7x24" drilled and engraved panel. | 10 Lengths of bus-bar; screws, nuts, bolts. |

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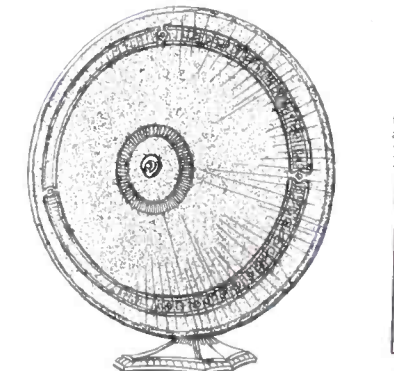
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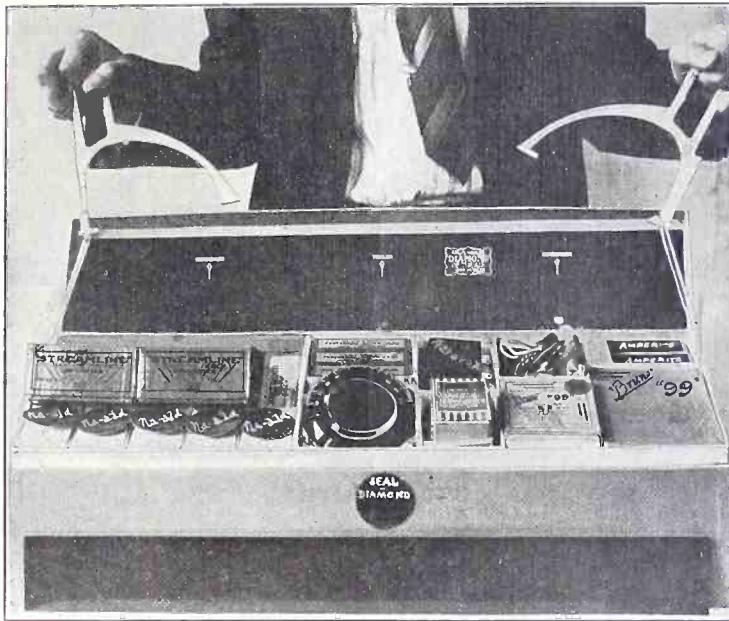
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DIAMOND OF THE AIR KIT.....\$35.00

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Each B.C.L. boxed and sealed Kit bears the personal seal and signature of Herman Bernard. This is your assurance and guarantee that all parts included are the best obtainable and will give you a balanced receiver capable of great distance, combined with wonderful tonal qualities—a perfect receiver, worthy of the endorsement of the thirteen leading parts manufacturers it bears.



With the addition to our shipping department of new men we are once more able to catch up with deliveries on the Diamond of the Air Kits. Shipments can now go forward the same day received by any form of delivery you may desire. We wish to thank those patrons who were obliged to delay the construction of their kits about two days for their patience with us. We are doing all that is humanly possible to keep everyone satisfied.

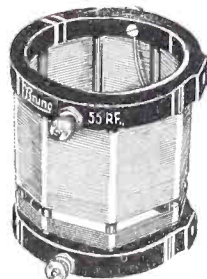
This is the way each kit is packed. Everything is included.

We are pleased to announce that each kit will contain Sidney E. Finkelstein's special 16-page booklet, with a new full-size blueprint, which gives all data necessary for the construction, care and operation of the Diamond of the Air.

We are able to supply the consumers with a copy at 50 cents each.



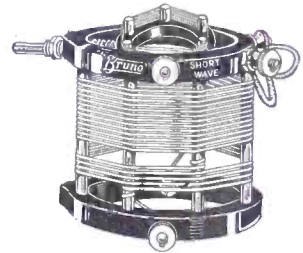
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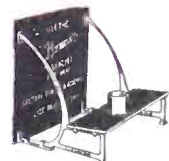
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RESULTS

Readers report on their experiences with sets built from hookups published in RADIO WORLD. Address Results Editor, RADIO WORLD, 145 West 45th Street, New York City, and send photographs of sets, if possible.

RESULTS EDITOR:

Several weeks ago a friend of mine introduced me to a 1926 Model Diamond of the Air. I was so pleased with its performance that I built one and wish to say that I am more than pleased with it. The selectivity and the volume are wonderful. I am very grateful to my friend for introducing me to RADIO WORLD, as it is the best radio magazine that I have ever had the pleasure of reading. I shall be only too glad to recommend this set to anyone who wants a really voluminous and selective set.

JOSEPH J. SCHNESSLER,
376 E. 155th St.,
N. Y. City.

