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DIAMOND OF AIR AS 2-CONTROL SET

By Herman Bernard

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By H. E. Wright

STUDY OF INDUCTANCE

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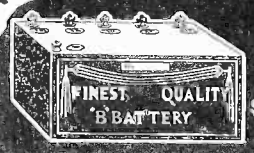

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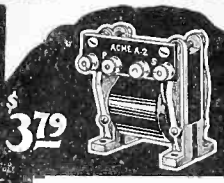

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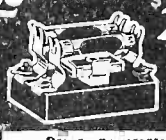

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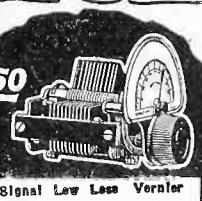

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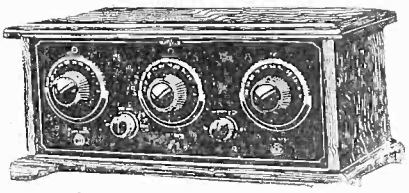

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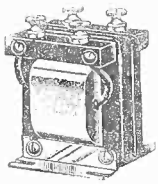

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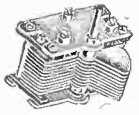

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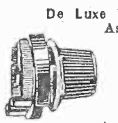

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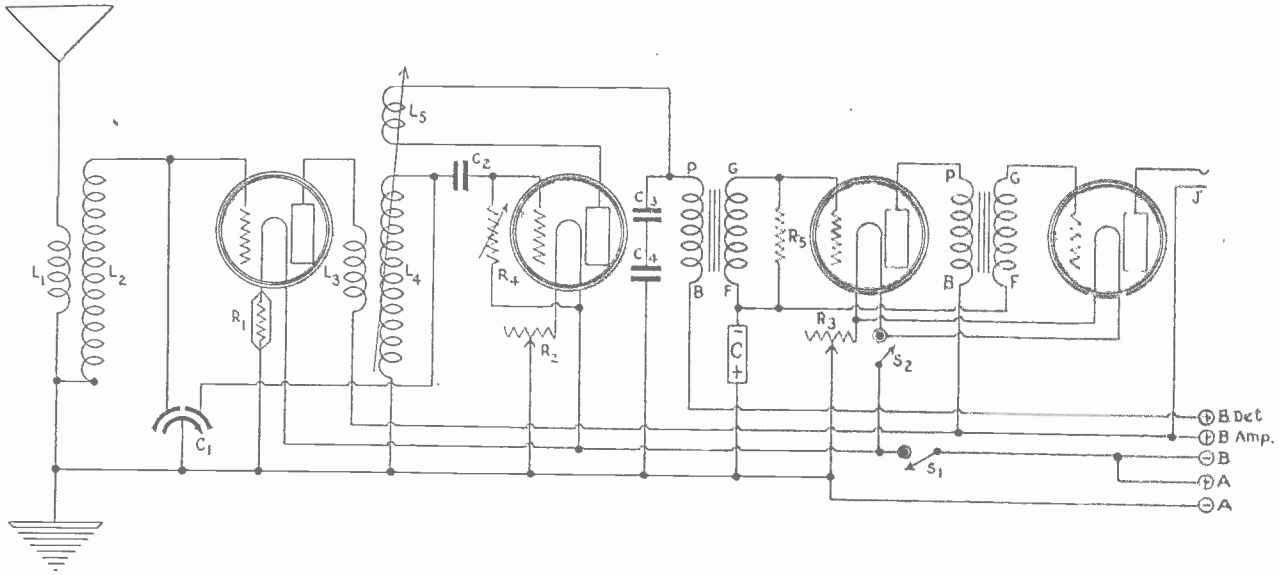
The 2-Control Diamond



HOW the Diamond of the Air is wired as a 2-control set (Fig. 1). Two variable condensers with a common rotor but with separate sta'ors are used to tune the secondaries L2 and L4. This condenser unit is known as the double or multiple type. The detector grid return is to negative, for it must be the same as the grid return of the RF tube, due to connection to the common rotor. But the variable grid leak goes to A+, and any oscillatory tube may thus be used as detector.

By Herman Bernard

PART I.

THE number of controls is becoming an important consideration in the choice of receivers. Public demand seems to be more pronounced in this direction than ever before. The single-control set is very popular, but it usually embodies more than four tubes and often is a reflex. If regeneration is to be used there must be two controls, for some means of varying the feedback is imperative. Efforts have been made, by employing gearing systems and the like, to regulate regeneration concomitantly with the tuning. While some of these devices have been very ingenious, none of them has proven very popular, and it is safe to say that the solution is not here yet. So valuable an adjunct is regeneration as a contributing agent of selectivity and sensitivity, which means distance reception, that it must be enjoyed to its full advantage for every wavelength. The trick gearing methods and other means of regulating regeneration by the same motion that accomplishes tuning do not comprehend the full utilization of regeneration's benefits.

How One Control is Saved

Therefore, granting there must be two controls in any instance of fully-reaped benefit, one may take a 4-tube hookup where two tubes handle the radio-frequency current and two the audio pulsations, and tune the two RF steps with a single instrument. Mechanically this is one condenser, but electrically it is two condensers in one. The rotor is common to two separate stators. As the low potential end of a coil is always connected to the rotor of a variable condenser, in this case the contact is made to the negative A battery. This is because the RF tube, being an amplifier, must be connected to negative to have the RF tube function at fullest efficiency, due to tube characteristics. As the secondaries of both coils, L2 and L4 in Fig. 1, are connected to the common rotor of the double condenser C1, the grid return of the detector tube must be to negative A battery also. This raises the question whether the detector tube, if of the most popular types. will function well with a negative grid return, since a positive grid return is nearly always recommended. The grid return will be identified as that terminal of a coil other than the terminal that goes to the grid of the tube.

The effect of the combination of a negative grid return and the connection of the leak to positive A is rather to bring the grid return near zero potential, that is, neutral. But even if the leak is connected to negative A, the tube will function well as a detector.

Discussion of Tubes

These considerations apply to the tubes most usually employed as detectors, such as UV201A, C301A, UV199, C299, DV2, DV3, WD11, WD12, C11 C12, etc. Some tubes, however work about as well with grid return to negative as to positive, in the detector circuit. and in these instances sometimes the negative grid return is even superior. Such tubes are commonly useful only as detectors and are of no value whatever as radio or audio amplifiers. Examples are the UV200, C300 and Sodion D21. The 200 and 300, known as "soft" tubes because they contain gas, the result of purposely incomplete evacuation, consume one ampere of current and require a 6-volt battery. The Sodion requires the same voltage but draws .25 ampere, as do all the other and unexpected tubes mentioned, exclusive of the "peanut" family (199 etc.), which draws .06 ampere.

If the constructor elects to use the 199 or equivalent tube it is preferable to have three 1½-volt No. 6 dry cells in series to heat the filaments, rather than the C battery type (4½ volts), which doesn't last long enough to be economical for this purpose. It is not to be expected, however, that the tubes requiring a 6-volt storage battery will be excelled in performance by any of the others.

Circuit is a Great One

The circuit itself is a splendid performer. It is very easily the equal of the Neutrodyne as to sensitivity, selectivity and volume. I have never operated any Neutrodyne that did even as much as this set. The stage of tuned radio-frequency is equal to the first RF stage of the Neutrodyne, while the presence of regeneration in the detector tube affords an amplification of equal to one and a half stages of additional RF, hence, hteoretically, this

Coils for Bernard's DX Set

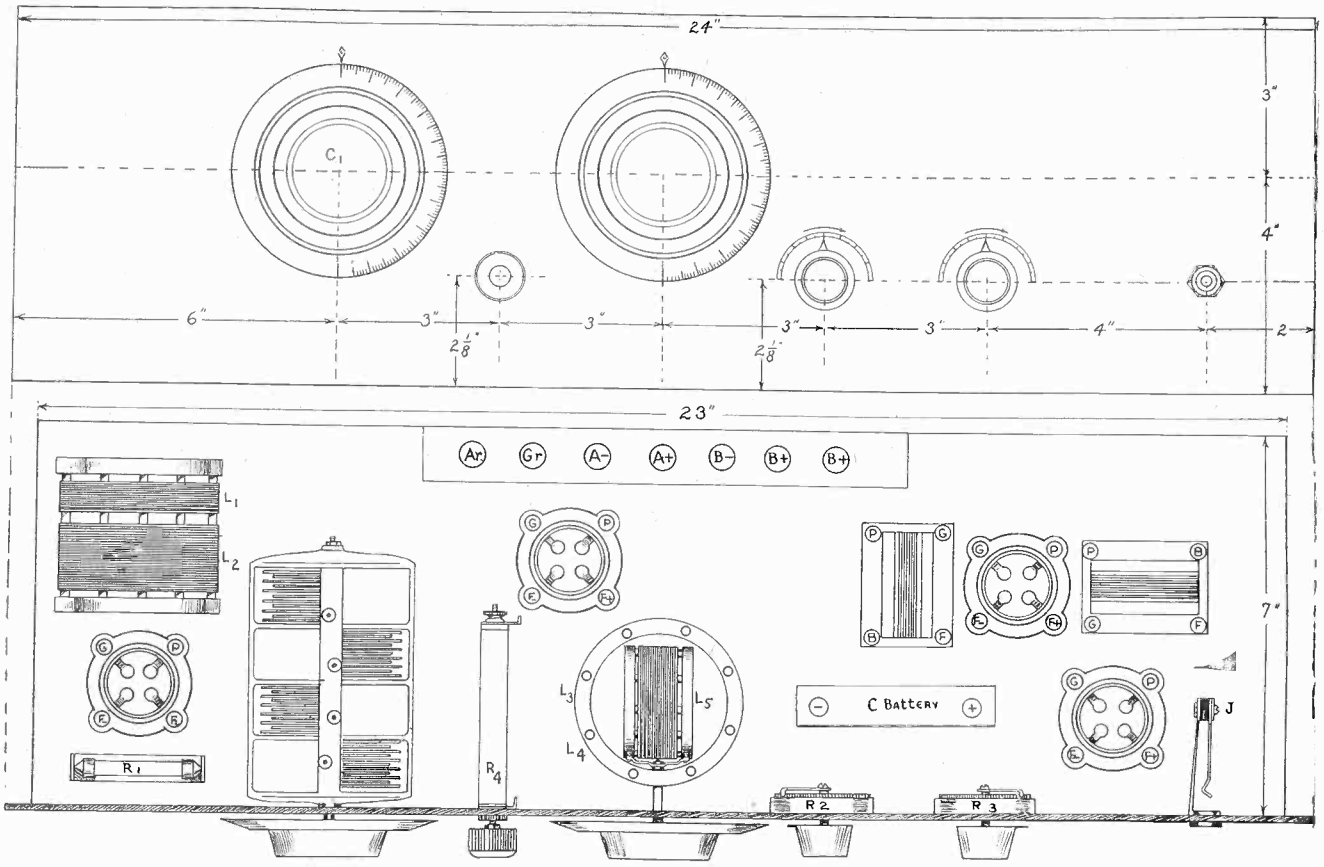


FIG. 2 (top) shows the panel layout. The switches are omitted, as their placement may be at any suitable point. The grid leak knob is between the dials. In Fig. 3, assembly plan, note that the coils are at right angles. This helps present feedback by stray magnetic coupling. R1 is the ballast resistance. R4 is the Bretwood Variable grid leak.

circuit is at least one-half a stage of RF better than the Neutrodyne, while employing four tubes instead of five and two controls instead of three.

The circuit is standard. The inclusion of the double condenser is no circuit alteration whatever, but only the adoption of a method of proven efficacy for control reduction.

Coils Must be Matched

Normally the same windings for the stators of both coils will cause the condenser to tune correctly, but there is one doubtful factor in two components that may be resolved easily by experiment. It may be found that the same number of turns on the primaries and the secondaries does not produce the same natural period for the coils when they are included in the circuit. This might be due to the capacity of the plate of the RF tube being included in the reactance of the L3L4 combination. This capacity is indeed small, but it may become a ratable factor when one must have the two coils matched. Another consideration is the absorption effect of tight coupling. If L3 is tightly coupled to L4 and the tickler L5 also is in close inductive relationship to the rest, the secondary will not have its full inductive value. There is extraction of inductance, so to speak. One might reasonably expect that the plate capacity, the effect of which is a boosting of wavelength, would overcome the absorption effect the other windings have on the secondary L4, and dozens of experiments confirm the reasonableness of this expectation. But should the signal be heard at two points, say strongly at 51 on the dial, then weaker as the dial is turned to left, then strong again at 53, the source of trouble is obvious.

Careful listening will determine which of the two strong points come in stronger than the other. This is a clue to the solution. The stronger signal will be that resulting from the tuning of L4, because it is in the detector circuit. If the stronger signal comes in with a lower capacity of the double condenser, then a turn or two should be removed from L4. If the stronger signal comes in at a higher capacity reading, add one turn. If trouble still exists, remove another turn. There is no need of considering fractions of a turn.

The general principle would be to add a turn, then another, if you are in doubt, for the likelihood is that L4 would suffer more by absorption than gain by added plate capacity effect. Hence, in winding the coils loose coupling for the coupler is to be favored.

How to Make and Use the Coils

Perhaps the constructor already has a 3-circuit tuning coil and also an RF transformer, the only inductances used in the circuit. These coils are usually made commercially these days for tuning with a .0005 mfd. variable condenser. That is the value condenser used in the present set. In such a case the builder may incorporate his present inductances. The double condenser may be of the .0005 mfd. or .00035 mfd. capacity to suit the coils on hand, but the directions herewith will apply to the .0005 mfd. type, such as the National, Bruno, Flewelling and others.

If the coils are to be made at home, L1L2 may consist of 53 turns of No. 20 single cotton covered wire, tapped at the tenth turn. The tubing is 3½" diameter 4" high, and may be cardboard, fiber bakelite, quartzite rods, etc. This coil is more conveniently made as a single winding, tapped at the right point, the ground and negative A battery going to the tap, this connection being continued to the rotor of the double condenser. In that way, too, you can't get your polarities wrong at the coil terminals. But those who have ready-made RFT need not do any rewinding, but simply may run a wire jumper from the ground terminal (end of primary) to the end of the secondary. This has no effect on the tuning.

L3L4L5, the 3-circuit coupler, is wound with the same kind of wire, L3 consisting of seven turns on a 3½" diameter tubing or other form. Anchor the coil terminals through pinholes punctured in the form. Leave ½" space, then wind 43 turns for the secondary, L4, as a distinctly separate winding. Leave about 10" of slack wire and cut. Thus if you find that by connecting the end of the long tailpiece you have not enough inductance, you can put on two more turns, using the slack wire. In that case push up the secondary winding so that the new terminal may be inserted through the previously made pinholes for anchorage. To avoid scraping the insulation off hte wire when the extra wire is not included on the form it is well to pass binding string through the punctured holes and around the wire where it adjoins these holes, rather than pass the long piece of wire through.

Making the Tickler

The rotary coil or tickler may consist of 26 turns of No. 26 single silk covered wire, 13 turns on each side of where the

Tuning Is Made Easier

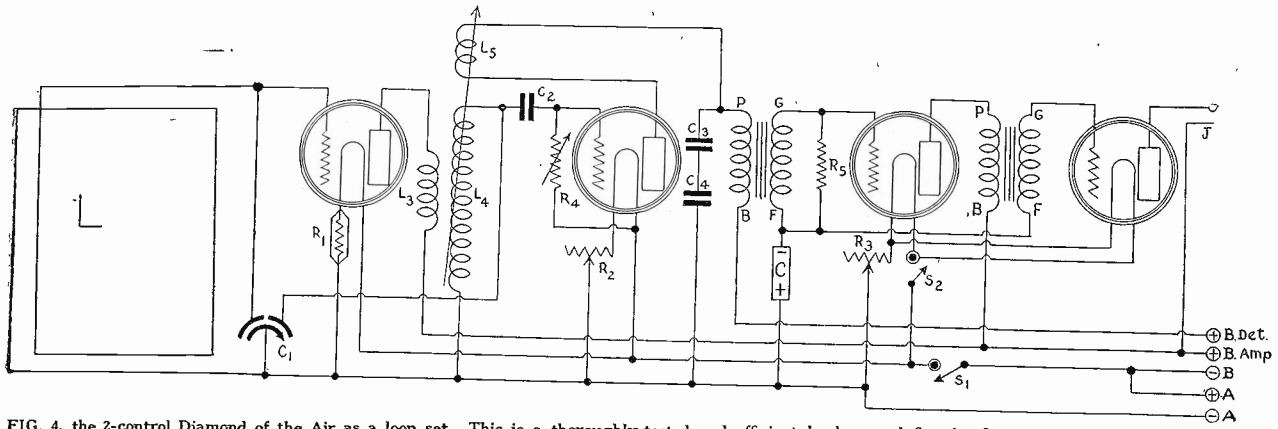


FIG. 4, the 2-control Diamond of the Air as a loop set. This is a thoroughly tested and efficient hookup and fine for Summer work, as the loop brings in less static. See next week's article for a discussion of this arrangement, particularly the matching of L4 with the loop inductance.

rotor shaft will protrude. The form is 2¾" in diameter and 2½" high. A home-made coupler is seldom a neat job. But if you make one yourself, place the tickler as far away from the stator form as is conveniently possible, so that little of the tickler form will dip into the stator form. If a panel-mounted tickler, with stator underneath, is not objectionable, the tickler form will dip into the stator form. the nearest possible points. In the great preponderance of instances, however, commercial products will be used. These may be Bruno No. 77, Globe, Eastern Pickle Bottle, Arc tri-tuner, Ambassador, Wallace and the like.

No concern need be felt if any commercial coil, either RFT or coupler, shows a variance between the number of turns on the primaries thereof and the number prescribed in this article, so long as aperiodic primaries are used (not primaries about as large as the secondaries). Nor need the kind of wire used be of material concern, since the circuit was tried out with all manner of coils and performed splendidly.

If forms of other sizes are on hand, they may be used, although 3" diameter is about as small as can be recommended for this set. If 4" diameters are used, put on 10 and 7-turn primaries respectively, and have the secondaries consist of 32 turns. The tickler may be the same as previously cited, or a 3" form may be used for L5, 22 turns being put on, 11 on each side of the rotor shaft. For 3" stators wind 48 turns, primaries 12 and 9. All windings are in the same direction in all cases.

One problem that may arise concerns fans who have a coupler but who want to wind their own RFT with the correct inductance. It is useless to give the inductance tables, especially as the calculable result is variable, due to the causes already stated. But the fan may hook up the commercial coupler in a 1-tube 3-circuit set, by making the connections temporarily in the circuit he is building, and using any condenser, or one-half of the double condenser. Then he may replace the 3-circuit coil with a home-made RFT of the same number of turns and same kind of wire, and compare the dial readings for local stations. If the readings run ahead of those obtained when the commercial coupler was used, more turns must be put on the secondary of the RFT, and if the readings run behind, vice versa. This test contemplates the use of dials that produce higher readings the more the condenser capacity is included.

The coil problem will not prove difficult. Indeed, the same number of turns on the secondaries, using the same kind of wire and same diameters, regardless of the difference in number of turns on the primaries, will produce the desired result in nine cases out of ten.

In the interest of keeping down even the number of minor controls a balanced resistance is used for the filament of the RF tube. This may be an Amperite, suited for the particular type of tube used. It is R1 in Fig. 1. R2 is a rheostat as is R3, which is about half the resistance value of R2, since it controls two tubes at once. The switch S2 turns on and off the two audio tubes, but is not absolutely necessary. Its inclusion is only for those who, when turning the audio tubes on or off, desire merely to press a switch, rather than turn a rheostat. Therefore, the rheostat R3 may be placed at its correct setting and thenceforth the switch employed. This method enables one to mount the rheostat inside the set, since its setting need not be changed. But those who do not mind turning the rheostat to get the best economical setting each time the audio tubes are to be turned on, or to extinguish those tubes altogether, may use only the rheostat and omit the switch. However, the switch S1 must be included in all cases, since it serves to turn the set on and off as a unit. If it were not included the ballast resistance of the RF tube would be in the battery circuit all the time and that tube would remain lighted so long as there was any life in the battery.

Use a Variable Grid Leak

C2, the grid condenser, may be fixed, about .00025 mfd. capacity, but preferably variable. R4, the grid leak, should be variable by all means. This is true for all regenerative sets. The leakage path must be just right for smooth regeneration control, to avoid the annoying "plop." When over-regeneration is permitted, for test purposes only, for it causes radiation, there should be a continuous whistle, not a growl or squawk. Even on the low waves this growling should not be present. Therefore if the set causes a squawking sound, decrease the leak resistance, thus increasing the leakage path, until the continuous whistle results. The leak setting is then correct. This is important, especially for those interested in the reception of programs from distant stations. The instrument used in this circuit was the Bretwood Variable Grid Leak, very popular in Great Britain, where it is made, and fast becoming popular in the United States and Canada. It has an accurate range from 3/10 to 10 megohms and holds its setting almost indefinitely. The more the plunger is screwed in the lower the resistance. But do not unscrew the plunger so far that it comes out. This you would not do, anyhow, for when you get past 6 or 7 megohms the signal begins to fade, and you naturally turn back to a lower resistance. There is never any occasion in a detector tube to use the full 10 megohms.