RESULTS EDITOR:

I have built Sidney E. Finkelstein's "Pathfinder," which he described in the Oct. 31 issue of RADIO WORLD. It is a wonder. I have had all the stations from KOA to WOAW on the speaker.

H. BIARNGAN,
11½ Cherry Street,
Providence, R. I.

RESULTS EDITOR:

I wish to thank RADIO WORLD for the pleasure I have had in building the

various hookups published. I built Hayden's Midget set, which was described in the Aug. 8 issue of RADIO WORLD, using cheap parts that I had laying around and used a 20 ft. inside aerial. Local stations came rolling in with volume that could be heard all over the room with ear phones on the table. I also picked up several outside stations with locals on.

E. B. GEAGLEY,
133 West 9th Street,
Cincinnati, Ohio.

RESULTS EDITOR:

RADIO WORLD is the best radio magazine that I have ever seen. I read the paper from cover to cover, including the advertisements. EDWARD W. WORK,
63 Third Street, Lowell, Mass.

RESULTS EDITOR:

I am one of the many readers of RADIO WORLD who have constructed that wonderful receiver, the Diamond of the Air. Praise certainly should be showered on Herman

Bernard, who designed this receiver. My recommendation to anyone who wishes to build a receiver to choose the Diamond. Over 100 distant stations have been received and all with loud speaker volume. The re-

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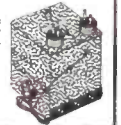


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2 Silver-Marshall Coil Sockets for No. 110-A and No. 111-A, each \$1.00.....	2.00
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1 Yaxley Filament Switch.....	.50
1 Yaxley Filament Control Jack.....	.70
1 Yaxley 2 Circuit Jack.....	.80

1 Yaxley D. P. D. T. Switch No. 60.....	\$1.25
9 Air-Gap Sockets, each 75c.....	6.75
3 National Vernier Dials (new type), each \$2.50.....	7.50
8 Eby Binding Posts, each 15c.....	1.20
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1 Jewell Meter 0 to 50 Milli-Amps.....	7.50
1 Micamold Condenser Grid .00025.....	.35
1 Micamold Condenser Grid .0005.....	.45
1 Micamold Condenser By-Pass .001.....	.40
1 Micamold Condenser By-Pass .01.....	.90
3 Micamold Condenser By-Pass .5, each 90c.....	2.70
1 Micamold Grid Leak 2 Megs.....	.30
1 Micamold Grid Leak 5 Megs.....	.30
1 Micamold Grid Leak Mount.....	.30
Total.....	\$133.90

NOTE—Silver-Marshall Transformers can be supplied at an additional cost of \$12.00 per set.

NOTE—For those desiring to wind their own coils, coupler and other special parts, the proper parts may be had on receipt of order for same.

Cabinets for the Fenway now in stock... \$22.50

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Send your order for any or all the parts TODAY. ALL MERCHANDISE SHIPPED PARCEL POST PRE-PAID SAME DAY ORDER IS RECEIVED—NO WAITS—EVERYTHING IS READY—Your Money Back If Not Satisfied! Anyway, send for special circular and price list—IT'S FREE!

CHAS. W. DOWN, 711 EIGHTH AVENUE, NEW YORK, N. Y.

(Wholesale Prices Quoted to Bonafide Dealers Only)

ception obtained from the Diamond equals that of my 8-tube Cockaday Super.

ARTHUR NYDICK,
745 East 6th St.,
N. Y. City.

RESULTS EDITOR:

Allow me to make a few praising remarks in reference to Feodor Rospatkin's 1-Tube Reflex for the Novice, which appeared in the Feb. 21 issue of RADIO WORLD. I was very skeptical after reading Mr. Hancock's letter and was very unsuccessful

in hooking this reflex the first time off the bat. I finally made the set work. The reason for the set not working was due to a defective crystal. However, as soon as a new one was inserted the results were wonderful. The tone quality is superb while no stations no matter how near they are as to wavelength will interfere with each other. KDKA, WJAR, WJJD and WPG were all brought in with good volume. The volume obtainable is tremendous. In fact it is the best of any 1-tube set that I have ever heard.

Great care must be taken to choose the right crystal. I only used spare parts in the construction of this receiver.

J. SAVAIESE,
152 E. 123rd St.,
* * * N. Y. C.

RESULTS EDITOR:

I have tried a great many hookups that have been published in RADIO WORLD and all cases I have found them to work wonderfully. Never have I found the results claimed by the designer to be exaggerated.

I built the 1-Tube DX Superdyne, described by Herman Bernard in the Dec. 24th, 1924, issue. I live about 3 1/2 miles from three powerful stations, WNAC, WEEI and WDBR, and find it is very easy to separate them with this receiver. I tapped the primary of the antenna tuner at every second turn. I also grounded the A+. These two features increased the volume and the selectivity of the set to a great extent. I have received the following DX stations with a great deal of volume: 6KW, WSB, WFAA, WJAX, KOIL, WDAF, KOA, PWV, WMBF and KFDM.

The coils are home-made. The condensers, socket and rheostat, etc., are manufactured by the General Radio Co., Cambridge, Mass.

R. H. ADDISON,
29 Armandine St.,
Dorchester Center 24, Mass.

RESULTS EDITOR:

I have built the Diamond of the Air and it has proven to be a most wonderful receiver for both local and distance signals. I am using a 120-foot antenna.

H. C. BAILEY,
Locust Valley,
Long Island, New York.

RESULTS EDITOR:

I have built the 2-control set as described by Capt. O'Rourke in the Jan. 26 issue of RADIO WORLD and am having excellent results with the same. It is not a hard task to listen to Ft. Worth, Tex., and then jump to New Orleans and Clearwater, Fla., on the speaker, with very pleasing volume.

Capt. O'Rourke must be given great credit for this set. I have never had a failure with any circuit published in RADIO WORLD.

T. BROWN,
27 Wade Ave.,
Toronto, Can.

FENWAY BLUE PRINTS

ACTUAL SIZE LAYOUTS
CERTIFIED BY THE DESIGNER

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PARTS

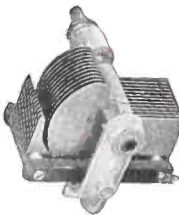
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Price of all types.
Each\$2.50
Sockets for any size
Coils. Each..... 1.00

SM Type #16 Condensers are furnished, all brass plates, die-cast frame and double adjustable cone bearings. May be gauged by placing one socket behind another, the shafts interlocking in any desired relation. S.L.F. .00035 mfd. capacity for all types of SM interchangeable coils. Price...\$5.75



SM Vernier Dials



The SM Type 801 Vernier Dials are of all bakelite construction. Zero to 100 — clockwise — counter-clockwise or 360 degrees (for Remler Condensers) in a single type. In appearance and operation the SM is the finest vernier dial on the market. Price, each\$2.50

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Designed so that maximum amplification will be obtained at 60 Kilocycles. Available in matched sets of any number. No. 210 is iron-core type while No. 211 is of the air-core type supplied with measured tuning condenser. Each transformer is furnished with individual laboratory curve chart. Price: Both Types.....\$6.00 each



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VICTOREEN—

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FENWAY Authorized by Leo Fenway, \$10 each.

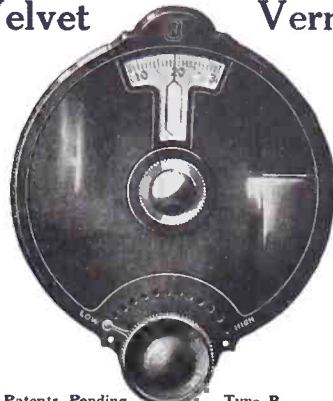
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The New NATIONAL Variable Velvet Vernier Dial

Positive Control Easily Mounted Gearless

Variable Ratio Velvet Smoothness Ornamental



Patents Pending Type B

This dial embodies a modified application of our "Velvet Vernier" mechanism designed to facilitate mounting on the 3/4" shaft of any standard type of variable condenser, without the use of tools other than a screw driver. It will replace plain dials on any receiver where sharper tuning is desired.

Of special importance is a new and novel device which enables the user to adjust at will the reduction to any ratio from 6:1 to 20:1. This feature aids greatly in the separation of stations operating on the lower wave lengths. This new dial is moulded from black bakelite in a highly ornamental design.

Specifications	Price	Gold Finish
Counter-Clockwise 200-0 (360°)	\$2.50	\$3.00
Clockwise 0-200 (360°)	2.50	3.00

Send for Bulletin 109 RW

NATIONAL CO., INC., 110 Brookline Street, Cambridge, Mass.
W. A. READY, President

Million a Day Listen In As Soviet Pushes Radio

WASHINGTON. More than a million radio fans in the Soviet Union listen in on the programs of the Government stations every day, according to a report of the Soviet radio industry received by the Russian Information Bureau here. The number is increasing by scores of thousands each week. Libraries in 400 villages in Moscow and Leningrad provinces have been equipped with powerful receiving sets and loud speakers, and 300 workers' clubs in the two cities have been similarly fitted out. The hospitals and the larger hotels are rapidly being supplied with radio apparatus and the demand for sets from the numerous co-operative apartment houses grows rapidly.