Reason for Two Bypass Condensers

The two bypass condensers C3 and C4 are used to avoid the danger of short-circuiting the B battery and causing the tubes to blow out. The conventional manner of including a bypass condenser is to place it across the primary of the first audio-transformer, but it is better to connect the condenser from the end of the plate coil (tickler) to A minus, and thus bypass all the batteries as well, to keep the RF currents out of them, so far as possible. But this method causes the condenser, if only one is used, to be the only separation between B plus and A minus, so that if the sole condenser is shorted your tubes may be destroyed. The extra condenser therefore is in the nature of insurance, since both scarcely would be short-circuited at the same time. The condensers used were Sangamo, C4 being .002 and C3 .001.

Reason for Using R5

The resistance R5 is about 100,000 ohms and is of great service in the interest of purity of tone, especially if a transformer of high ratio is used, or any other that produces very high amplification, which includes some of the best transformers on the market. If two transformers of different ratios are used the higher ratio should be in the first stage, to reduce the tendency to overload the last audio tube.

Speaker Set Only

Notice that there is only one jack, a single-circuit variety, so that the speaker tips may be plugged in. No provision is made or tapping the detector tube, because the custom seems to be growing to enjoy speaker reception only on multi-tube sets. Those desiring earphone option may put a double-circuit jack in the detector stage.

The switch or switches should be of the toggle variety, rather than the push-pull type, since the pushing and pulling tends to jar the panel unless the friction is exceedingly smooth. The new Cutler-Hammer toggle switches were used.

[*This concludes Part I of the article on how to build the 2-control Diamond of the Air. Part II, the conclusion, will be published next week, issue of May 30*].

The Function of Inductance

By Lewis Winner

Radio Engineer

OF THE three electrical quantities in the radio circuit there is one which the wireless telephone depends upon wholly and that is inductance. In the days of the Marconi coherer and the large spark transmitter we had quite a few sets employing capacity coupling. This was not due to the fact that capacity was thought to be better than inductance but because the inductance patent rights, which were held by Marconi, were unobtainable, so American inventors set out to find a substitute, which was capacity. But as soon as the patent ran out, all went back to the inductive tuner. The trouble with most capacity tuners was that they had too many controls, were too big, and not efficient. I do not wish to impress upon you that capacity is not a help in the set, but inductance stands out in prominence.

Aspects of Inductance

Any electrical circuit or conductor which has the property of storing up energy in electromagnetic form is known as having inductance. However we have various results from a circuit containing inductance, such as self-induction and mutual induction. Self-induction is that remarkable feature which results from the rise and the fall of a large magnetic field of force around a circuit or coil, through which a current is flowing. When we induce an electromotive force in one of the coils, through which current is traveling and changing at a definite rate per second, provided it is not greater than unity, we have what is known as mutual induction. For instance, we have self-induction in the wire itself, but we have mutual induction when we have two or more wires, that is the current is induced from one wire to the other wire.

Values Considered

The various forms of inductance are of no theoretical value unless we have some method of calculating them. The unit that we use is known as the henry. The henry is too large a value to use in radio receivers or transmitters, except where a great number of turns exists in coils, having lots of iron. Therefore we use the microhenry, the milli-henry or the centimeter. Any circuit or coil built so that the change of magnetic flux, which is produced by a current which changes at the rate of one ampere per second, in turn producing an electromotive force of one volt is known as having an inductance of one henry.

In direct current circuits, the effect of self-induction is only known when the current is turned off and on, but in an alternating current circuit the effect is always noticeable. Regardless of conductor there is always present self-induction. This of course is dependent upon the area and the shape of the wire, viz., wires which are coiled have a much greater self-induction than a straight piece of wire. In an alternating current circuit when inductance is present the current lags behind the voltage (Fig. 1). This is the opposite to the capacity effect.

The Alpha Angle

Fig. 2 shows a lagging current also, but on a diagrammatical scheme. Both the voltage and the current are rotating about the center in a clockwise direction. The angle between these two points, which is known as "alpha," remains constant. This

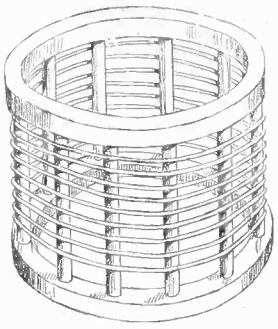


FIG 5—A type of tuning coil (low loss). This is a concentrated form of inductance. Spaced windings like these should be put on all tuning coils and great results will be obtained.

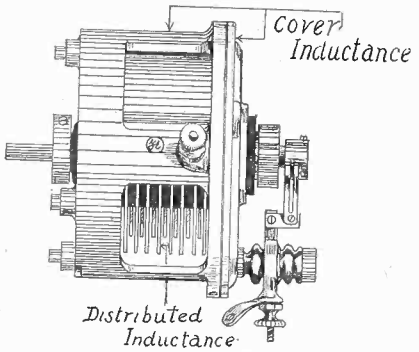


FIG. 4—Where inductance (distributed) is present in a continuously variable air condenser. Note the arrows between the plates indicating that even the material (aluminum) contains inductance.

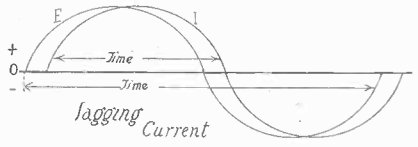


FIG. 1—Above diagram shows a lagging current, I (amperage) lagging behind E (voltage). Note the difference in time.

angle is called the power factor angle and a definite trigonometric function known as the cosine of the angle is called the power factor which in turn is expressed in percentage. This separation of the current and the potential, which is producing the angle "alpha," is called "phase displacement" or time displacement. Since capacity and inductance have effects opposite in character, and if there is a state of equilibrium between the capacity and inductance, no phase displacement takes place. The current and the voltage are then in phase. Fig. 3.

Where Inductance is Used

We have inductance present in every electrical circuit, viz., in the motor, in the generator, in the spark coils, in the various meters (galvanometers, ammeters, voltmeters, radio-frequency meters, milliammeters, thermo-couple ammeters, wattmeters, inducto-meters, wavemeters, resistance meters, audibility meters, decremeters, vacuum tube testing meters, etc.) in the variable condenser, in the transformers, in the antenna, in the ground, in the counterpoise, in the thermionic tube, in the jacks, in the coils, in the lightning arrestors, in the rheostats, etc., etc. One can imagine what a large part inductance plays.

We had distributed and concentrated in capacity and we have the same principle applying to inductance, where concentrated inductance appears in the coil and distributed inductance appears in the condenser or in the internal part of the tube, etc.

Inductance Stands Out

I shall attempt to show you wherein the receiver inductance stands out. The wavelengths that a set can receive are determined mostly by inductance, say 90%. Of course a variable condenser shunted across any of the coils may raise or lower the wavelength, but what I mean is that the actual wavelength of the set is determined by the different constants of the coils.

We start with the open oscillating circuit, which contains the aerial, primary of coil and ground. All these elements are made up of inductance, except the small capacities between the turns of wire and between the antenna and ground. The current is induced from the primary of the coil to the secondary or the closed oscillation circuit, which comprises, the tickler (if regenerative) tube, phones and batteries.

All these elements have inductance present in them and are very important determining features of the receiver.

You have noticed that often bell wire or soft stranded No. 18 wire is recommended for wiring the set internally, instead of bus bar, as bus bar increases the capacity, i. e., wavelength, of the coils and, therefore, you find that you cannot receive lower wavelengths.

The tuner employed in the radio receiver should be wound on forms containing the least amount of resistance. The less resistance in the wire, too, the better of flow of current and consequently the louder the signals, with also greater selectivity. The larger the wire the better the current will flow, up to a certain point where other vices set in. When putting up the antenna, use No. 14 hand-drawn copper wire, being sure to keep the surfaces of the wire bright, since the radio frequency currents travel on the surface of the wire. The ground wire and the lead-in should be No. 14 copper wire, but covered with heavy insulation to prevent any stray currents being in-

(*Concluded on page 26*)

Radio Aids Army Tests

PRIVATE MARTIN HELLMAN, receiving radio messages from Mitchel Field, N. Y., that aided the anti-craft forces to repel the attack of the airplanes of Fort Totten, N. Y., in a war game. The set used is a portable transmitter and receiver, having a great range when sending.
(Kadel & Herbert)

A DX Transmitter

Simple to Make Easy to Work

AMATUER NIGHT

A Department for the "Hams"

By C. H. West

THERE are many amateurs and experimenters of radio who would like to own a radio telephone transmitter that would be heard at distance points.

The main setback seems to be in the construction of the transmitter and not so much inability to procure an amateur transmitting license.

Those who contemplate building an efficient radio phone transmitter at a low cost may follow Fig. 1. It is known as the Colpitt's Circuit, with the Heising system of modulation.

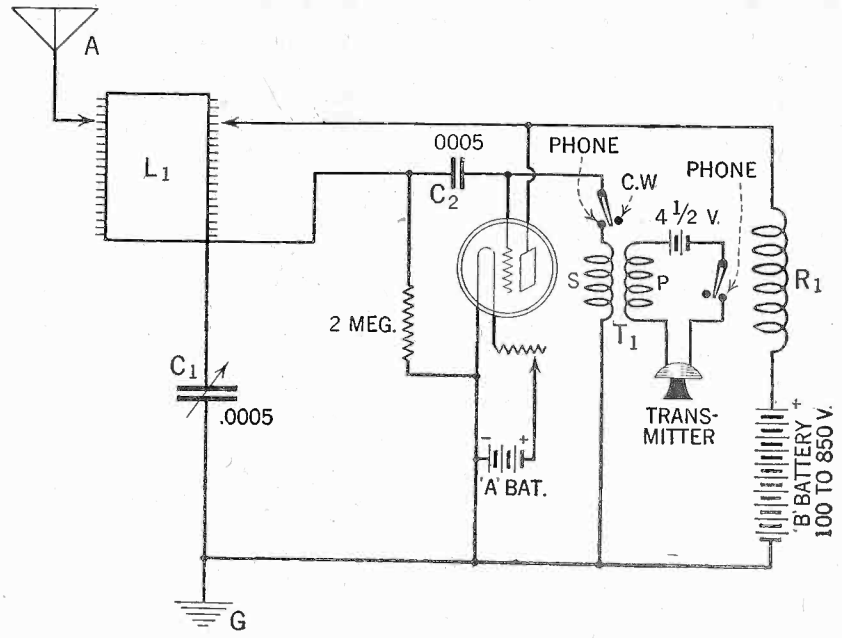
The tuning inductance L_1 contains 50 turns of No. 18 annunciator wire, wound on a 4" diameter tubing, with a tap taken every second turn. The tuning condenser preferably is .0005 mfd. The grid condenser has a capacity of .0005 mfd. The radio-frequency choke coil, R_1, is made by winding 300 turns of No. 30 SCC wire on a 2" diameter tubing. The modulation transformer, T_1, is a bell ringing transformer, which can be bought of an electrical dealer for about $2.50. The transformer was primarily designed to operate door bells from a 110 volt A.C. house current source, but somehow or other it is one of the best modulation transformers that can be found, for low power consumption. It can be overloaded to a great extent with no distortion of voice. This transformer has a great many turns of wire in the secondary. Owing usually to the great amount of voltage it usually has to step down, and chokes out all squeals of the carrier wave, which allows a very clear modulated note to be emitted.

Stations within 100 miles have heard me and have reported signals very clear and QSA.

About 250 volts are used on the plate of tube, the source of supply being a string of B batteries.

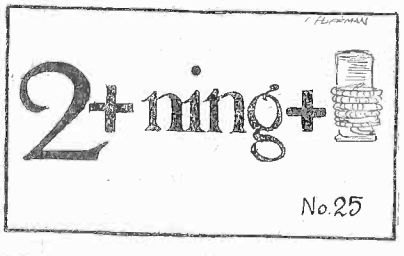
The UV 202 tube (5 watt. GE type) should be employed.

The antenna should be around 45 feet in length and composed of 4 wires. The ground may be a counterpoise or the water pipe of the house. The call of my station is 2CSM and can be heard on 175 meters. Those who listen in to me will be convinced as to the clear modulation of this transmitter.



CIRCUIT DIAGRAM of the 5-watt transmitter.

The Weekly Rebus



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The names of those sending the solution will be published.

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All in Chicago Share Air with Another Station

EVERY Chicago broadcasting station is now sharing its wavelength with another station located in or near Chicago. The last local station to be placed on a part-time basis was WBCN, which is now dividing the 266-Meter band with WENR.

As a result of the new arrangement WBCN is now doing two hours' less broadcasting on Tuesday and Thursday evenings, a half hour less on Friday and three hours less on Saturday. To compensate partly for this reduction a half hour has been added on Wednesday and Sunday nights.

A Reflex for Volume

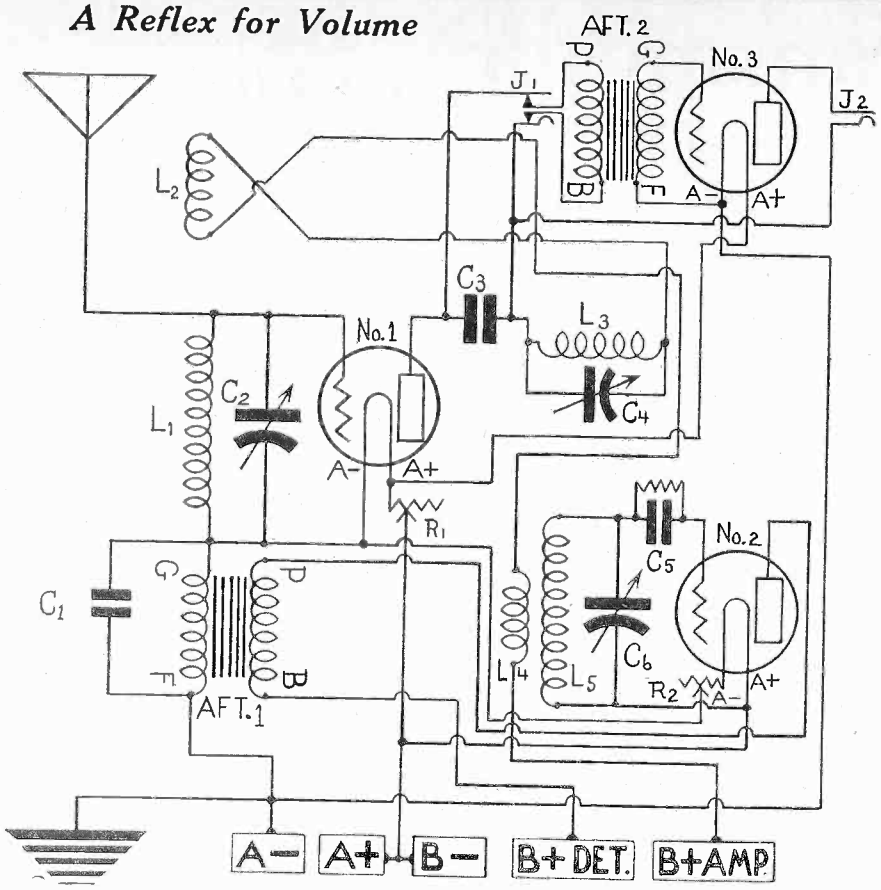


FIG. 1—A receiver employing three tubes, which are doing the work of four tubes. When one first looks at this diagram it looks like an awful hard thing to follow. But after close attention to the coils, it looks like a "cinch." L1, the primary, has 45 turns of No. 22 DCC, wound on a 3" form. L2, the tickler coil, has 30 turns of No. 22 DCC, wound on a 2½" form 2½" high, the two coupled inductively. L3, which is mounted on back of C4, (a .0005 mfd. variable condenser) contains 35 turns of No. 22 DCC wound on a 3" diameter form. L4L5 is the radio-frequency transformer, wound on a 3" form, with 22 DCC, L4 having 10 turns and L5 (½" space left) having 45 turns. C1 is a .001 mfd. fixed condenser. C3 is a .002 mfd. fixed condenser. C2 is a variable condenser of .0005 mfd. capacity. C5 is the regular .00025 mfd. grid condenser. C6 is a .0005 mfd. variable condenser. AFT1 is a high ratio transformer. UV201A's are used throughout the set. The chief drawback of this set is the fact that there are four controls. Note the way of obtaining regeneration through the medium of inversed coupling.

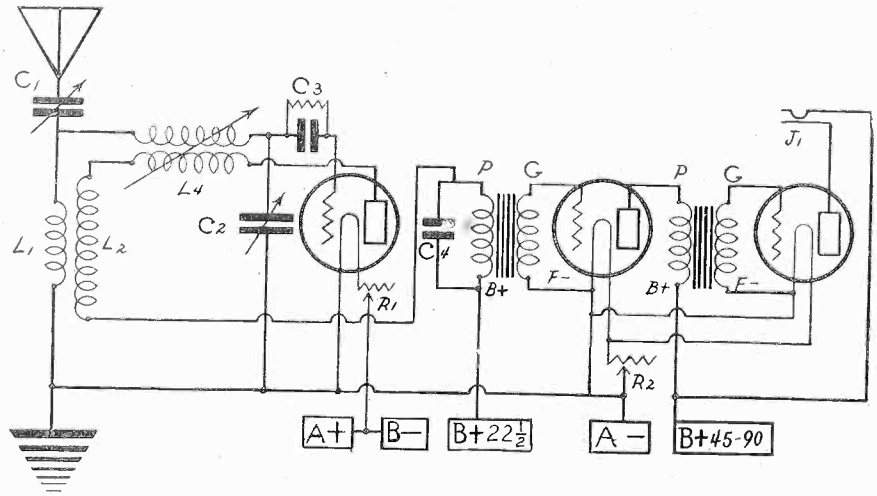
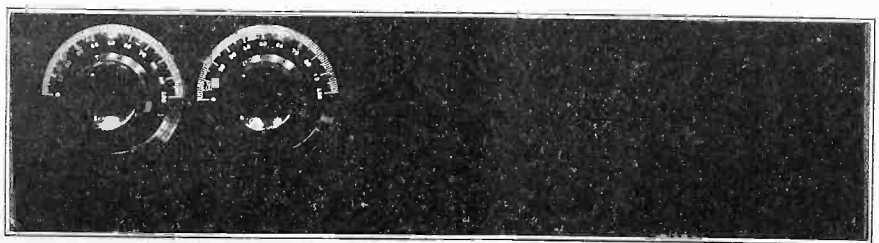
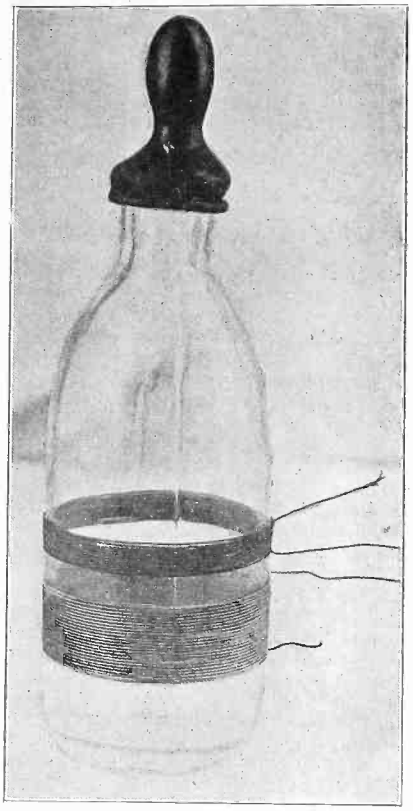


FIG. 3, an efficient 3-tube regenerative receiver, which has made many a distance record. L1 is wound on a 3" tubing with 22 DCC, 26 turns being employed. L2, the plate coil, is wound on the same tubing 1¼" away from L1 and has 30 turns of No. 22 DCC. L4, also plate, coil which is variable is a variometer rotor, the other variometer part (stator) going to grid and C1. All windings in same direction. C1C2 are .0005 mfd. variable condensers. C3 is the grid condenser, with 2-megohm grid leak. A UV200 is used for the detector with 16½ to 22½ volts on the plate of the tube. If UV201A's are used for the amplifiers 45 to 90 volts are put on their plates. C4 is .001.

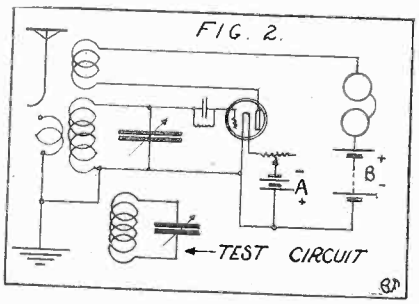


THIS panel arrangement is all right. Efficiency comes before symmetry.