The big transmitting stations at Moscow and Leningrad are wired to all the principal theatres, concert halls, public meeting places and lecture halls. The stations at the principal cities in European Russia have recently been hooked up for furnishing simultaneous programs.

When the radio listener in the Soviet Union wants to hear a bit of foreign transmission by way of variety, he tunes in on one of the big stations in Germany, England or Denmark, and he can even get Paris. Similarly the larger Soviet stations have been getting appreciative letters from fans who have enjoyed their programs in England, Germany, Czechoslovakia and the Scandinavian countries.

In addition to the stations in Moscow and Leningrad, powerful transmitting plants are now operating at Kharkov, Ivanovo, Bogorodsk, Kiev, Nijni-Novgorod, Minsk, Voronesh, Tiflis, Baku and other

cities. The radio laboratory at Nijni has constructed a hundred-kilowatt generator lamp for transmitting stations. Several stations are being completed in remote points in Siberia.

The wavelengths of some of the principal stations follow:

Moscow, Comintern station, 1450 meters; Moscow, Popoff station, 1010 meters; Leningrad, 940 meters; Kiev, 900

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If your dealer cannot supply you send us 25c in postage
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APOLLO
Parlor Model



Stands 22 inches high, has a ten inch bell, gives faithful reproduction and may be varied from a whisper to a torrent of sound by the adjustable unit control without the least loss of the sweet, mellow, clear tones that are found in the Apollo Speakers. Mail orders promptly filled. Send no money, just pay the postman.

We can save you 20 to 50% on all radio parts and accessories. Write us for prices on articles you need.

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meters; Ivanovo, 800 meters; Nijni-Novgorod, 850 meters; Voronesh, 1100 meters.

The Joke About Having Gotten It May Turn Into a Solemn Reality
WASHINGTON.

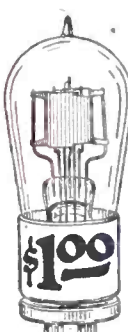
A broadcasting station is under construction at Santiago, Chile, and is expected to be in operation by June 1. The station, which will be owned and operated by the Compania Radio Chilean, will operate on 400 meters with 1,500 watts power. The call letters of the station will be CMBA.

Vacuum Tubes Rebuilt \$1.00 each

POSITIVELY GUARANTEED equal to new tubes in every respect. Money will be refunded if tubes prove unsatisfactory for any reason other than burn-outs.

Send us your broken and burned out tubes by parcel post. (Not necessary to insure or guard against breakage.) We make return shipments by parcel post C.O.D. and try to maintain 24-hour service.

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Radio World's 1926 Model

DIAMOND OF THE AIR

The text of the official Diamond booklet was written by HERMAN BERNARD, designer of the 5-tube circuit which offers the most in selectivity, volume, tone, quality and DX. Price, per copy

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William A. Welty Company
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MAKE \$100 WEEKLY IN SPARE TIME. Sell what the public wants—long distance radio receiving sets. Two sales weekly pay \$100 profit. No big investment, no canvassing. Sharpe of Colorado made \$965 in one month. Representatives wanted at once. This plan is sweeping the country—write today before your county is gone. Ozarka, Inc., 126-J, Austin Ave., Chicago, Ill.

RADIO FAN WANTED to sell Standard Radio Apparatus. H. A. Roberts & Co., 180 Broadway, New York City.

1926 DIAMOND OF THE AIR COMPLETE with all accessories, ready to use, \$85.00, including Cone Speaker. B. Benson, Orchard Park, N. Y.

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RADIO WORLD
145 WEST 45th ST. NEW YORK CITY

Better Delivery Marks Capitol Theatre Programs

The new broadcasting studio of the Capitol Theatre, New York City, is now in operation. Major Edward Bowes directed the first concert by the Capitol "Family" from the new radio quarters and

the results showed the improvements in reproduction and control that had been expected. The new studio is so constructed as to eliminate vibrations and sound reverberations. This is achieved by special equipment; particular construction of the walls, ceilings and floor, and the profuse hanging of draperies. The first practical tests from the studio showed a more brilliant reproduction of the piano; rounder and fuller notes in the vocal numbers; elimination of blasting by brass instruments and a more perfect balance in the orchestra tone.

"We are not content to let well enough alone," said Major Bowes, "and we will

not rest until we have reached a state of technical perfection. In co-operation with WEAF we will continue to conduct experiments and an exhaustive study of conditions with a view to making further improvements and keeping up with the rapid development of radio transmission and control."