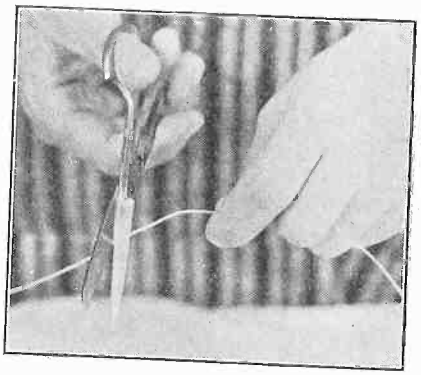
Yes, This Works



EVEN baby's bottle can be used in a radio set and to advantage. Take some No. 22 or 24 DCC wire and wind 10 turns nearer top of bottle, leave ½" and wind 56 turns more. Lo and behold, we now have an efficient radio-frequency transformer of the low-loss type! The coupling can be varied by simply putting the secondary nearer or further away from the primary. This is made easy by the fact that the glass is slippery and offers no resistance as does a bakelite or rubber form.

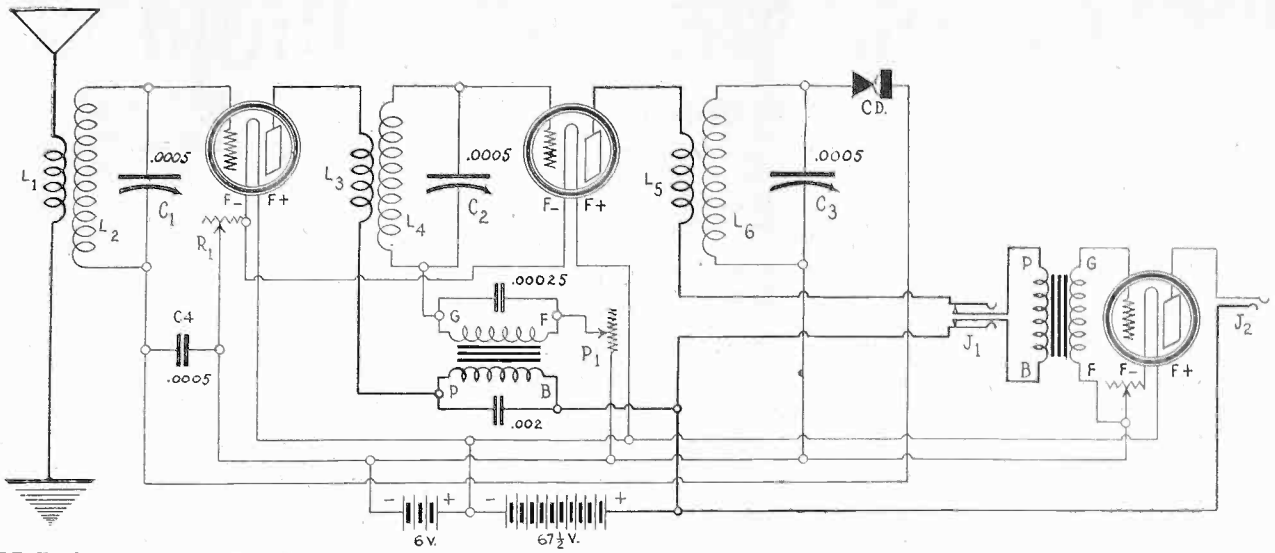


A 3-CIRCUIT single-tube receiver, with a wavemeter placed in inductive relation to the ground. How to construct all types of wavemeters will be described in the Vacation Number, June 6. There is nothing new about this set except that the antenna coil has a switch by which the aerial may be disconnected, so that you calibrate the exact wavelength that your set can receive, without the antenna (which is pure inductance) instead of making the wavelength higher than really the coil will tune to.



EVEN a pair of scissors comes in handy in cutting wire, although pliers are more frequently used. Scissors can easily be used to scrape off the insulation and also to cut at close quarters.
(Hayden Studios)

A Powerful 3-Tube Reflex



GREAT volume and 1,200 miles on speaker were the results obtained by H. E. Wright from this 3-tube reflex. L1L2, L3L4 and L5L6 are radio-frequency transformers. The variable condensers are .0005 mfd, normally 23 plates. Two stages of RF, crystal detector and three audio stages are used. The first audio stage uses no step-up transformer, this being replaced by C4. The second tube is reflexed for the second audio stage. The third tube is a free audio stage. P1 is a potentiometer spider-web coils are used.

By H. E. Wright

THE usual type of 3-tube reflex circuit consists of one stage of straight radio-frequency, one stage of radio and one of audio-frequency reflexed, crystal detector, and one stage of straight audio-frequency. In some instances however, two of the tubes, and sometimes even three are reflexed, but this procedure makes the circuit very difficult to construct and, as a rule, it does not give the amplification which might be expected.

The circuit given herewith is somewhat different but it is undoubtedly a most efficient 3-tube set, both as regards volume and the ability to get DX.

The oscillatory high-frequency current from the antenna passes first through the first tube where it is amplified at radio frequency, then through the second tube, where it is further amplified at radio-frequency. After being rectified by the crystal detector, the signal, which is now of an audible frequency, passes back into the first tube where it is amplified at audio-frequency. There also seems to be a slight amount of regeneration present in this tube which accounts for the distances from which this set will receive. The second tube, being reflexed, then acts as an audio-amplifier, while the last tube is a stage of straight audio-frequency.

More Volume From Large Tubes

As there is no step-up transformer included in the grid circuit of the first tube, the audio-frequency amplification obtained from this tube depends solely on the amplification factor of the tube used. The large tubes give proportionally greater volume than the smaller ones. However, if dry cells are to be used, very excellent results are obtainable by the use of the 199 type. I used these tubes in the experimental set.

I used the De Forest crystal.

The potentiometer P1 has a resistance of 400 ohms and is used to prevent oscillation of the second tube when very strong signals are being tuned in. This method of stabilization does not distort nor does it materially reduce the volume, as would be the case if the grid potential was changed.

How to Wind the Coils

All the coils are wound on spider-web forms having an inside diameter of 2". L1L2, L3L4, L5L6 are radio-frequency transformers of two coils each, placed side by side with the windings running in the same direction. The secondaries L2, L4, L6 each have fifty turns of 24 DCC. The primaries are wound with number 24 DSC, L1 having 12 turns, L3 18 turns, and L5 32 turns. Do not use double cotton covered wire for the primaries as they would then be of a larger size, and the additional capacitative coupling between the two coils would probably be sufficient to cause oscillation of either or both of the first two tubes. No. 22 wire will do nicely.

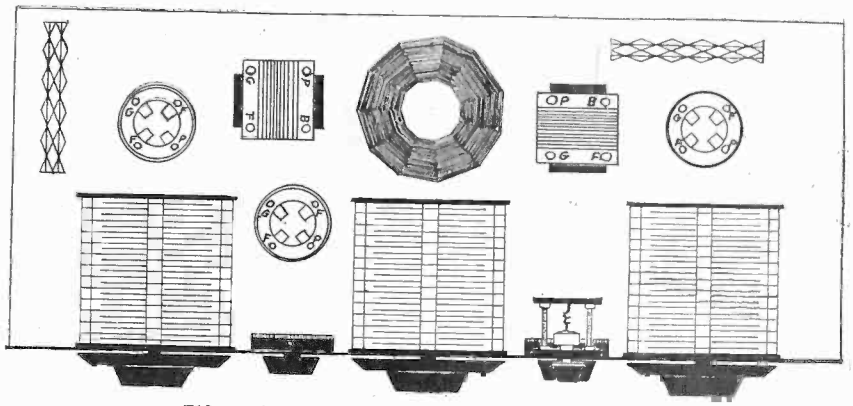


FIG. 2, the assembly plan of Wright's 3-Tube Reflex.

Wiring Directions

1. Connect one F post on each of the three sockets together and continue the wire to the A plus. Connect the movable arms of both rheostats together then continue the wire to the A minus. Connect the other two F posts on the first two sockets together and continue the wire to the other terminal of the rheostat R1. Run a wire from the other terminal of R2 to the remaining F post on the third socket. The filament circuits are now complete.

2. The antenna post is connected to the beginning of the L1 winding. The end goes to the ground.

3. The beginning of L2 goes to one terminal of the condenser C1 then to one side of the fixed condenser C4, then to the cup side of the crystal detector. The other side of C4 goes to the A minus. The end of L2 goes to the other terminal of C1, then to the G post of the first socket. The beginning of L4 connects to one terminal of the second condenser C2, then to the G post of the first audio-transformer. The F post of this transformer goes to the A minus. A .00025 fixed condenser is connected across the G and A posts. The end of L4 goes to the other terminal of C2, then to the G post of the second socket. The beginning of coil L6 goes to one side of condenser C3, then to the A minus. The end of L6 goes to the other terminal of C3 and is continued to the catwhisker side of the crystal detector. The G post of the third socket goes to the G of the second audio transformer. The F post of the transformer goes to the movable arm of the potentiometer. One of the other terminals of the potentiometer goes to the A minus.

4. The P post of the first socket goes to the beginning of the coil L3. The end of the L3 goes to the P post of the first audio-transformer. The B post of this transformer goes to the B plus. Connect a .002 fixed condenser across the P and B posts. The P post of the second socket goes to the beginning of the coil L5. The end of this coil goes to the outside spring of the first jack. The inside spring adjacent to this spring goes to the P post of the second audio-transformer. The other inside spring goes to the B post of this transformer. The other outside spring of this jack is connected to one of the springs of the second jack and the wire is continued to the B plus. The

(*Concluded on page 24*)

A Simple 1-Tube DX Set for the Novice to Build

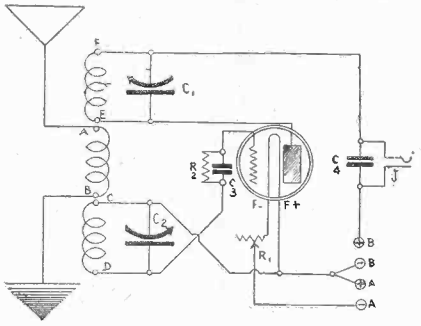


FIG. 1, circuit of the tuned plate regenerative set. The coil terminals are designated by letters, so that the novice will be sure to get the polarities right. The grid coil CD is connected in reverse fashion to the usual (incorrect) method.

By Percy Warren

WE ALL know that a set which is built of expensive materials works very well and is recommended by all experts, but suppose that we haven't the money to purchase the best new parts? By that I do not mean that we mustn't use materials efficient electrically and still expect to get very good results. What I mean is that we can build our own coil at a very small cost and still obtain efficiency.

Of all the sets that give distance and volume there is not one that excels the simple regenerative type. There are many types of regenerative sets, the single circuit, the double circuit and finally the triple circuit. There was even a 4-circuit set, with several controls. Of all four types there is no one more popular than the 3-circuit tuner. This circuit deserves its popularity because it is selective and voluminous.

The set that I am going to describe is of the 3-circuit variety and is a world-beater for volume and distance, even though the inexperienced person can build it.

Construction of the Coil

The first thing that you want to do before you build this set is to read every piece of data that refers to the successful operation of the receiver. You have probably read the information already. After doing this we are all set to build the coil, which is very simple, but with which a great deal of care should be taken.

Procure a form about 4" in length, 3" in diameter. We will wind the grid coil first, starting about ¼" from one end of the form. Before doing this, better drill two holes about 3/16" in diameter and about ½" away from each other for anchorage. Put bindery posts here and mark one G and one F+. Now drill two holes exactly as the ones drilled on the other end of the form. Put two bindery posts here and mark posts P and B+. On this same side about 2" away drill two more holes of the same dimensions as the four others. The beginning of the grid coil winding goes to a post marked G and lettered as D on the diagram (Fig. 1). Continue winding 50 turns of No. 22 single cotton covered wire and put the end of the coil to the post marked A+. Leave ½" and put the beginning of this new winding to the post marked GR. (B in Fig. 1). Continue winding until ten turns have been completed, connecting the end to the post marked A+. (C in Fig. 1). Leave ¼" now and place the beginning of the wire to the post marked P (E in Fig. 1). Continue winding until 35 turns have been made, connecting the end of the wire to the last post which is marked B+. (F in Fig. 1). Make sure that all the windings are in the same direction and that all the posts are designated.

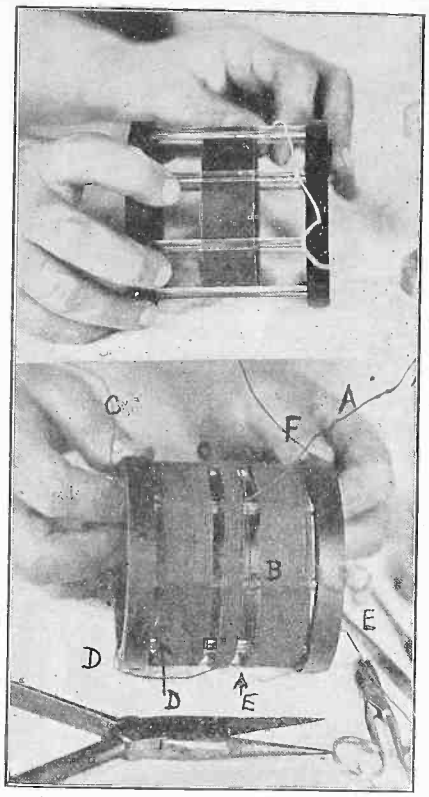


FIG. 2 (top), showing how the winding of the coil is begun. Any kind of form, cardboard included, may be used. AB is the aperiodic primary (see Fig. 1 also). EF is the plate coil, purposely shown incorrectly (Fig. 3, lower photo) to accentuate a common mistake. Note that E, which goes to plate, adjoins B, which goes to ground. Thus there is a clash of potentials, E being high, and B low. This causes losses. See Fig. 1 for correct connections. In Fig. 3 note that C, which goes to A+, is next to A (aerial), another clash of potentials. From left to right the terminals should read D, C, B, A, E, F. In other words, just reverse the aerial and ground connections.

Panel Instructions

Lay aside the coil and take the panel. There are two controls on the front, besides the rheostat, which should be of the 6 ohm. type for WD11 or 12 tube. The panel is 7x10" and is of hard rubber which is more efficient for radio than the beautiful-looking bakelite panel. Drill a hole for the variable condenser, 2 5/6" away from the end and 3½" from the top of the panel. The templates for the condensers are in the cartons. The condensers is the only article which costs any "real money."

The dials are 3" in diameter. The same dimensions apply to the other variable condenser when drilling the holes. For the rheostat drill 1½" from the bottom and 4" from the ends. The other dimensions are given with the rheostat. That is all the drilling that goes on the front of the panel, except the baseboard holes, which are determined by the size of the board that you have (usually an inch thick board about 6" in length, and having about three holes evenly spaced, 3 1/3" space). On the board mount the coil between the two condensers. Don't squeeze it in.

Assembly Directions

At the extreme end of the board place the terminal strip (the strip which consists of the battery binding posts and the antenna and ground posts). Directly in back of the coil put the socket. If you deem a jack too expensive a pair of binding posts may be put on the terminal strip or on the panel and the tips of the phones put there.

The other materials include C4, .001 mfd., fixed condenser; C3, .00025 mfd. fixed; R2, two or three megohm grid leak.

Wiring Directions

Now for the wiring of the set. Connect the post marked A in Fig. 1 and on coil to the antenna and the post marked GR to the ground. The F+ (C in diagram) goes to the positive post of the socket and to the plus post of the A battery, which is connected to B—. The terminal marked G on coil goes to one side of the grid condenser and to the grid leak. The other end of the grid condenser goes to the grid post of the socket. The terminal marked P (in diagram E) goes to the plate post of the socket. The last terminal marked B+ (in diagram F) goes to one end of the .001 condenser, whose other end goes to the B+. Across the terminals of both the plate and the grid coils connect two .0005 variable condensers, making sure that the rotary plates of the grid coil go to the A+ and the rotary plates of the condenser which is shunted across the plate coil to the B+ side of the plate coil. All this wiring should be done with No. 18 bell wire or rubber-covered telephone wire. Avoid bus bar. That completes the wiring of the set.

Aerial Advice

Your antenna should be of at least 75 feet in length, well soldered, and your lead-in should be put about one foot away from the wall, well-insulated. Your ground should be as short as possible and should consist of No. 14 rubber-covered wire. The antenna wire should be No. 14 hard-drawn copper wire.

The aerial should be at least 20 feet above the level of the ground and at least 10 feet above the level of the roof. But if you have a tin roof, place the antenna as high as 25 feet, but which must be done in order to get away from the good grounding qualities of the tin.

Trouble Hints

If you are getting noisy reception first push up the prongs of your tube socket, clean the terminals at the end of the tube with sandpaper and test your B battery with a pair of phones. If, when you put the phones across the battery, you hear a lot of rushing noise you can be sure that the battery is no good. Test your by-pass condenser, which is the condenser having a capacity of .001 mfd., as this is often shorted.

Photos Show the Completion of the Baby Portable

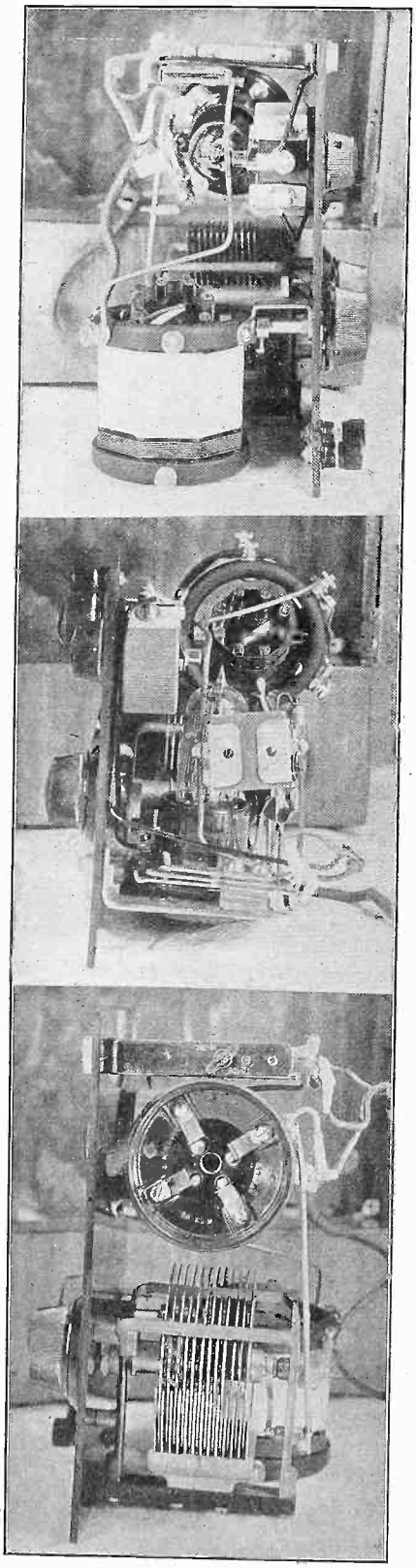


FIG. 4 (top) shows a view, looking down on the receiver from the top. Note that the coil is mounted with axis parallel with the length of the panel. Fig. 5 is a view from the right side, with rheostat and grid condenser in foreground. Fig. 6 (bottom) shows the jack, socket bottom and bottom view in general. (Hayden Studios.)

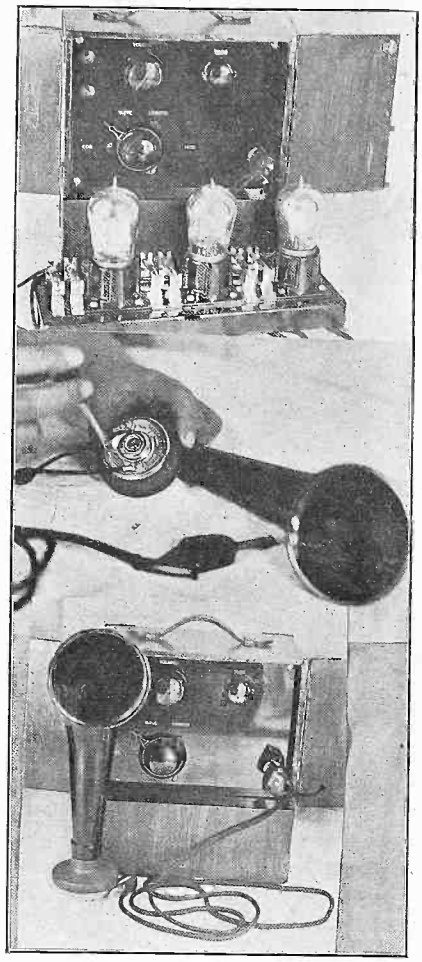


FIG. 7, a resistance coupled AF amplifier that may be connected to the set at home for excellent quality speaker operation. This is the Daven unit. Fig. 8 shows an adjustable speaker unit, with horn, the plug being inserted in a jack connected to the last audio tube's output. Fig. 9 shows front view of setup, with speaker in operation from the set's jack, rewired for audio output.

By Herbert E. Hayden

PART II.

THE Baby Portable, a 1-tube regenerative set the main features of which are compactness and fine performance, is very simple to complete. In the first part of this article, published last week, issue of May 16, data were given on the coils and parts. The diameter of the Bruno No. 99 coil, used for this set, is 2½". A 3" diameter form may be used, but the other affords even greater compactness and without sacrifice of efficiency.