Station Changes

KMOX, St. Louis, is operating temporarily on 280 meters until its apparatus can be adjusted to work on 233 meters. The station has increased its power from 1,000 to 1,500 watts.

WEW, St. Louis, has transferred from class A to B and increased its power to 1,000 watts.

WCEE, at Elgin, has been taken over by the S. W. Straus Company. The station will operate in the future under the call of WWSW at Batavia, Ill.

WHK, Cleveland, transferred to class B and increased its power to 1,000 watts.

KFON, Long Beach, Calif., is now owned by the Nichols and Warriner Company.

KMMJ, Clay Center, Neb., was transferred to class B and increased its power to 1,000 watts.

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A complete radio set in the form of a book, bound in fine cloth with gold stamping. Equipped with Towers head phones and antenna. Guaranteed range fifteen miles. An ideal auxiliary to a tube set. Costs nothing to operate and lasts forever. Just the set for the children and fine for the traveling man.

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W. O. Braun Co., 32-60 So. Clinton St., Chicago, U. S. A.

Prohibit Loud Speakers, Police Chief Demands

Chief of Police William H. O'Neill of East Orange, N. J., thinks loud speakers are "unnecessary annoyances," and said that an unprecedented number of complaints about them had reached him. Receiving sets, particularly those near open windows, prevent neighbors from sleeping, he said. He asked the City Council to prohibit their use.

CHOSEN FOR THEIR MERIT



TYPE 271
Medium Frequency Transformer.
10,000 Meters. (30 K. C.) Price \$5.00.

Always remember in building a radio receiver that its performance depends primarily upon two things: efficient circuit and the use of good parts.

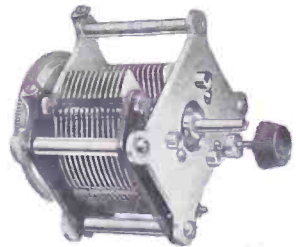
Wherever you find a popular circuit you will invariably find General Radio Parts.

General Radio Company has contributed more in scientific apparatus for laboratory use than any other one company in the history of radio.

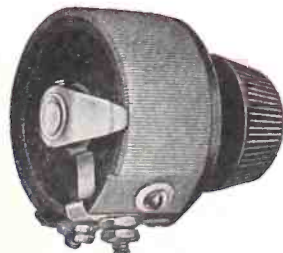
The same outstanding craftsmanship and material are embodied in General Radio Parts for use in the construction of Broadcast receiver.

Through the merits of design, performance, and price, General Radio instruments for the scientist or set builder are universally recognized as the standard of excellence.

Every instrument made by the General Radio is thoroughly guaranteed.



TYPE 334-N
Variable Condenser. Price \$4.00
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TYPE 301
Rheostat Price \$1.25

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CAMBRIDGE 39, MASS.

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INSTRUMENTS



TYPE 285
Audio Amplifying Transformer. Ratios
6 to 1 and 2 to 1. Price \$8.00 each.

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Paris on a Victoreen!

Verified Reception from
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Coast to Coast on a Loop
is easy with a

VICTOREEN SUPER

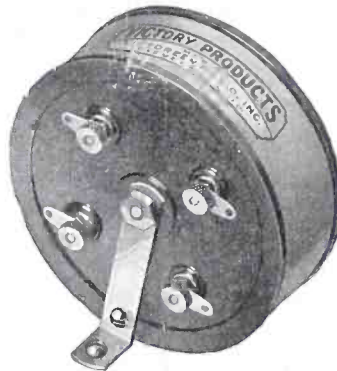
Built with "Tuned" R. F. Transformers of Air Core Construction

Additional Parts Required to Build a Victoreen Super

- 2 .0005 Variable Condensers
- 8 Vacuum Tube Sockets
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- 2 2 Meg. Grid Leaks
- 1 400 Ohm Potentiometer
- 2 30 Ohm Rheostats
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- 2 Double Circuit Jacks
- 1 Single Circuit Filament Jack
- 1 Filament Switch
- 2 Audio Transformers
- 1 1 Mfd. Bypass Condenser
- 1 4½ Volt "C" Battery
- 1 7x24 in. Panel
- Base Board—8¾x23x¾
- Binding Posts, Screws, Bus Bar and Solder Lugs

Any good dealer will have these parts in stock

Complete parts for this set can be purchased of your dealer.



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- 4 "Victoreen" No. 170 R. F. Transformers—\$7.00 each
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Should use of Aerial be preferred to Loop, the "Victoreen" No. 160 Antenna Coupler is required, at \$3.50, extra.

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UV199 or 201A Type of Tubes may be used—a truly Victoreen Feature.

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