HERBERT E. HAYDEN

The accompanying photos show how the set is assembled and completed. For home use an audio-amplifier may be hooked up externally, as shown in Fig. 7, where a 3-stage resistance-coupled amplifier unit is employed.

If loud-speaker operation is desired, any horn may be used, or a cone type speaker. A handy horn of small size is shown in Fig. 9 in front of the set. This has a Mozart adjustable unit in it.

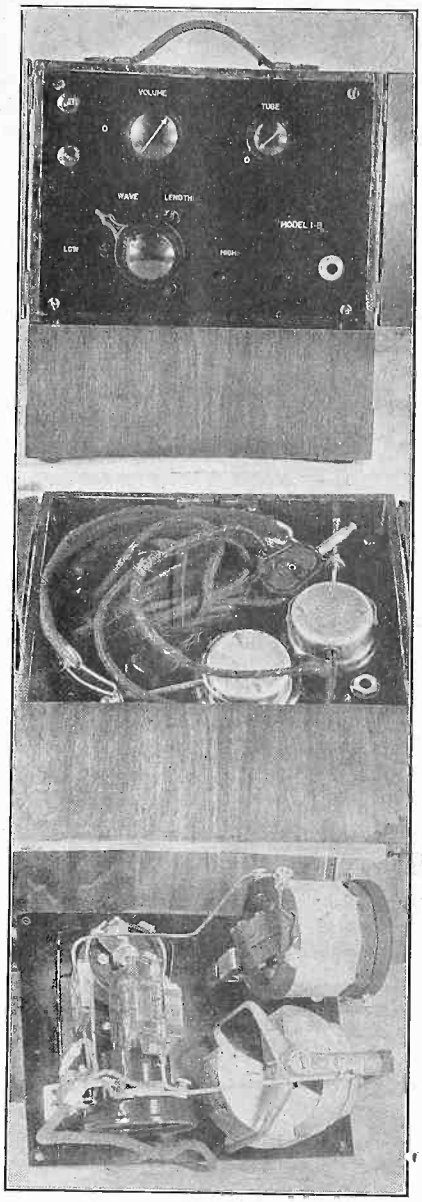


FIG. 10 is the front view of the panel in cabinet. The phones may be carried between the panel and the doors (Fig. 11). Leads to coil and condenser are kept short (Fig. 12).

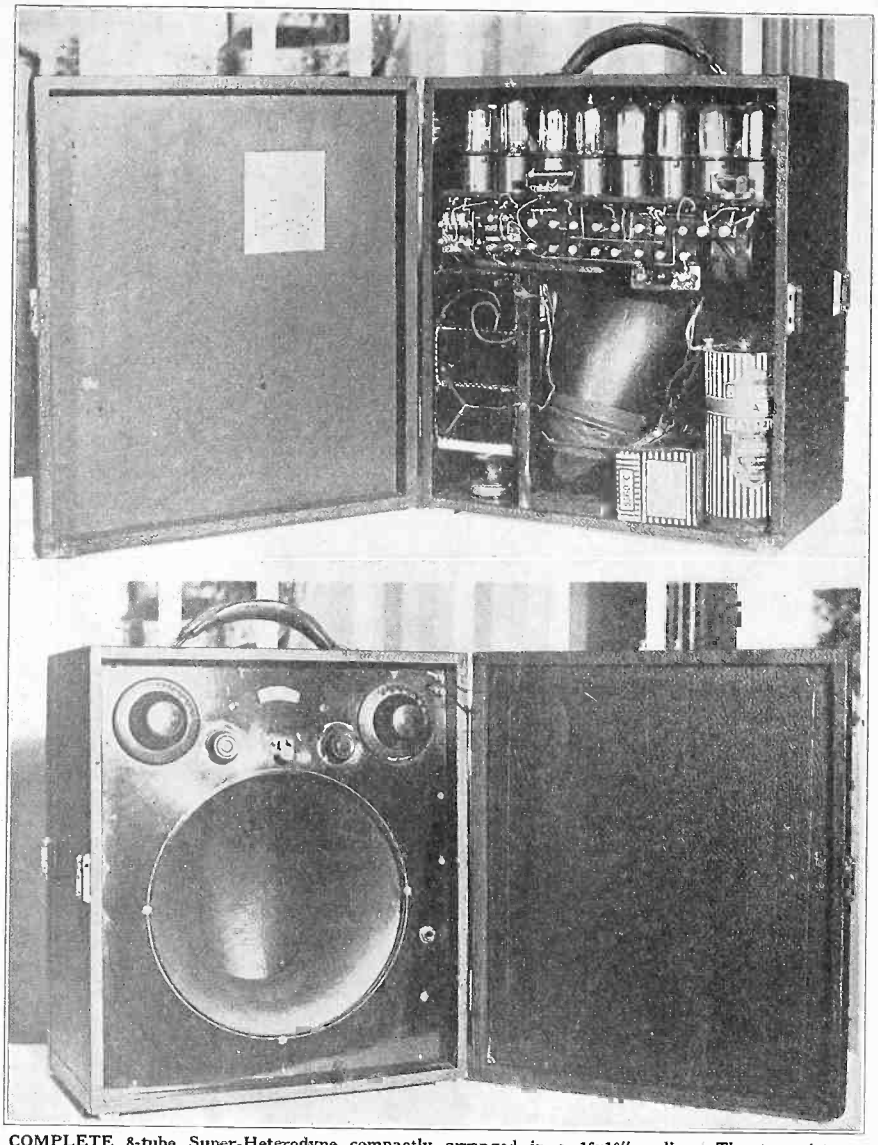
A neat-looking job indeed is the finished product, shown in Fig. 10. The earphones may be carried in the case itself, being snugly fitted between the doors and the panel. A pair of Towers Scientific phones is shown so situated in Fig. 11. The rear view of the receiver is depicted in Fig. 12.

Wiring Directions

The aerial is connected to one terminal of the aperiodic primary and also to the corresponding terminal of the secondary. Thus if the coil is one where the two windings adjoin, or where binding posts of primary and secondary adjoin, make the connection by putting a wire jumper across. The plan I followed, so as not to

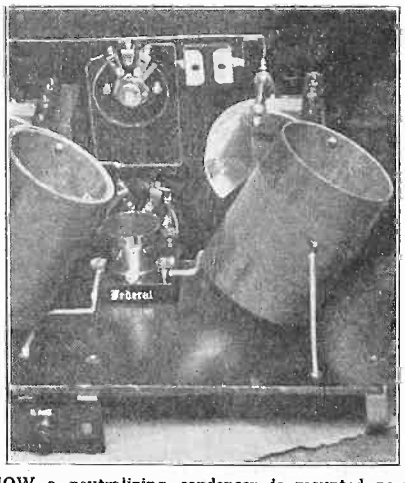
(*Concluded on page 26*)

A Super-Heterodyne Portable



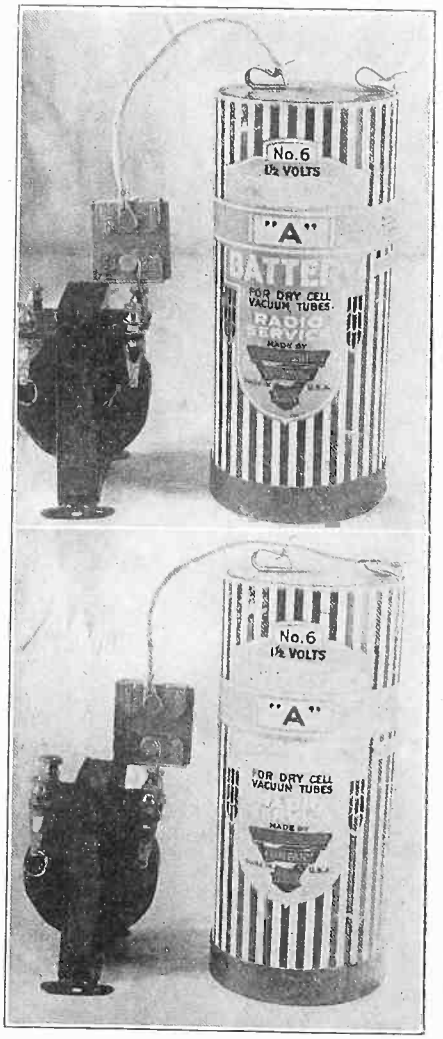
A COMPLETE 8-tube Super-Heterodyne compactly arranged in a 16x18" valise. The top picture shows the inside rear view of the receiver, the eight 199 tubes being supported on a piece of hard rubber panel. The lower photo shows the front panel, with speaker built in. The two dials control variable condensers.

The Super-Heterodyne installed in a taxi.



HOW a neutralizing condenser is mounted near the radio-frequency transformer, so as to obtain the shortest possible leads. Note how the transformer is mounted at an angle (about 57.3) so that the proper oscillation constant of the vacuum tube is obtained, e.g., the point where the tube will not spill over.

PUT a porcelain lead-in insulator at an angle pointing toward ground, so that water won't get inside your house or provide a leakage path for the radio waves. (Kadel & Herbert).



HERE we have the wrong and correct manner in which to connect a by-pass condenser. The top photo shows the lead of the plate post of an audio-frequency transformer going through a by-pass condenser to the positive post, which is wrong. Connect to A— (bottom photo).

THE BLUEBIRD REFLEX 2-tube earphone marvel by Capt. Peter V. O'Rourke. Send 15c for February 7 issue. RADIO WORLD, 1493 Broadway, New York City

Reducing Dielectric Losses

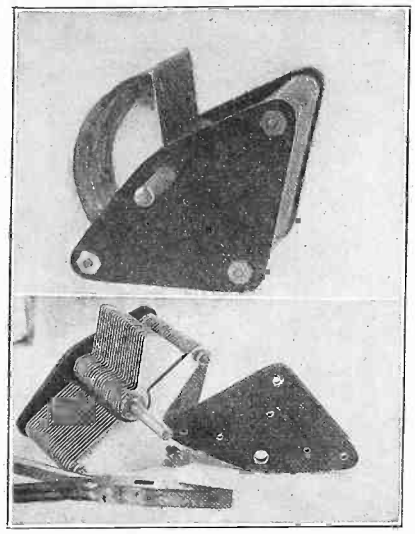


FIG. 1, a variable condenser with an insulation end piece. This introduces a dielectric medium in the electro-static field of the condenser and contributes forms of resistance and absorption losses. Fig. 2, A pair of pliers may be used in removing the insulation end plate from the variable condenser, if nuts hold the end plate to the metal plates of the condenser. Otherwise a screwdriver serves the purpose. In this stripped condition the condenser has no means for panel mounting.

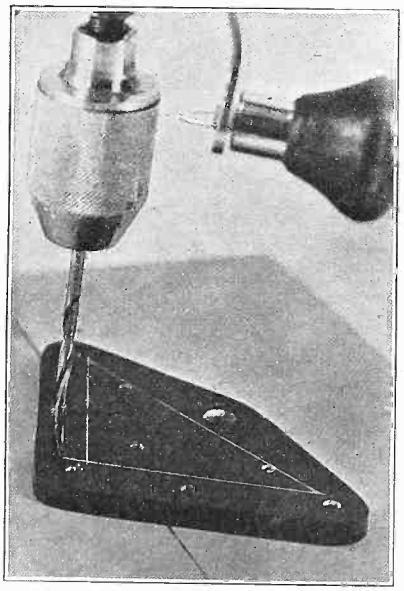


FIG. 3, two holes are drilled outside the triangle, so that mounting screws may be inserted, to enable panel mounting. Since the triangle is to be cut away, the old mounting holes will disappear.

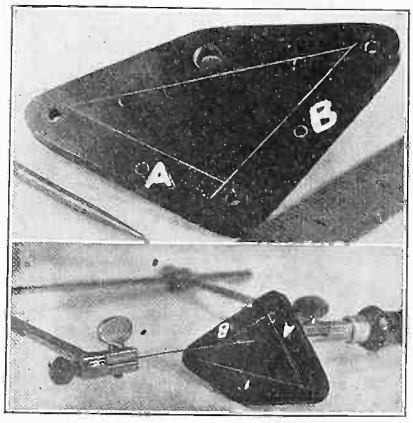


FIG 4, the two new mounting holes are shown, marked A and B. Also note that the hole through which the rotor shaft of the condenser extends is not to be disturbed. Using one of the former mounting holes as a starting point, insert a fret saw and start cutting in the direction of one line of the triangle. If the blade is not thin enough, use a drill to make the hole large enough for insertion of the blade, as of a hacksaw. When the triangle is removed in this manner the skeleton end-piece is replaced on the condenser and the instrument is mounted on the panel, in which new mounting holes must be drilled.

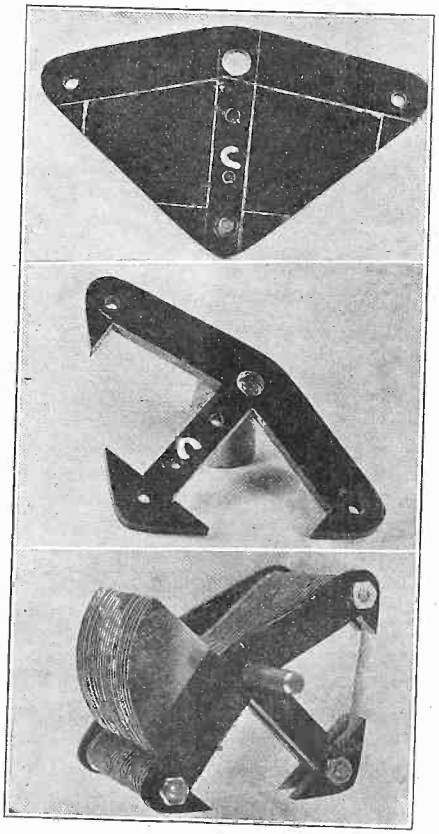
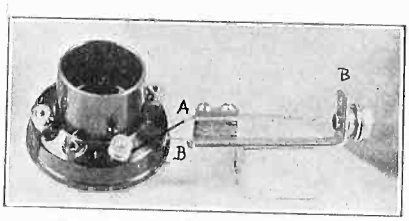


FIG 6, showing another method of cutting away dielectric end piece, preferable in remodeling condensers that lend themselves more readily to this method. Here one original mounting hole is retained and a new one drilled, the one above the C in the photo. Fig. 7 shows the insulation cut according to the pattern. The three holes for affixing the end piece to the metal plates are retained.

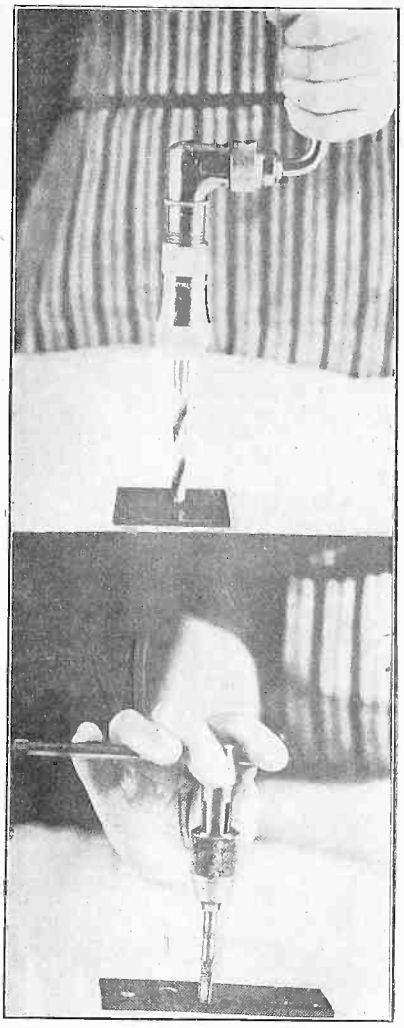
FIG. 8, the completed job. The skeleton end plate has been remounted. Note the panel mounting screws on the center arm. The three other holes are occupied by the screws which extend through the three corners of the stator. The nuts hold the skeleton frame in place. They should be tightened carefully so that the rotor plates will be equi-distant from the stator plates, thus avoiding possibility of the one touching the other.

B Plus Should Connect to Jack Frame



CORRECT the spring (A) of a jack to plate, the right-angle or frame (B) to B battery.

HOW TO BUILD A NEUTRALIZED LOOP, by Frank Freer. Send 15c for May 2 issue, RADIO WORLD.



IN USING a twist drill, if the drill will not make a wide enough hole (top photo) then use a reamer, as shown in lower photo. (Hayden Studios).

AS TO THE FULL PAGE ADVERTISEMENT OF THE MODERN RADIO TUBE MFG. CO.

ON PAGE 38 of our April 4 issue there appeared a full page advertisement of the Modern Radio Tube Manufacturing Co., 57-59 Branford St., Newark, N. J. Mr. Porrell, who gave us this advertisement, had been advertising in our columns for some months, always giving our readers satisfactory results.

It develops that in using a new address, some disagreement arose between Mr. Porrell and his associates, as to who was entitled to open the mail, and the Post Office decided to hold up all of this mail pending a settlement. For this reason there has been a delay in filling these orders. In order to protect our readers as far as possible, we have made an investigation, and have discovered that either the mail will be released and the orders filled, or the Post Office will return the full remittances to those who sent them in answer to the advertisement.

TIN FOIL A SOLDER SUBSTITUTE

WHEN putting up your antenna, in bad weather, a piece of tin foil wrapped around the lead-in connection and covered over with some tape is a good substitute for the troublesome solder.

THE RADIO UNIVERSITY

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

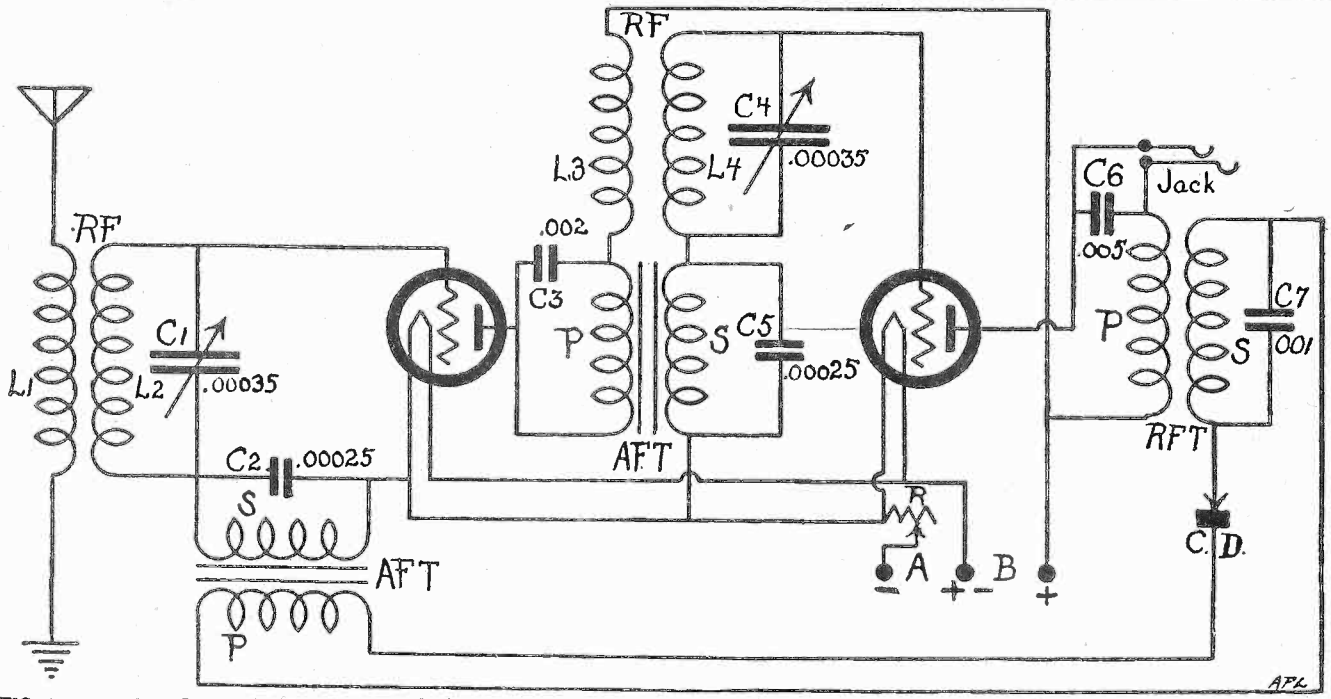


FIG. 144, a 2-tube reflex, employing an Acme radio-frequency transformer, and two General Radio or any other standard make audio frequency transformers. L1 and L2 are both around on a 3" tubing. Use No. 22 DCC., L1, 10 turns, L2, 60. One-half inch separation between the two windings. L3 has 15 turns, L4 has 60 turns, ¼" between two. Use No. 22 DCC. C. is a fixed crystal detector. 67½ volts are employed on plates of tubes. PS is a fixed RFT.

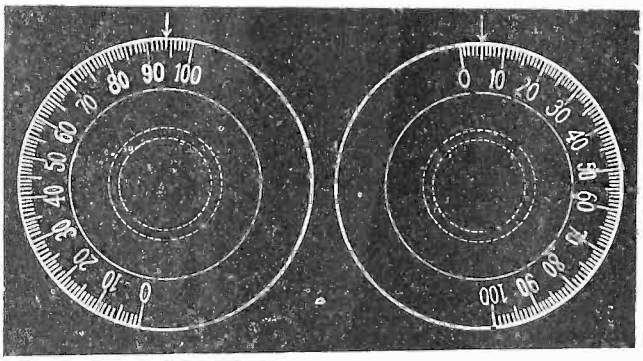


FIG. 145—A picture diagram of two dials which are identically designed as to the numbers on them and the direction of turning. At first glance, both look different, e.g., the one at the right looks like an anti-clockwise dial, but by simply studying the diagram it can be seen that by simply turning it either from 0 to 100 (left to right) the same direction must be utilized. A dial which reads from left to right 0-100, (clockwise) is turned in an anti-clockwise movement, e.g., you turn from 0-100 from right to left. The direction of turning is the controlling factor and it is always opposite to the direction of reading.

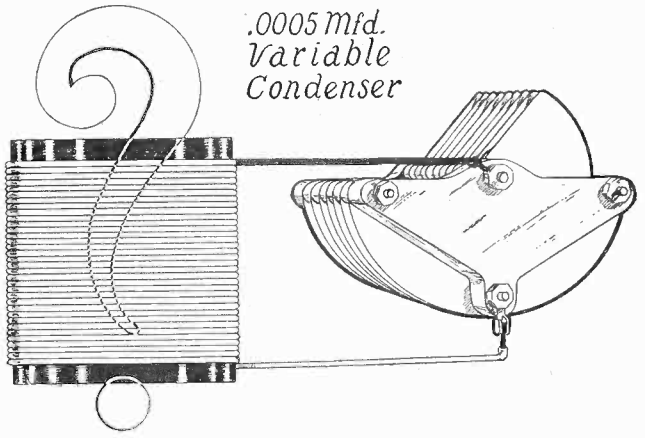


FIG. 146—A coil shunted by a variable condenser. A question mark over the coil shows that a coil which is fixed and can be tuned by a variable condenser, must have an inductance sufficient to be effective with the condenser in shunt to tune the broadcast band. For .0005 mfd. condenser use 43 turns of No. 22 SCC wire for .00035 use 56 turns; diameter of tubing 3½".

WOULD you please give me a diagram of a 2-tube reflex?—C. B. Barkrs, Long Island City, N. Y.

See Fig. 144.

* * *

I HAVE heard a great deal about clockwise and anti-clockwise and I am confused just as to what they mean. Would you please explain same?—D. B. Larkins, N. Y.

See Fig. 145.

* * *

I WOULD like to know what is meant by shunting a variable condenser across a coil.—H. L. Carlmoton, St. Louis, Mo.

Fig. 146 shows diagram which illustrates the word "shunted."

* * *

I WOULD like to know what devices are employed with the wavemeter and for what purpose may the wavemeter be employed. How would you calibrate a receiving set? What is the use of a buzzer in the wavemeter? (2)—Why is it necessary to measure the natural wavelength of the aerial circuit when tuning the transmitter to a given wavelength? (3)—What is the purpose of the hot wire ammeter in the aerial circuit?—Frank Jolly, Jr., Ogdensburg, N. Y.

(1) A complete article on wavemeters, including pictures and diagrams on how to make one, will be run in the Fourth Annual Vacation Number, June 6. (2) So that the combined inductance of the antenna system (aerial, ground, lead-in, and inductance coil) will not be over the fixed wavelength when tuned in resonance with the secondary, where more inductance and capacity are present and if too close a degree of coupling is present, the inductance and capacity present will add to the wavelength and go above the wavelength assigned by the government. This only applies, however, when your antenna is exceedingly long, as otherwise you take individual wavelength readings of the antenna circuit and the secondary circuit, then combine the two, that is, couple them up and take readings again comparing these with the separate readings taken before. This is a very complicated affair. (3) A hot wire ammeter has many functions in the radio transmitter. It indicates when the highest amount of current has been put in the antenna. When you have adjusted the frequency of the secondary circuit by a wavemeter to a certain wavelength, resonance may be obtained in the antenna circuit by placing an ammeter in antenna, and coupling the oscillation transformer until the needle offers a sharp deflection, at which point resonance is indicated. It also gives the marine radio operator a gauging ability, that is, he can see how much current is required to send certain distances (the farther away, naturally the more the current needed) and thereby adjust his set to transmit only enough energy to cover a certain distance. Of course, this is a rough unmathematical method. There are many physical obstacles, but it is of a practical use. Amateurs, please note that you cannot tell how far you are sending by simply reading your meter because your wave might be distorted, distracted or absorbed, just the night you are thinking you have a sent a great distance, because your antenna meter probably reads 4 or 5 amperes.

* * *

WHAT IS a galvanometer?—N. J. Plaerson, New Brunswick, Canada.

A galvanometer is a meter which will measure .0000001 of an ampere or more. This same meter can be made to measure volts by putting lots of wire around iron core; to measure amperes by putting on a couple of turns of coarse wire. The galvanometer has only about 2 or 3 turns of Number 14 wire.

* * *

I BUILT the set as described by Byrt C. Caldwell in the Dec. 6 issue and find it difficult to log stations, that is, a station might one night come in very clear and loud and the next night the same station is received distorted and with very low volume.—Geo. B. Hostetter, Box 325, Freewater, Oregon.

Test your B batteries and see if they have their right voltage, because if they are low or short internally, the voltage will rise and decrease, thereby causing the current in the plate to

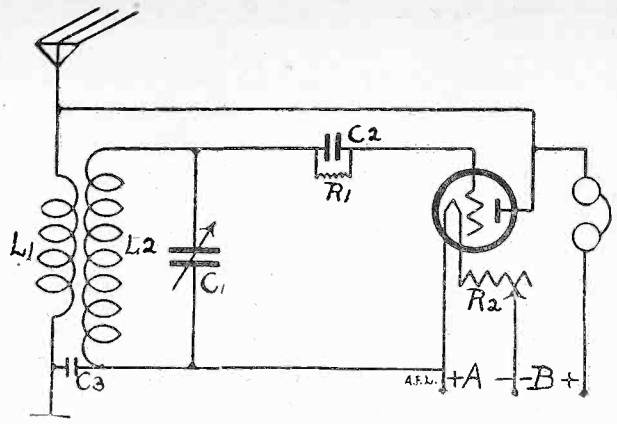


FIG. 147—A diagram of a single circuit single tube regenerative set. L1 and L2 are wound on a 3" tubing. L1 10 turns, L2 60 turns, ½" between two windings. This set oscillates beautifully and is a terrible interference maker. C3 is .001 mfds. C1 is .00035 (usually 17 plates).

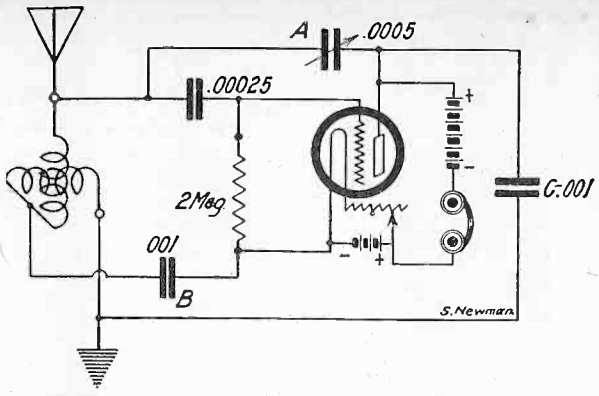


FIG. 148—Another squealer of the single-circuit type. Note that the plate is coupled through condenser A to antenna. This set is not as bad an offender as the other on account of indirect coupling method employed. This set delivers a large amount of volume. The variometer has 56 turns on the stator and 72 turns on the rotor, all windings being made up of No. 24 DCC wire. A UV200 tube is used here, with about 18 to 22½ volts on the plate, a 6-volt A battery for the filament. A 6-ohm rheostat is used to control the emission of electrons from the filament. The mid-tap is taken off the center of the stator coil.

fluctuate and render poor signals. Also your A battery may have to be charged. When you leave the A battery alone for a night, there is a return of energy, which in return gives the filament the property of emitting a large amount of electrons. Also your antenna might be leaking, that is, the insulators may have poor insulating properties. Another thing to think about is your neighbor. He may be hooking on your antenna some nights, or may be listening in on some nights on his regenerative set, which may be emitting feeble signals (the squeals and squawks you hear so many times).

* * *

..WOULD you please explain what is meant by the single circuit "squealers" that I hear so much about?—P. B. Laxitor, North Hampton, Mass.

Figs. 147 and 148 show two circuit diagrams which illustrate your point.

* * *

WHAT chemicals are needed to put in the cells of a storage B battery?—O. W. Hanks, 298 Broadway, N. Y. C.

Sulphuric acid. The specific gravity should be carefully measured, not be too concentrated, because the plates will be injured. Plain distilled water (not tapped sink water, as this contains metallic substances). Add the acid to the water and not the other way around. These substances should be mixed in a stone vessel and not in a metal container. Now put the diluted solution in the glass jar about ¼" above the plates and see that the solution never falls below. If, however, it does add pure distilled water to it. All this material may be purchased at a storage battery service station. The acid should be about 80% and the water 20%.

* * *

HOW DO you find the frequency of a station when you have the number of meters?—M. N. Rose, N. Y. C.

To find the frequency when you have the number of meters, divide the number of meters into 300,000,000, viz., 360 meters equals 833,333 cycles; 600 meters equals 500,000 cycles (500 kilocycles).

* * *

SHOULD THE O'Rourke 4-tube DX 3-control set, published March 21, be licensed under the Armstrong Regenerative patents for manufacture? (2) Could a variable condenser be substituted for a variocoupler by using a fixed coil and shunting it with the condenser? (3) Which is the better, the diamond-weave or the basket-weave radio-frequency transformer? (4) Could I wrap a piece of tin foil around one of these coils and ground it so as to eliminate any stray capacity that may exist around the coil?—Albert C. Leitch, Rouston, Louisiana.

(1) Yes, a license would be necessary to commercial manufacture. At present it is said no more licenses are being issued by the patent owners. (2) Yes, great success may be had with this method. (3) The diamond-weave is the better. (4) Yes, provided the coil is not wrapped around too tightly, that is, the tin foil must not touch the wire and make an internal short. This is a very excellent idea, and should be practiced a great deal. The loss in volume is very small.

* * *

IS THE 2-tube DX set as described by Herman Bernard a very good set and is it possible to add on a step of audio-frequency amplification?—K. W. Simpson, R.F.D., No. 10, Box 90, Charlotte, Mich.

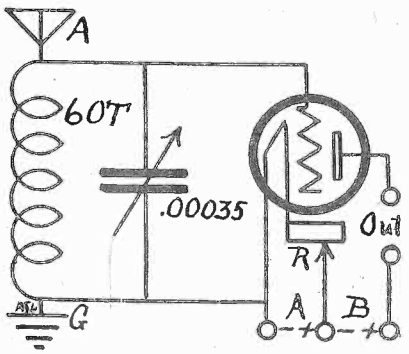


FIG. 149—A single-tube, non-regenerative receiver. This receiver is exactly the same as a crystal set, except that there is more stability and bit more volume. This is the least amount of materials that can be employed in a tube set. The tubing is 3" diameter.

It is a great set and has proven to be very popular with the fans who have received a large amount of distance and volume. A step of audio frequency may easily be added in the regular way.

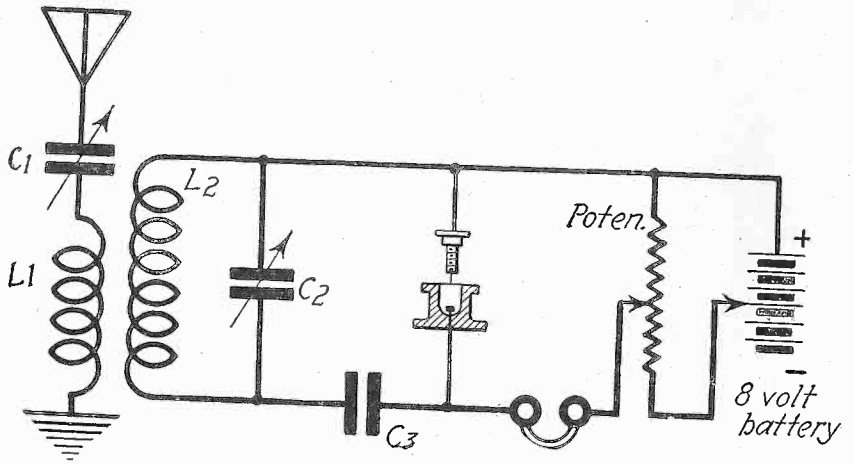
* * *

I WOULD like to see a diagram using a 1-tube set, using only a coil and variable condenser. I realize that a set of this type cannot be selective and is only experimental.—J. Cohen, Jamaica, N. Y.

Fig. 149 shows the diagram.

WHY does not my set, a Neutrodyne, receive distant stations, which I was promised it would when I bought it?—N. M. Bermen, Atlantic City, N. J.

A guarantee on how far a set can receive is not safe, because there are too many physical and mechanical obstacles, such as location, good grounding qualities, steel buildings, nature of building in which set is installed, place where the set is put, dead spots above the roof of the house in which the set is installed, kind of antenna employed, its height, how long it is, the kind of insulators used, the type of lead-in, the type of ground used, whether it is soldered to the water pipe or just hooked on, whether the ground goes directly to a water system or to a plain earth ground which is never kept wet,



AN INDUCTIVELY coupled crystal receiver. A carborundum crystal is hooked up with a potentiometer and battery for giving the crystal good rectifying qualities. Wind 15 turns of No. 20SCC and on a 3-inch tubing for L1, leave one-half inch and wind 60 turns more. C1 and C2 are .0005 mfd. C3 has a capacity of .001 mfd. A 200- to 400-ohm potentiometer is used to increase or decrease the voltage which is being fed into the crystal. Use a pair of phones having a resistance of 2,000 to 3,000 ohms. A pretty long antenna is used for this set, so as to get a maximum amount of signal strength. This receiver is the most selective of all the crystal sets.

Join RADIO WORLD'S University Club

and we will enter your name on our subscription and University lists by special number. Put this number on the outside of your envelope addressed to RADIO WORLD (not the enclosed return envelope) and also put it in your queries and the questions will be answered the same day as received.

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

RADIO WORLD, 1493 Broadway, New York City:

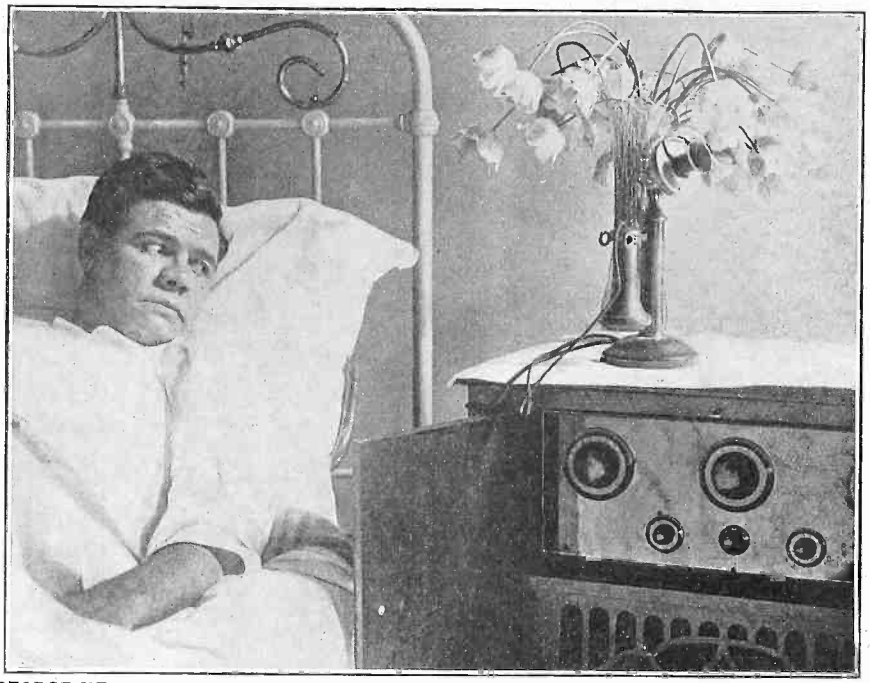
Enclosed find $6.00 for RADIO WORLD for one year (52 Nos.) and also consider this an application to join RADIO WORLD'S University Club, which gives me free information in your Radio University Department for the coming year, and a number indicating my membership.

Name .....

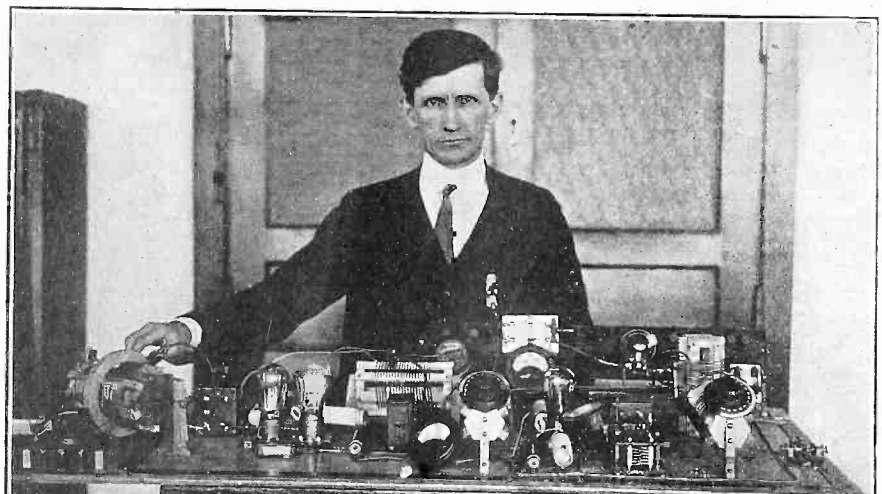
Street .....

City and State .....

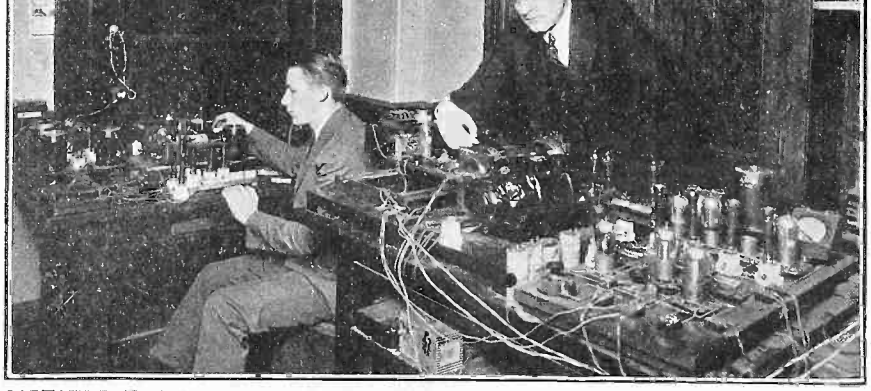
Set Aids Babe Ruth Recover



GEORGE HERMAN (BABE) RUTH listening in on a 5-tube radio set, installed by an ardent admirer and which helped "Babe" recover, so that he might be able to put the "Yankees" back into a winning stride. (Foto Topics.)



A. M. TROGNER, of the Naval Research Laboratory, operating the short-wave transmitter (40-85 meters) which he designed. This set is to be installed in about thirteen of the Naval Districts throughout the United States. (Harris & Ewing)



CAPTAIN RICHARD H. RANGER (at right), inventor of the radio transmitting devices, looking over the transmitting and receiving apparatus for radioing photos. Alfred E. Loenig, at left, an expert in the sending of radio photos, did the recent transmitting of photos from Honolulu. (Fotograms.)

Photos Fly F to New Yo of Ether

TWO of the Photos sent by radio from Honolul (Wi

War Game Photos

AT THE request of the War Depar ment the Radio Corporation America transmitted photos nearly all th way by radio, of the war tactics in th Pacific. The ultimate reception point wa New York City. The photos were su cessfully sent over 112 miles of wire an 5,024 miles of air. They were sent fro Honolulu.

Will be Military Factor

Maj. Gen. Charles P. Summerall sai that the picture-transmitting machin would become a military factor of th first order.

"The marvelous demonstration of wire lessing photographs from Honolulu by th Radio Corporation of America," he sai "opens up an entirely new field for mil tary communications. By means of thi development absolute secrecy will resul in materially assisting our military com manders. By slightly altering the positio of the carriage receiving the picture o message, a garbled mass of dots an dashes is broadcast, which would be totall unintelligible to persons without the code

"Maps showing in detail either our posi tions or enemy positions can be sent an received in twenty minutes. These maps while intelligible to our authorities, woul by a slight shift of the receiving dials b so twisted and distorted that they woul bear no relation to any geographical for mation. Coast line or gun positions woul be shifted to impossible points, and instead of lines would appear as scattered dots an dashes.

"The possibilities of this experiment which General Harbord has arranged a the request of the War Department, ar beyond anything yet conceived in signa communications."

Photos That Were Radioed

Among the pictures transmitted were photographs of Major Gen. John L. Hines,

om Honolulu k on Wings and Wire

eft, Major-General Lewis; right W. F. S. Hawk. Vorld.)

adioed 5,136 Miles

U. S. A., and Rear Admiral Robert E. Coontz, U. S. N., the umpires in the war games; Major Wilson of Honolulu, Governor Wallace R. Farrington of Hawaii, three war game scenes, troops at mess, a big gun in action and the flagship Seattle of the fleet attacking Hawaii.

The picture-transmitter is a portable apparatus developed by Captain R. H. Ranger, the inventor of the process.

The process of sending a picture started at Honolulu with folding the developed film into a cylinder and adjusting it on the transmitter. The film was then started revolving under a powerful needle of light. The black detail of the picture stopped the light and the white part let the light through. With varying intensity the light passed through the film and fell upon a photo-electric cell, which transformed the light into electrical impulses so controlled that they preserved the pattern of the picture.

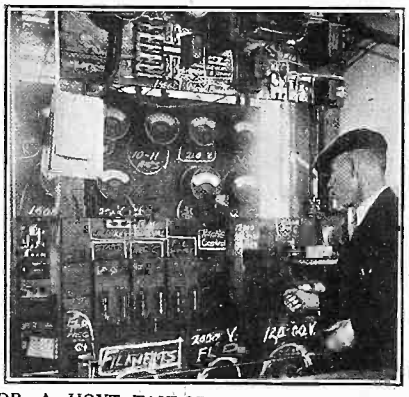
Action in 20 Minutes

It took the transmitting machine just about twenty minutes to transform the details of each photograph into electrical impulses. After being relayed by wire and radio, the electrical impulses reproduced the detail on films in the Broad street office of the Radio Corporation of America. Within a very small fraction of a second after the last detail of the picture had been picked up by the transmitting machine at Honolulu, it was registered again by the recording apparatuss in New York.

Each signal went through a long series of transformations before it became a part of the picture in the office of the Radio Corporation in New York City. Each signal existed twice in the form of light, three times in the form of electrical current running over wire and twice as radio waves.

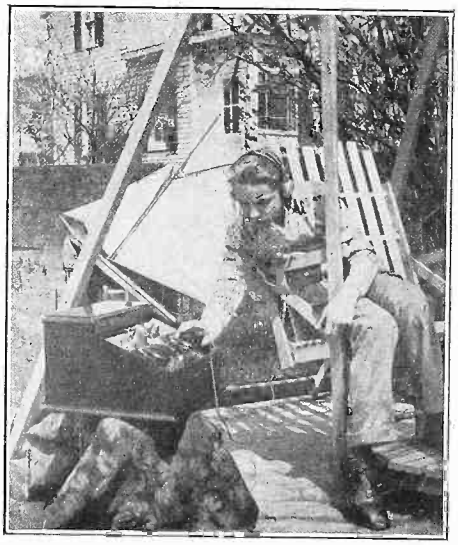
Realistic Kisses Advocated

HOW a kiss usually is broadcast. We at the receiving end hear it and may think it is done as below, and some advocate the realistic manner. Miss Mildred MacLeod and Donald Duff of "Wild Birds," are seen in photo. Mr. Duff is demonstrating a radio kiss before the microphone. (Foto topics.)

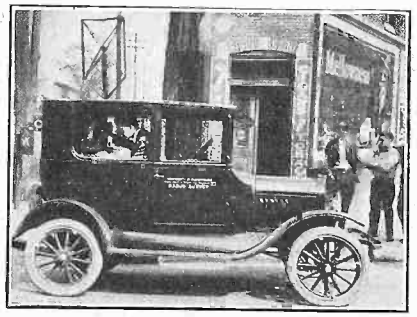


DR. A. HOYT TAYLOR, Superintendent at the Bellevue Naval Research Lab., operating a powerful short-wave transmitter. (Harris & Ewing)

DEVOTEES OF REALISM insist that even before the microphone the kiss in a broadcast play should be real, as on the stage (shown above). Costumes, too, are advocated. (Foto Topics).



LISTENING-IN after a "sail" with a model yacht. The boy is seen operating a three-tube regenerative portable receiver. (Underwood & Underwood.)



KNOX McILWAIN, of the Moore School of Electrical Engineering of Pennsylvania University, operating a specially designed Super-Heterodyne in the radio school's survey car. Radio waves are studied. (Wide World)

THE KEY TO THE AIR

KEY

Abbreviations: E. S. T., Eastern Standard Time; C. S. T., Central Standard Time; M. S. T., Mountain Standard Time; P. S. T., Pacific Standard Time; D. S., Daylight Saving Time.

How to tune in a desired distant station at just the right time—Choose your station from the list published herewith. See what time division the station is under (E. S. T., C. S. T., etc.); then consult the table below. Add to or subtract, as directed from the time as given on the PROGRAM. The result will be the same BY YOUR CLOCK that you should tune in, unless daylight saving time intervenes, as explained below.—The table:

If you are in	*And want a station in*	*Subtract*	*Add*
E. S. T.	C. S. T.		1 hr.
E. S. T.	M. S. T.		2 hrs.
E. S. T.	P. S. T.		3 hrs.
C. S. T.	E. S. T.	1 hr.	
C. S. T.	M. S. T.		1 hr.
C. S. T.	P. S. T.		2 hrs.
M. S. T.	E. S. T.	2 hrs.	
M. S. T.	C. S. T.	1 hr.	
M. S. T.	P. S. T.		1 hr.
P. S. T.	E. S. T.	3 hrs.	
P. S. T.	C. S. T.	2 hrs.	
P. S. T.	D. S. T.	1 hr.	

If you are under Daylight Saving Time, and the station you want is under that time, too, or if both are under Standard Time, the above table will hold.

If you are under Daylight Saving Time, and the station operates under Standard Time, add one hour to the table result.

If the station uses Daylight Saving Time, and you are under Standard Time, subtract one hour from the table result.

Friday

WAAM, Newark, N. J., 263 (E. S. T., D. S.) —11 A. M. to 12.

WAHG, Richmond Hill, N. Y., 316 (E. S. T., D. S.)—12 to 1:05 P. M.; 8 to 12 P. M.

WAMD, Minneapolis, Minn., 243.8 (C. S. T.)— 12 to 1 P. M.; 10 to 12.

WBBM, Chicago, Ill., 226 (C. S. T.)—8 to 10 P. M.

WBBR, New York City, 272.6 (E. S. T., D. S.) —8 P. M. to 10.

WBZ, Springfield, Mass., 333.1 (E. S. T., D. S.) —6 P. M. to 11.

WCCO, St. Paul and Minneapolis, Minn., 416.4 (C. S. T.)—9:30 A. M. to 12 M.; 1:30 to 4; 5:30 to 10.

WCAE, Pittsburgh, Pa., 461.3 (E. S. T., D. S.) —12:30 to 1:30 P. M.; 4:30 to 5:30; 6:30 to 11.

WDAF, Kansas City, Kansas, 365.6 (C. S. T.)— 3:30 to 7 P. M.; 8 to 10; 11:45 to 1 A. M.

WEAF, New York City, 492 (E. S. T., D. S.) —6:45 A. M. to 7:45; 11 to 12; 4 P. M. to 5; 6 to 12.

WEAO, Ohio State University, 293.9 (E. S. T.) —8 P. M. to 10.

WEEI, Boston, Mass., 476 (E. S. T., D. S.)— 6:45 A. M. to 7:45; 2 P. M. to 3:15; 5:30 to 10.

WEMC, Berrien Springs, Mich., 286 (C. S. T.)— 9 P. M. to 11.

WFAA, Dallas, Texas, 475.9 (C. S. T.)—10:30 A. M. to 11:30; 12:30 P. M. to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30.

WGBS, New York City, 316 (E. S. T., D. S.) —10 A. M. to 11; 1:30 P. M. to 4; 6 to 11.

WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)— 12 M. to 12:45 P. M.; 7:30 to 11.

WGST, Atlanta, Ga., 270 (C. S. T.)—7 P. M. to 8.

WGY, Schenectady, N. Y., 379.5 (E. S. T.)— 1 P. M. to 2; 5:30 to 10:30.

WHAD, Milwaukee, Wis., 275 (C. S. T.)—11 A. M. to 11:30; 6 P. M. to 8.

WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M. to 5; 7:30 to 9.

WHN, New York City, 360 (E. S. T., D. S.) —12:30 P. M. to 1; 2:15 to 5; 7 to 11; 12 to 12:30 A. M.

WHO, Des Moines, Iowa, 526 (C. S. T.)—7:30 P. M. to 9; 11 to 12; 12:30 to 1:30; 4:30 to 5:30; 6:30 to 9:30.

WIP, Philadelphia, Pa., 508.2 (E. S. T., D. S.) —7 A. M. to 8; 1 P. M. to 2; 3 to 4:50; 6 to 8.

WJY, New York City, 405 (E. S. T., D. S.)— 7:30 P. M. to 11:30.

WJZ, New York City, 455 (E. S. T., D. S.)— 10 A. M. to 11; 1 P. M. to 2; 4 to 6; 7 to 10:30.

WLW, Cincinnati, O., 422.3 (E. S. T.)—10:45 A. M. to 12:15; 1:30 P. M. to 2:30.

WMCA, New York City, 341 (E. S. T., D. S.) —3 P. M. to 5; 6:30 to 7:30; 8:15 to 8:20; 9 to 10:15; 11 to 11:30.

WNYC, New York City, 526 (E. S. T., D. S.) —3:45 P. M. to 4:45; 6:20 to 11.

WOAW, Omaha, Neb., 526 (C. S. T.)—12:30 P. M. to 1; 5:45 to 7:10; 9 to 11.

WOC, Davenport, Iowa, 484 (C. S. T.)—12:57 P. M. to 2; 3 to 3:30; 5:45 to 12.

WOR, Newark, N. J., 405 (E. S. T., D. S.)— 6:45 A. M. to 7:45; 2:30 P. M. to 4; 6:15 to 7.

WPG, Atlantic City, N. J., 299.8 (E. S. T., D. S.) —7 P. M. to 8:30; 10 to 12.

WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M. to 12 M.; 3 P. M. to 4; 7 to 8; 10 to 2 A. M.

WRC, Washington, D. C., 469 (E. S. T.)—4:30 P. M. to 5; 6:45 to 12.

KDKA, Pittsburgh, Pa., 309 (E. S. T.)—6 A. M. to 7; 9:45 to 12:20 P. M.; 1:30 to 3:20; 5:30 to 11.

KFAE, State College of Wash., 348.6 (P. S. T.) —7:30 P. M. to 9.

KFDY, Brookings, S. D., 273 (M. S. T.)— 8 P. M. to 9.

KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M. to 10.

KFKX, Hastings, Neb., 288.3 (C. S. T.)—12:30 P. M. to 1:30; 9:30 to 12.

KFNF, Shenandoah, Iowa, 266 (C. S. T.)—12:15 P. M. to 1:15; 3 to 4; 6:30 to 10.

KFOA, Seattle, Wash., 455 (P. S. T.)—12:30 P. M. to 1:30; 4 to 5:15; 6 to 11.

KGO, Oakland, Cal., 361.2 (P. S. T.)—11:10 A. M. to 1 P. M.; 1:30 to 3; 4 to 7.

KGW, Portland, Oregon, 491.5 (P. S. T.)—11:30 A. M. to 1:30 P. M.; 5 to 11.

KHJ, Los Angeles, Cal., 405.2 (P. S. T.)—7 A. M. to 7:15; 12 M. to 3:30 P. M.; 5:30 to 11:30.

KNX, Hollywood, Cal., 337 (P. S. T.)—11:30 A. M. to 12:30 P. M.; 1 to 2; 4 to 5; 6:30 to 12.

KOB, State College of New Mexico, 348.6 (M. S. T.)—11:55 A. M. to 12:30 P. M.; 7:30 to 8:30; 9:55 to 10:10.

KPO, San Francisco, Cal., 429 (P. S. T.)—7:30 A. M. to 8; 10:30 to 12 M.; 1 P. M. to 2; 4:30 to 11.

KSD, St. Louis, Mo., 545.1 (C. S. T.)—4 P. M. to 5.

KTHS, Hot Springs, Ark., 374.8 (C. S. T.)— 12:30 P. M. to 1; 8:20 to 10.

KYW, Chicago, Ill., 536 (C. S. T., D. S.)— 6:30 A. M. to 7:30; 10:55 to 1 P. M.; 2:25 to 3:30; 6:02 to 7:20; 9 to 1:30 A. M.

CNRA, Moncton, Canada, 313 (E. S. T.)—8:30 P. M. to 10:30.

CNRE, Edmonton, Canada, 516.9 (M. S. T.)— 8:30 P. M. to 10:30.

CNRS, Saskatoon, Canada, 400 (M. S. T.)—2:30 P. M. to 3.

CNRT, Toronto, Canada, 357 (E. S. T.)—6:30 P. M. to 11.

Saturday

WAAM, Newark, N. J., 263 (E. S. T.)—7 P. M. to 11.

WAHG, Richmond Hill, N. Y., 316 (E. S. T.) D. S.)—12 M. to 2 A. M.

WAMD, Minneapolis, Minn., 243.8 (C. S. T.)— 12 M. to 1 P. M.; 10 to 12.

WBBM, Chicago, Ill., 226 (C. S. T.)—8 P. M. to 1 A. M.

WBBR, New York City, 272.6 (E. S. T., D. S.) —8 P. M. to 9.

WBZ, Springfield, Mass., 333.1 (E. S. T., D. S.) —11 A. M. to 12:30 P. M.; 7 to 9.

WCAE, Pittsburgh, Pa., 461.3 (E. S. T., D. S.) —10:45 A. M. to 12 M.; 3 P. M. to 4; 6:30 to 7:30.

WCBD, Zion, Ill., 344.6 (C. S. T.)—8 P. M. to 10.

WCCO, St. Paul and Minneapolis, Minn., 416.4 (C. S. T.)—9:30 A. M. to 12:30 P. M.; 2:30 to 5; 6 to 10.

WEAF, New York City, 492 (E. S. T., D. S.)— 6:45 A. M. to 7:45; 4 P. M. to 5; 6 to 12.

WEEI, Boston, Mass., 476 (E. S. T., D. S.)— 6:45 A. M. to 7 A. M.

WEMC, Berrien Springs, Mich., 286 (C. S. T.) —11 A. M. to 12:30 P. M.; 8:15 to 11.

WFAA, Dallas, Texas, 475.9 (C. S. T.)—12:30 P. M. to 1; 6 to 7; 8:30 to 9:30; 11 to 12:30 A. M.

WGBS, New York City, 316 (E. S. T., D. S.)— 10 A. M. to 11; 1:30 P. M. to 3; 6 to 12.

WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)— 12 M. to 12:45 P. M.; 2:30 to 4:30; 7:30 to 8.

WGY, Schenectady, N. Y., 379.5 (E. S. T.)—7:30 P. M. to 10.

WHAD, Milwaukee, Wis., 275 (C. S. T.)—11 A. M. to 11:30; 6 P. M. to 8.

WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M. to 5; 7:30 to 9.

WHN, New York City, 360 (E. S. T., D. S.)— 2:15 P. M. to 5; 7:30 to 10.

WHO, Des Moines, Iowa, 526 (C. S. T.)—11 A. M. to 12:30 P. M.; 4 to 5:30; 7:30 to 8:30.

WIP, Philadelphia, Pa., 508.2 (E. S. T., D. S.)— 7 A. M. to 8; 10:20 to 11; 1 P. M. to 2; 3 to 4; 6 to 11:30.

WJY, New York City, 405 (E. S. T., D. S.)— 2:30 P. M. to 5; 8 to 10:30.

WJZ, New York City, 455 (E. S. T., D. S.)— 9 A. M. to 12:30 P. M.; 2:30 to 4; 7 to 10.

WKRC, Cincinnati, O., 326 (E. S. T.)—10 to 12 M.

WLW, Cincinnati, O., 422.3 (E. S. T.)—9:30 A. M. to 12:30 P. M.; 7:30 to 10.

WMAK, Lockport, N. Y., 265.5 (E. S. T.)— 10:25 A. M. to 12:30 P. M.

WMC, Memphis, Tenn., 499.7 (E. S. T.)—7:30 P. M. to 10.

WMCA, New York City, 341 (E. S. T., D. S.) —3 P. M. to 3:15; 3:30 to 5; 8 to 8:15; 8:30 to 8:45; 11 P. M. to 1 A. M.

WNYC, New York City, 526 (E. S. T., D. S.)— 1 P. M. to 3; 7 to 11.

WOAW, Omaha, Neb., 526 (C. S. T.)—9 A. M. to 11; 2:15 P. M. to 4; 9 to 11.

WOC, Davenport, Iowa, 484 (C. S. T.)—12:57 P. M. to 2; 5:45 to 7:10; 9 to 12.

WOO, Philadelphia, Pa., 508.2 (E. S. T., D. S.) —11 A. M. to 1 P. M.; 4:40 to 5; 10:55 to 11:02.

WOR, Newark, N. J., 405 (E. S. T., D. S.)— 6:45 A. M. to 7:45; 2:30 P. M. to 4; 6:15 to 7:30; 8 to 11.

WPG, Atlantic City, N. J., 299.8 (C. S. T.)— 7 P. M. to 12.

WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M. to 12 M.; 3 P. M. to 4; 7 to 8; 10 to 3 A. M.

WRC, Washington, D. C., 469 (E. S. T.)—4:30 to 5:30 P. M.; 6:45 to 12.

WWJ, Detroit, Mich., 352.7 (E. S. T.)—11 A. M. to 12:30 P. M.; 2 to 3; 7:20 to 10:30.

KDKA, Pittsburgh, Pa., 309 (E. S. T.)—10 A. M. to 12:30 P. M.; 1:30 to 6:30.

KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M. to 11.

KFKX, Hastings, Neb., 288.3 (C. S. T.)—12:30 P. M. to 1:30; 9:30 to 12:30.

KFNF, Shenandoah, Iowa, 266 (C. S. T.)—12:15 P. M. to 1:15; 3 to 4; 6:30 to 10:30.

KFOA, Seattle, Wash., 455 (P. S. T.)—Silent.

KGO, Oakland, Cal., 361.2 (P. S. T.)—11 A. M. to 12:30 P. M.; 3:30 to 5:45; 7:30 to 9.

KGW, Portland, Oregon, 491.5 (P. S. T.)—11:30 A. M. to 1:30 P. M.; 6 to 7; 10 to 11.

KHJ, Los Angeles, Cal., 405.2 (E. S. T., D. S.)— 7 A. M. to 7:30; 10 to 1:30 P. M.; 2:30 to 3:30; 5:30 to 2 A. M.

KNX, Hollywood, Cal., 337 (P. S. T.)—1 P. M. to 2; 6:30 to 2 A. M.

KOA, Denver, Colo., 322.4 (M. S. T.)—11:30 A. M. to 1 P. M.; 7 to 10.

KPO, San Francisco, Cal., 429 (P. S. T.)—8 A. M. to 12 M.; 2 P. M. to 3; 6 to 10.

KSD, St. Louis, Mo., 545.1 (C. S. T.)—7 P. M. to 8:30.

KTHS, Hot Springs, Ark., 374.8 (C. S. T.)— 12:30 P. M. to 1; 8:30 to 10:30.

KYW, Chicago, Ill., 536 (C. S. T., D. S.)—11 A. M. to 12:30 P. M.; 4 to 5; 7 to 8.

CKAC, Montreal, Canada, 411 (E. S. T.)—4:30 P. M. to 5:30.

CNRO, Ottawa, Ontario, Canada, 435 (E. S. T.) —7:30 P. M. to 10.

PWX, Havana, Cuba, 400 (E. S. T.)—8:30 P. M. to 11:30.

Sunday

WBBM, Chicago, Ill., 226 (C. S. T.)—4 P. M. to 6; 8 to 10.

WBBR, New York City, 272.6 (E. S. T., D. S.) —10 A. M. to 12 M., 9 P. M. to 11.

WCCO, St. Paul and Minneapolis, Minn., 416.4 (C. S. T.)—11 A. M. to 12:30 P. M.; 4:10 to 5:10; 7:20 to 10.

WDAF, Kansas City, Kansas, 365.6 (C. S. T.)— 4 P. M. to 5:30.

WEAF, New York City, 492 (E. S. T., D. S.)— 3 P. M. to 5; 7:20 to 10:15.

WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)— 3 P. M. to 4; 7:15 to 8.

WGBS, New York City, 316 (E. S. T., D. S.)— 3:30 P. M. to 4:30; 9:30 to 10:30.

WGY, Schenectady, N. Y., 379.5 (E. S. T.)— 9:30 A. M. to 12:30 P. M.; 2:35 to 3:45; 6:30 to 10:30.

WHAD, Milwaukee, Wis., 275 (C. S. T.)—2 P. M. to 3.

WHN, New York City, 360 (E. S. T., D. S.)— 1 P. M. to 1:30; 3 to 6; 10 to 12.

WIP, Philadelphia, Pa., 508.2 (E. S. T., D. S.) —10:45 A. M. to 12:30 P. M.; 3:30 to 4:30.

WKRC, Cincinnati, O., 326 (E. S. T.)—6:45 P. M. to 11.

WNYC, New York City, 526 (E. S. T., D. S.)— 9 P. M. to 11.

WPG, Atlantic City, N. J., 299.8 (C. S. T., D. S.) —3:15 P. M. to 5; 9 to 11.

WQJ, Chicago, Ill., 448 (C. S. T.)—10:30 A. M. to 12:30 P. M.; 3 P. M. to 4; 8 to 10.

KFNF, Shenandoah, Iowa, 266 (C. S. T.)—10:45 A. M. to 12:30 P. M.; 2:30 to 4:30; 6:30 to 10.

KGW, Portland, Oregon, 491.5 (P. S. T.)—10:30 A. M. to 12:30 P. M.; 6 to 9.

KHJ, Los Angeles, Cal., 405.2 (E. S. T., D. S.) —10 A. M. to 12:30 P. M.; 6 to 9.

KTHS, Hot Springs, Ark., 374.8 (C. S. T.)— 11 A. M. to 12:30 P. M.; 2:30 to 3:40; 8:40 to 11.

Monday

WAAM, Newark, N. J., 263 (E. S. T., D. S.) —11 A. M. to 12 M.; 7 P. M. to 11.

WAHG, Richmond Hill, N. Y., 316 (E. S. T., D. S.)—12 M. to 1:05 P. M.; 8 to 2 A. M.

WAMD, Minneapolis, Minn., 243.8 (C. S. T.)— 10 P. M. to 12.

WBBM, Chicago, Ill., 226 (C. S. T.)—6 P. M. to 7.

WBBR, New York City, 272.6 (E. S. T., D. S.) —8 P. M. to 9.

WBZ, Springfield, Mass., 333.1 (E. S. T., D. S.) —6 P. M. to 11:30.

WCAE, Pittsburgh, Pa., 461.3 (E. S. T., D. S.)— 12:30 P. M. to 1:30; 4:30 to 5:30; 6:30 to 12.

WCBD, Zion, Ill., 344.6 (C. S. T.)—8 P. M. to 10.

WCCO, St. Paul and Minneapolis, Minn., 416.4 (C. S. T.)—9:30 A. M. to 12 M.; 1:30 P. M. to 6:15; 8 to 10.

WDAF, Kansas City, Kansas, 365.6 (C. S. T.)— 3:30 P. M. to 7; 8 to 10; 11:45 to 1 A. M.

WEAF, New York City, 492 (E. S. T., D. C.)— 6:45 A. M. to 7:45; 4 P. M. to 5; 6 to 11:30.

WEEI, Boston, Mass., 476 (E. S. T., D. S.)— 6:45 A. M. to 8; 3 P. M. to 4; 5:30 to 10.

WEMC, Berrien Springs, Mich., 286 (C. S. T.)— 8:15 P. M. to 11.

WFAA, Dallas, Texas, 475.9 (C. S. T.)—10:30 A. M. to 11:30; 12:30 P. M. to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30.

WGBS, New York City, 316 (E. S. T., D. S.) —10 A. M. to 11; 1:30 P. M. to 3:10; 6 to 7:30.

WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)— 12 M. to 12:30 P. M.; 2:30 to 4:30; 7:30 to 11.

WGST, Atlanta, Ga., 270 (C. S. T.)—9 P. M. to 10.

WGY, Schenectady, N. Y., 379.5 (E. S. T.)—1 P. M. to 2; 5:30 to 8:30.

WHAD, Milwaukee, Wis., 275 (C. S. T.)—11 A. M. to 11:30; 6 P. M. to 10:30.

WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M. to 5; 7:30 to 9.

WHN, New York City, 360 (E. S. T., D. S.)— 2:15 P. M. to 5; 6:30 to 12.

WHO, Des Moines, Iowa, 526 (C. S. T.)—12:15 P. M. to 1:30; 7:30 to 9; 11:15 to 12.

WIP, Philadelphia, Pa., 508.2 (E. S. T., D. S.) —7 A. M. to 8; 1 P. M. to 2; 3 to 8.

WJZ, New York City, 455 (E. S. T., D. S.)— 10 A. M. to 11; 1 P. M. to 2; 4 to 5:30; 6 to 6:30; 7 to 11.

WKRC, Cincinnati, O., 326 (E. S. T.)—8 P. M. to 10.

WLW, Cincinnati, O., 422.3 (E. S. T.)—10:45 A. M. to 12:15 P. M.; 1:30 to 2:30; 3 to 5; 6 to 10.
WMAK, Lockport, N. Y., 265.5 (E. S. T.)—8 P. M. to 12.
WNYC, New York City, 526 (E. S. T., D. S.)—3:15 P. M. to 4:15; 6:20 to 11.
WOAW, Omaha, Neb., 526 (C. S. T.)—12:30 P. M. to 1:30; 5:45 to 10:30.
WOC, Davenport, Iowa, 484 (C. S. T.)—12:57 P. M. to 2; 3 to 3:30; 5:45 to 6.
WOO, Philadelphia, Pa., 508.2 (E. S. T., D. S.)—11 A. M. to 1 P. M.; 4:40 to 6; 7:30 to 11.
WOR, Newark, N. J., 405 (E. S. T., D. S.)—6:45 A. M. to 7:45; 2:30 to 4; 6:15 to 11:30.
WPG, Atlantic City, N. J., 299.8 (E. S. T., D. S.)—7 P. M. to 11.
WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M. to 12 M.; 3 P. M. to 4.
WRC, Washington, D. C., 469 (E. S. T.)—1 P. M. to 2; 4 to 6.
KDKA, Pittsburgh, Pa., 309 (E. S. T.)—6 A. M. to 7; 9:45 to 12:15 P. M.; 2:30 to 3:20; 5:30 to 10.
KFAE, State College of Wash., 348.6 (P. S. T.)—7:30 P. M. to 9.
KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M. to 11.
KFKX, Hastings, Neb., 288.3 (C. S. T.)—12:30 P. M. to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (C. S. T.)—12:15 P. M. to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (P. S. T.)—12:45 P. M. to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (P. S. T.)—9 A. M. to 10:30; 11:30 A. M. to 1 P. M.; 1:30 to 6; 6:45 to 7; 8 to 1 A. M.
KGW, Portland, Oregon, 491.5 (P. S. T.)—11:30 A. M. to 1:30; 5 to 8.
KHJ, Los Angeles, Cal., 405.2 (P. S. T.)—7 A. M. to 7:15; 12 M. to 1:30 P. M.; 5:30 to 10.
KNX, Hollywood, Cal., 337 (P. S. T.)—12 M. to 1 P. M.; 4 to 5; 6:30 to 12.
KOB, State College of New Mexico, 348.6 (M. S. T.)—11:55 A. M. to 12:30 P. M.; 7:30 to 8:30; 9:55 to 10:10.
KPO, San Francisco, Cal., 429 (P. S. T.)—10:30 A. M. to 12 M.; 1 P. M. to 2; 2:30 to 3:30; 4:30 to 10.
KSD, St. Louis, Mo., 545.1 (C. S. T.)—7:30 P. M. to 10.
KTHS, Hot Springs, Ark., 374.8 (C. S. T.)—12:30 P. M. to 1; 8:30 to 10.
KYW, Chicago, Ill., 536 (C. S. T., D. S.)—6:30 A. M. to 7:30; 10:55 to 1 P. M.; 2:15 to 3:30; 6:02 to 7.

Tuesday

WAAM, Newark, N. J., 263 (E. S. T., D. S.)—11 A. M. to 12 M.; 7 P. M. to 11.
WAHG, Richmond Hill, N. Y., 316 (E. S. T., D. S.)—12 P. M. to 1:05 A. M.
WAMD, Minneapolis, Minn., 243.8 (C. S. T.)—12 M. to 1 P. M.; 10 to 12.
WBBM, Chicago, Ill., 226 (C. S. T.)—8 P. M to 12.
WBZ, Springfield, Mass., 333.1 (E. S. T., D. S.)—6 P. M. to 11.
WCAE, Pittsburgh, Pa., 461.3 (E. S. T., D. S.)—12:30 P. M. to 1:30; 4:30 to 5:30; 6:30 to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (C. S. T.)—9:30 A. M. to 12 M.; 1:30 P. M. to 4; 5:30 to 10.
WDAF, Kansas City, Kansas, 365.6 (C. S. T.)—3:30 P. M. to 7; 11:45 to 1 A. M.
WEAF, New York City, 492 (E. S. T., D. S.)—6:45 A. M. to 7:45; 11 to 12 M.; 4 P. M. to 5; 6 to 12.
WEEI, Boston, Mass., 476 (E. S. T., D. S.)—6:45 A. M. to 8; 1 P. M. to 2; 6:30 to 10, 11:30 to 12:30 A. M.
WFAA, Dallas, Texas, 475.9 (C. S. T.)—10:30 A. M. to 11:30; 12:30 P. M. to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30; 11 to 12.
WGBS, New York City, 316 (E. S. T., D. S.)—10 A. M. to 11; 1:30 P. M. to 3; 6 to 11:30.
WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)—11 A. M. to 12:45 P. M.; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (E. S. T.)—11 P. M. to 2:30; 5:20 to 7:30; 9 to 11:30.
WHAD, Milwaukee, Wis., 275 (C. S. T.)—11 A. M. to 11:30 ; 6 P. M. to 8.
WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M. to 5; 7:30 to 9.
WHN, New York City, 360 (E. S. T., D. S.)—12:30 P. M. to 1; 2:15 to 3:15; 4 to 5:30; 7:30 to 10:45; 11:30 to 12:30 A. M.
WHO, Des Moines, Iowa, 526 (C. S. T.)—12:15 P. M. to 1:30; 7:30 to 9; 11 to 12.
WIP, Philadelphia, Pa., 508.2 (E. S. T., D. S.)—7 A. M. to 8; 1 P. M. to 2; 3 to 4:50; 6 to 11.
WJY, New York City, 405 (E. S. T., D. S.)—7:30 P. M. to 11:30.
WJZ, New York City, 455 (E. S. T., D. S.)—10 A. M. to 11; 1 P. M. to 2; 4 to 6; 7 to 11.
WKRC, Cincinnati, O., 326 (E. S. T.)—8 P. M. to 12.
WLW, Cincinnati, O., 422.3 (E. S. T.)—10:45 A. M. to 1 P. M.; 1:30 to 2:30; 3 to 5; 6 to 11.
WNYC, New York City, 526 (E. S. T., D. S.)—3:45 P. M. to 5; 6:50 to 11.
WOAW, Omaha, Neb., 526 (C. S. T.)—12:30 P. M. to 1:30; 5:45 to 11.
WOC, Davenport, Iowa, 484 (C. S. T.)—12:57 P. M. to 2; 3 to 3:30; 5:45 to 10.
WOO, Philadelphia, Pa., 508.2 (E. S. T., D. S.)—11 A. M. to 1 P. M.; 4:40 to 5; 10:55 to 11:02.
WOR, Newark, N. J., 405 (E. S. T., D. S.)—6:45 A. M. to 7:45; 2:30 P. M. to 4; 6:15 to 7:30.
WPG, Atlantic City, N. J., 299.8 (E. S. T., D. S.)—7 P. M. to 11.
WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M. to 12 M.; 3 P. M. to 4; 7 to 8; 10 to 2 A. M.
WRC, Washington, D. C., 469 (E. S. T.)—4:30 P. M. to 5:30; 6:45 to 11.
KDKA, Pittsburgh, Pa., 309 (E. S. T.)—9:15 A. M. to 12 M.; 1:30 P. M. to 3:20; 5:30 to 10:45.
KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M. to 11.
KFKX, Hastings, Neb., 288.3 (C. S. T.)—12:30 P. M. to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFOA, Seattle, Wash., 455 (P. S. T.)—12:30 P. M. to 1:30; 4 to 5:15; 6 to 11.
KGO, Oakland, Cal., 361.2 (P. S. T.)—11:30 A. M. to 1 P. M.; 1:30 to 3; 4 to 6:45; 8 to 1 A. M.
KGW, Portland, Oregon, 491.5 (P. S. T.)—11:30 A. M. to 1:30 P. M.; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (P. S. T.)—7 A. M. to 7:15; 12 M. to 3:30 P. M.; 5:30 to 11.
KNX, Hollywood, Cal., 337 (P. S. T.)—9 A. M. to 10; 1 P. M. to 2; 4 to 5; 6:30 to 12.
KPO, San Francisco, Cal., 429 (P. S. T.)—7 A. M. to 7:45; 10 to 12 M.; 1 P. M. to 2; 3:30 to 11.
KSD, St. Louis, Mo., 545.1 (C. S. T.)—6 P. M. to 7.
KTHS, Hot Springs, Ark., 374.8 (C. S. T.)—12:30 P. M. to 1; 8:30 to 10:30.
KYW, Chicago, Ill., 536 (C. S. T., D. S.)—6:30 A. M. to 7:30; 10:30 to 1 P. M.; 2:15 to 4; 6:02 to 11:30.
CNRA, Moncton, New Brunswick, Canada, 313 (E. S. T.)—9:30 P. M. to 11.
CNRR, Regina, Saskatchewan, Canada, 8 P. M. to 10.

Wednesday

WAAM, Newark, N. J., 263 (E. S. T., D. S.)—11 A. M. to 12 M.; 7 P. M. to 11.
WAHG, Richmond, Hill, N. Y., 316 (E. S. T., D. S.)—12 M. to 1:05 P. M.; 8 to 12.
WAMD, Minneapolis, Minn., 243.8 (C. S. T.)—12 M. to 1 P. M.; 10 to 12.
WBBM, Chicago, Ill., 226 (C. S. T.)—8 P. M. to 10.
WBZ, Springfield, Mass., 333.1 (E. S. T., D. S.)—6 P. M. to 11.
WCAE, Pittsburgh, Pa., 461.3 (E. S. T., D. S.)—12:30 P. M. to 1:30; 4:30 to 5:30; 6:30 to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (C. S. T.)—9:30 A. M. to 12 M.; 1:30 to 4; 5:30 to 11.
WDAF, Kansas City, Kansas, 365.6 (C. S. T.)—3:30 P. M. to 7; 8 to 9:15; 11:45 to 1 A. M.
WEAF, New York City, 492 (E. S. T., D. S.)—6:45 A. M. to 7:45; 11 to 12 M.; 4 P. M. to 5; 6 to 12.
WEAO, Ohio State University, 293.9 (E. S. T.)—8 P. M. to 10.
WEEI, Boston, Mass., 476 (E. S. T., D. S.)—6:45 A. M. to 8; 3 P. M. to 4; 5:30 to 10.
WEMC, Berrien Springs, Mich., 286 (C. S. T.)—8:15 P. M. to 11.
WFAA, Dallas, Texas, 475.9 (C. S. T.)—10:30 A. M. to 11:30; 12:30 P. M. to 1.
WGBS, New York City, 316 (E. S. T., D. S.)—10 A. M. to 11 P. M.; 1:30 to 4; 6 to 7.
WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)—12 M. to 12:45 P. M.; 2:30 to 4:30; 6:30 to 11.
WGY, Schenectady, N. Y., 379.5 (C. S. T.)—5:30 P. M. to 7:30.
WHAD, Milwaukee, Wis., 275 (C. S. T.)—11 A. M. to 11:30; 4 P. M. to 5; 6 to 10; 11:30 to 12:30 A. M.
WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M. to 5; 7:30 to 9.
WHN, New York City, 360 (E. S. T., D. S.)—2:15 P. M. to 5:30; 7:30 to 11; 11:30 to 12:30 A. M.
WHO, Des Moines, Iowa, 526 (C. S. T.)—12:15 P. M. to 1:30; 6:30 to 12 M.
WIP, Philadelphia, Pa., 508 (E. S. T., D. S.)—7 A. M. to 8; 10:20 to 11; 1 P. M. to 2; 3 to 4; 6 to 8.
WJZ, New York City, 455 (E. S. T., D. S.)—10 A. M. to 11; 1 P. M. to 2; 4 to 6; 7 to 11:30.
WKRC, Cincinnati, Ohio, 326 (E. S. T.)—8 P. M. to 10.
WLW, Cincinnati, O., 422.3 (E. S. T.)—10:45 A. M. to 12:15 P. M.; 1:30 to 2:30; 3 to 5; 6 to 11.
WNYC, New York City, 526 (E. S. T., D. S.)—6:30 P. M. to 11.
WOC, Davenport, Iowa, 484 (C. S. T.)— 12:57 P. M. to 2; 3 to 3:30; 4 to 7:05; 9 to 11.
WOR, Newark, N. J., 405 (E. S. T., D. S.)—6:45 A. M. to 7:45; 2:30 P. M. to 4; 6:15 to 12 M.
WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M. to 12 M.; 3 P. M. to 4; 7 to 8; 10 to 2 A. M.
WRC, Washington, D. C., 469 (E. S. T.)—1 P. M. to 2; 4 to 6:30.
KDKA, Pittsburgh, Pa., 309 (E. S. T.)—6 A. M. to 7; 9:45 to 12:15 P. M.; 2:30 to 3:20; 5:30 to 11.
KFAE, State College of Wash., 348.6 (P. S. T.)—7:30 P. M. to 9.
KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M. to 11.
KFKX, Hastings, Neb., 288.3 (C. S. T.)—12:30 P. M. to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (C. S. T.)—12:15 P. M. to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (P. S. T.)—12:30 P. M. to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (P. S. T.)—11:30 A. M. to 1 P. M.; 1:30 to 2:30; 3 to 6:45.
KGW, Portland, Oregon, 491.5 (P. S. T.)—11:30 A. M. to 1:30 P. M.; 5 to 10.
KHJ, Los Angeles, Cal., 405.2 (P. S. T.)—7 A. M. to 7:15; 12 M. to 1:30 P. M.; 5:30 to 12.
KNX, Hollywood, Cal., 337 (P. S. T.)—1 P. M. to 2; 7 to 12.
KOB, State College of New Mexico, 348.6 (M. S. T.)—11:55 A. M. to 12:30 P. M.; 7:30 to 8:30; 9:55 to 10:10.
KPO, San Francisco, Cal., 429 (P. S. T.)—7 A. M. to 8; 10:30 to 12 M.; 1 P. M. to 2; 4:30 to 11.
KSD, St. Louis, Mo., 545.1 (C. S. T.)—7 P. M. to 10.
KTHS, Hot Springs, Ark., 374.8 (C. S. T.)—8:30 P. M. to 10.
KYW, Chicago, Ill., 536 (C. S. T., D. S.)—6:30 A. M. to 7:30; 10:55 to 1 P. M.; 2:15 to 4; 6:02 to 11:30.
PWX, Havana, Cuba, 400 (E. S. T.)—8:30 P. M. to 11:30.
CNRO, Ottawa, Ontario, Canada, 435 (E. S. T.)—7 P. M. to 11.

Thursday

WAAM, Newark, N. J., 263 (E. S. T., D. S.)—11 A. M. to 12 M.; 7 P. M. to 11.
WAHG, Richmond Hill, N. Y., 316 (E. S. T.)—12 P. M. to 1:05.
WAMB, Minneapolis, Minn., 243.8 (C. S. T.)—12 M. to 1 P. M.; 10 to 12 M.
WBBM, Chicago, Ill., 226 (C. S. T.)—8 P. M. to 10.
WBZ, Springfield, Mass., 333.1 (E. S. T., D. S.)—6 P. M. to 1145.
WCAE, Pittsburgh, Pa., 461.3 (C. S. T., D. S.)—12:30 P. M. to 1:30; 4:30 to 5:30; 6:30 to 11.
WCBD, Zion, Ill., 344.6 (C. S. T.)—8 P. M. to 10.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (C. S. T.)—9:30 A. M. to 12 M.; 1:30 P. M. to 4; 5:30 to 10.
WEAF, New York City, 492 (E. S. T., D. S.)—6:45 A. M. to 7:45; 11 to 12 M.; 4 P. M. to 5; 6 to 12.
WEEI, Boston, Mass., 476 (E. S. T., D. S.)—6:45 A. M. to 7:45; 1 P. M. to 2; 2:30 to 10.
WFAA, Dallas, Texas, 475.9 (C. S. T.)—10:30 A. M. to 11:30; 12:30 P. M. to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30; 11 to 1 A. M.
WGBS, New York City, 316 (E. S. T., D. S.)—10 A. M. to 11; 1:30 P. M. to 4; 6 to 7:30.
WGR, Buffalo, N. Y., 319 (E. S. T., D. S.)—12M. to 12:45 P. M.; 2 to 4; 7:30 to 11.
WHAD, Milwaukee, Wis., 275 (C. S. T.)—11 A. M. to 11:30; 6 P. M. to 7:15; 8:30 to 11.
WHAS, Louisville, Ky., 399.8 (C. S. T.)—4 P. M. to 5; 7:30 to 9.
WHN, New York City, 360 (E. S. T., D. S.)—2:15 P. M. to 5; 7:30 to 11; 11:30 to 12:30 A. M.
WHO, Des Moines, Iowa, 526 (C. S. T.)—7:30 P. M. to 9; 11 to 12 M.
WJY, New York City, 405 (E. S. T., D. S.)—7:30 P. M. to 11:30.
WJZ, New York City, 455 (E. S. T., D. S.)—10 A. M. to 11 P. M.; 1 to 2; 4 to 6; 7 to 12 M.
WLW, Cincinnati, O., 422.3 (E. S. T.)—10:40 A. M. to 12:15 P. M.; 1:30 to 5; 6 to 8; 10 to 11.
WMAK, Lockport, N. Y., 265.5 (E. S. T.)—11 P. M. to 1 A. M.
WYNC, New York City, 526 (E. S. T., D. S.)—3:15 P. M. to 4:15; 6:50 to 11.
WOAW, Omaha, Neb., 526 (C. S. T.)—12:30 P. M. to 1:30; 5:45 to 11.
WOC, Davenport, Iowa, 484 (C. S. T.)—12:57 A. M. to 2 P. M.; 3 to 3:30; 4 to 7:10; 8 to 9.
WOR, Newark, N. J., 405 (E. S. T., D. S.)—6:45 A. M. to 7:45; 2:30 P. M. to 4; 6:15 to 7.
WPG, Atlantic City, N. J., 299.8 (E. S. T., D. S.)—7 P. M. to 11.
WQJ, Chicago, Ill., 448 (C. S. T.)—11 A. M. to 12 M.; 3 P. M. to 4; 7 to 8; 10 to 2 A. M.
WRC, Washington, D. C., 469 (E. S. T.)—1 P. M. to 2; 4 to 6:30.
KDKA, Pittsburgh, Pa., 309 (E. S. T.)—9:45 A. M. to 12:15 P. M.; 2:30 to 3:20; 5:30 to 10.
KFAE, State College of Washington, 348.6 (P. S. T.)—7:30 P. M. to 9.
KFI, Los Angeles, Cal., 467 (P. S. T.)—5 P. M. to 11.
KFKX, Hastings, Neb., 288.3 (C. S. T.)—12:30 P. M. to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (C. S. T.)—12:15 to 1:15 P. M.; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (P. S. T.)—12:30 P. M. to 1:30; 4 to 5:15; 6 to 7.
KGO, Oakland, Cal., 361.2 (P. S. T.)—11:30 A. M. to 1 P. M.; 1:30 to 3; 4 to 6:45; 7:15 to 10.
KGW, Portland, Oregon, 491.5 (P. S. T.)—11:30 A. M. to 1:30 P. M.; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (P. S. T.)—7 A. M. to 7:15; 12 M. to 3:20; 5:30 to 11:30.
KNX, Hollywood, Cal., 337 (P. S. T.)—11 A. M. to 12:05 P. M.; 4 to 5; 6 to 12.
KPO, San Francisco, Cal., 429 (P. S. T.)—7 A. M. to 8; 10:30 to 12M.; 1 P. M. to 2; 3:30 to 11.
KSD, St. Louis, Mo., 595.1 (C. S. T.)—7:30 P. M. to 9.
KTHS, Hot Sprnigs, Ark., 374.8 (C. S. T.)—8:30 P. M. to 10.
KYW, Chicago, Ill., 536 (C. S. T., D. S.)—6:30 A. M. to 7:30; 10:55 to 1 P. M.; 2:25 to 2:30; 6:02 to 11.
CNRC, Calgary, Canada, 430 (M. S. T.)—7 P. M. to 10.
CNRM, Montreal, Canada, 411 (E. S. T.)—8:30 P. M. to 10:30.
CNRW, Winnipeg, Canada, 384.4 (C. S. T.)—8 P. M. to 10.

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A SURVEY OF 1-TUBE DX SETS, by Lieut. Peter V. O'Rourke. Seven circuit diagrams. Great material for DX fans. Send 15c for April 11 issue. RADIO WORLD, 1493 Broadway, New York City.

A 3-TUBE REFLEX FOR THE NOVICE, by Feodor Rofpatkin. Schematic and picture diagrams, panel and assembly. Send 15c for March 28 issue of RADIO WORLD.

THE BLUEBIRD REFLEX 2-tube earphone marvel by Capt. Peter V. O'Rourke. Send 15c for February 7 issue. RADIO WORLD, 1493 Broadway, New York City.

A THOUGHT FOR THE WEEK

RADIO has its troubles and its growing pains, but in the final analysis the assets so far exceed the liabilities that life has been made larger and better because of it.

RADIO WORLD

Title Reg. U. S. Pat. Off.

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

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(Dated Saturday of same week)
FROM PUBLICATION OFFICE
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EDITOR, Roland Burke Hennessy
MANAGING EDITOR, Herman Bernard

SUBSCRIPTION RATES

Fifteen cents a copy. $6.00 a year. $3.00 for six months. $1.50 for three months. Add $1.00 a year extra for foreign postage. Canada, 50 cents.

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.

ADVERTISING RATES

General Advertising

1 Page, 7¼"x11"	462 lines	$300.00
½ Page, 7¼"x5½"	221 lines	150.00
¼ Page, 4½" D. C.	115 lines	75.00
1 Column, 2¼"x11"	154 lines	100.00
1 Inch		10.00
Per agate line		.75

Times Discounts

52 consecutive issues	20%
26 times consecutively or E. O. W. one year	15%
4 consecutive issues	10%

WEEKLY, dated each Saturday, published Wednesday. Advertising forms close Tuesday, eleven days in advance of date of issue.

CLASSIFIED ADVERTISEMENTS

Ten cents per word. Minimum, 10 words. Cash with order. Business Opportunities, 50 cents a line; minimum, $1.00.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

MAY 23, 1925

The Human Element

THE BLUEBIRD REFLEX 2-tube earphone marvel by Capt. Peter V. O'Rourke. Send 15c for February 7 issue. RADIO WORLD, 1493 Broadway, New York City.

A $5 HOME-MADE LOUDSPEAKER, by Herbert E. Hayden, in Feb. 7 and March 4 issues. Send 30c for both copies. RADIO WORLD, 1493 Broadway.

Bonawitz 187, Roxy 144; Fourteen of Popularity Contestants Listed

THEY'RE OFF! It isn't the end of the race, only the start, so too much value should not be placed on the present standing of the competitors. However, RADIO WORLD'S 1925 test to determine whom its readers consider the most popular radio entertainer sized up as follows when this edition went to press:

Karl Bonawitz, WIP, Philadelphia	**187**
Roxy, WEAF, New York	**144**
Ben Bernie and Orch., WEAF	**139**
The Happiness Boys, WEAF	**86**
Leo Reisman Orch., WBZ, Springfield, Mass	**36**
Alvin E. Hauser, WFBH, New York	**35**
Harmony Girls, WLS, Chicago	**35**
Olcott Vail, WHN, New York	**34**
Jack Little, Salem, Ill	**33**
Nils T. Granlund, WHN	**24**
Hotel Commodore Orch., WJZ, New York	**19**
Walter Peterson, WLS	**18**
Gold Dust Twins, WCAE, Washington, D. C	**18**
Ford and Glenn, WLS	**17**
Others scattering	

This is the first compiled list that has been published. Each week showed somebody leading who wasn't leading the week before. Therefore while there is much encouragement in being first now, it is entirely too early to dream about wearing that gold medal. It is beginning to look as if a drive is to be made for a pair of contestants having 35 votes now and hailing from a Chicago station. There may be something sentimental or romantic in that.

The contest will terminate with July, therefore there's lots of time for many things to happen. But the early voting is stimulating, not only as to interest but it is conclusively proven that occupation of some place on the list causes votes to be cast that otherwise would not have come in.

Be sure to read next week's announcement.

RADIO WORLD'S POPULARITY TEST

To Determine the Gold Medal Radio Entertainer for 1925

Popularity Editor, RADIO WORLD,
1493 Broadway, New York City.

I hereby cast one ballot for:

(Name of Entertainer).....

(Entertainer's Station) .....

(Voter Sign Full Name Here).....

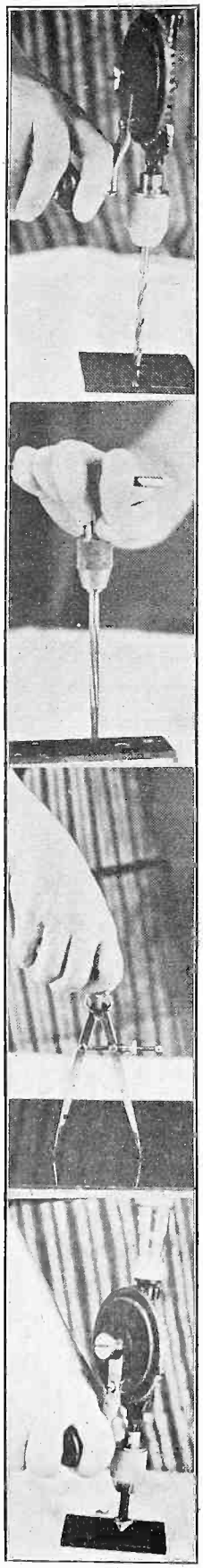
(Street and Number).....

(City)..... **(State)**.....

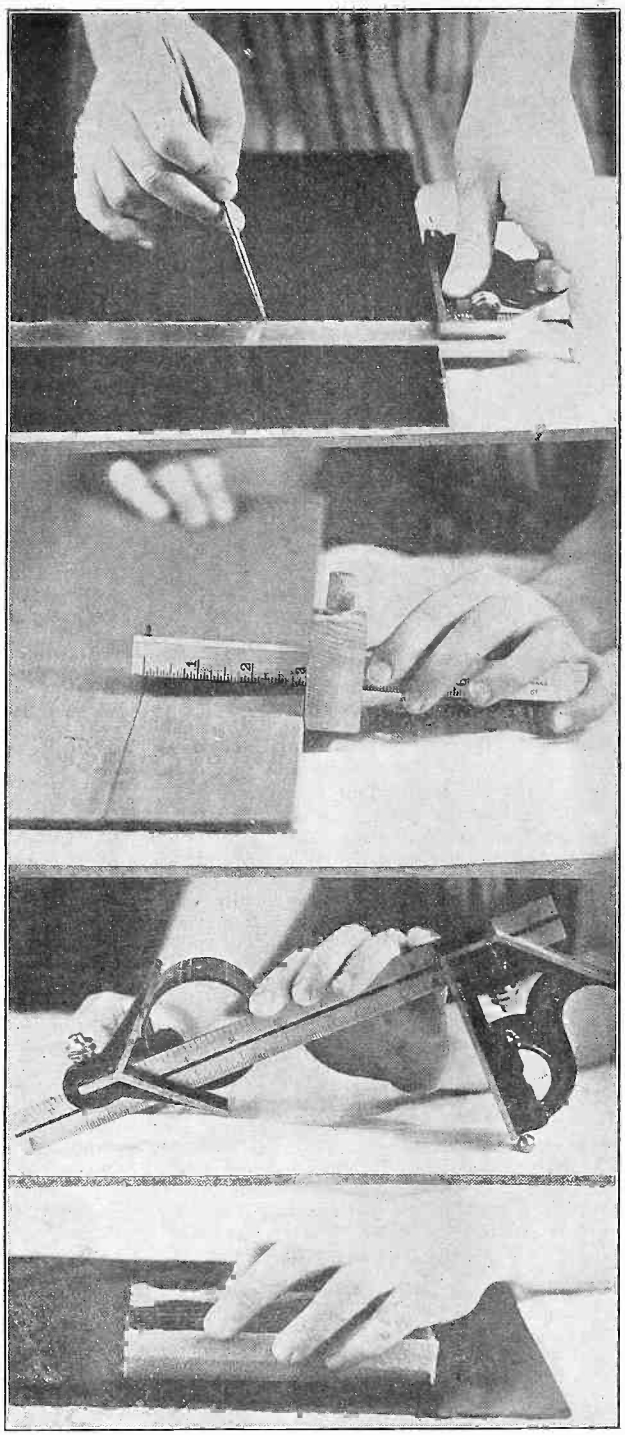
FILL OUT THIS COUPON AND MAIL NOW!

No. 6-5-23

Precise Tools Insure Neatness



FIGS. 1, 2, 3 and 4, top to bottom, showing tools in use.



FIGS. 5, 6, 7 and 8, top to bottom. (Hayden Studios).

BAKELITE is drilled with a hand-drill and twist drills. The little spool the drill point fits into is known as a chuck. This grips the drill point firmly. The average chuck on hand drills holds a drill ¼" in diameter as the largest size and a No. 60 (about the size of a pin) as the smallest. See Fig. 1. A tapered reamer helps make shafts fit when the hole in the panel has not been drilled large enough (Fig. 2). The device holding the reamer is known as a "tap holder." A steel divider will make things line up in an exact manner, as it can be adjusted with the little thumb screw to an infinite degree. It is also used to make circle. (Fig 3) A countersink makes a flat head screw fit flush with the panel after the hole has been drilled. It cuts a little cone shaped hole just large enough for the screwhead. Fig. 4 shows an adjustable try-square. This enables the user to mark off perfectly straight lines. The tool in Fig. 6 is known as an adjustable scratch gauge. When the round objects are placed in the jaws of our automatic center-

(*Concluded on page 27*)

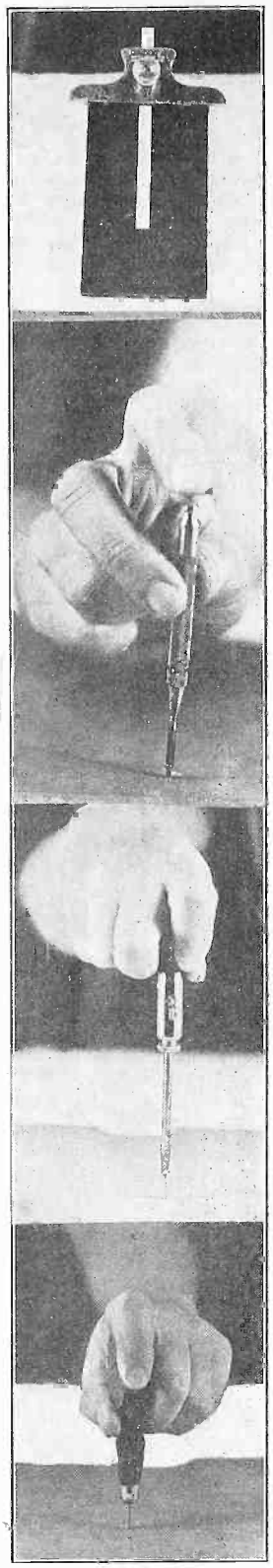


FIG. 9 (top). This is a little depth gauge. It tells you how far back the panel will set and a thousand other things. Fig. 10 discloses how, when using small wood screws, a jeweler's screw driver is handy. See how easy and neat the job is. Don't use a big driver for this, as shown in Fig. 11. At bottom, Fig. 12, is a Brad awl. It keeps the wood from splitting when wood screws are used. It is a very sharp and thin needle with a firm handle, and will make a neat bale in the hardest wood.

Woman Expert of Standards Bureau Explains Her Work

By Thomas Stevenson

SINCE women began to vote, they have pretty nearly filled every position previously considered to be the heritage of men. There are women scientists, physicians, lawyers, politicians, street car conductors, and possibly some day presidents.

Clearing the air of static, inventing new types of apparatus and unraveling the many mysteries connected with radio phenomena, however, are generally considered to be the work only of old, studious men who have spent most of their lives in laboratories. Certainly, the role does not seem to fit a young, good looking woman.

Yet, one of the experts on the staff of the Bureau of Standards Radio Laboratory is Grace Hazen who, while she refuses to reveal her age, cannot be over 25 years. Miss Hazen, who holds the title of Assistant Physicist, is one of the very few women who can claim to be radio engineers.

Comes to Scientific Family

Miss Hazen has been at the Bureau of Standards for more than four years. Her particular task is the "fundamental standardization of frequency meters." Born just 18 miles from the "Thousand Islands" in upper New York, Miss Hazen received her degree at St. Lawrence University.

"My father was a meteorologist," says she, "and he taught me to love scientific work. I have always been interested in radio and when I was graduated from college I came to Washington with the Bureau of Standards."

Miss Hazen makes her own sets, although she is more interested in their construction than in tuning in programs.

"I enjoy the programs most of all when I am on vacation," says she. "I have built myself a small portable with which I can pick up plenty of amusement."

Broadcast Talk is Easy

Miss Hazen was recently requested to deliver an address through a local station on her work in the radio field. She declared later that it was "lots easier than facing a huge audience."

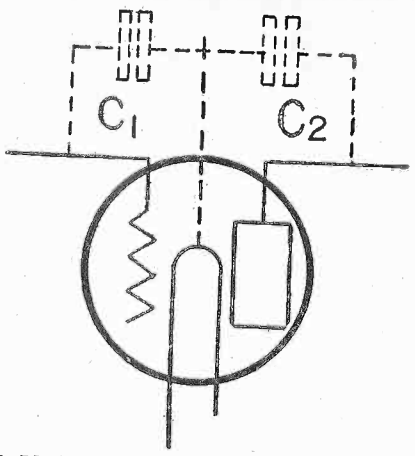
"If the fans didn't want to listen to me they could tune me out or merely take off the headphones while I was talking. If the audience had been present they could only sit and be uncomfortable if they didn't like my talk."

The meter upon which Miss Hazen is working is of particular value in enabling stations to maintain constant frequencies and thus eliminate a lot of interference which would otherwise result in the present crowded condition of the air.

What the Problem Is

"It has been the work of the Radio Laboratory," says Miss Hazen, "to determine what the meter or the kilocycle is in terms of fundamental standards in order to have a standard of radio frequency. The meter is a unit of length, a little longer than a yard, used to indicate the actual length of the wave produced in space. The kilocycle on the other hand is a measure of the number of thousands of waves transmitted per second. Thus it is a measure of impulses per second, or frequency.

"The velocity of a radio wave which is a constant for all wavelengths divided by the length in meters of any particular wave gives the frequency in kilocycles per second and conversely the velocity divided by the number of kilocycles per second gives the wavelength.



A DIAGRAM shownig in symbols how capacity exists between the grid and plate elements of a vacuum tube. This is the capacity that has to be neutralized in a Neutrodyne receiver.

The Invisibility Factor

"While the Bureau of Standards puts such effort into the maintenance of standards, if you should ask to see the standard meter or kilocycle you would be told that it is invisible. However, any radio signal may be used as a standard if it can be compared by some process with a standard of length or time. For such a comparison an instrument called a frequency meter or wave meter can be used, providing it has been standardized in terms of a fundamental unit.

"Such an instrument is somewhat similar to a crystal receiving set since it usually consists of a variable condenser, a coil of wire, a crystal detector and an indicating instrument. The variable condenser is divided in scale divisions which after standardization may be read in terms of frequency or wavelength. Thus the frequency meter, or as it is more commonly called, the wavemeter, represents the invisible meter or kilocycle.

"The meter is not, as some think, a measure of the distance a transmitting station can be heard. In fact it has been found that under certain conditions stations employing shorter wavelengths than those generally used by broadcasting stat-ions can be received at greater distances.

How the Meter is Used

"To illustrate how the meter is used in measuring the wavelength, picture the waves produced when a pebble is dropped in a pool of quiet water. There will be a whole train of little waves radiating from the center all having the same wavelength but of diminishing height or more correctly amplitude. The length of a single wave can be measured from the crest of one wave to the crest of the next. We then speak of the wavelength of the whole train of waves as that of the wave measured.

"Since all radio waves travel at the same speed, we can see that during a second there will be a great many more short waves pass a given point than long waves. For example, if a wave has a length of 300 meters, 1,000,000 will pass in one second. Now if the wave has a length of 3,000 meters, or ten times as great, only one-tenth as many will pass in one second.

Prefers Kilocycle Standard

"It is better to think of the kilocycle as the basic measure of radio phenomena rather than the meter. The kilocycle means simply 1,000 cycles. The number of cycles, or frequency, does not change the length of the wave is altered by it. The electrical engineer always speaks in terms of cycles to express the alternations of current in his circuits. We are more or less accustomed to see 60 cycles or 25 cycles marked on electric fans or other household appliances. A radio wave is produced by an alternating electric current identical with the 60-cycle electric current which we have in our house except that it is of a very much higher frequency. Radio frequencies are approximately 12,000 to 30,000,000 cycles per second, that is, from 12 to 30,000 kilocycles. The broadcasting stations use a range of frequencies from approximately 500 to 1500 kilocycles.

An Example of Sound

"To one not used to electrical terms the sound wave produced from a violin string or from a tuning fork gives a better illustration of wave phenomena. The pitch of the sound produced is determined by the number of waves per second. For example, middle C has a frequency of 512. The string of the violin or tuning fork vibrates in the air setting up waves in much the same way as the vibrations of the electric current sets up radio waves in space. Waves from about 20 to 20,000 cycles are audible.

"Although the radio laboratory of the Bureau of Standards has done most of its standardization from a low or audio-frequency basis, it has worked with the extremely high frequencies using the actual measure of the wavelength for standardization thus referring the wavelength to the fundamental standard of length. The system used at the Bureau of Standards consists in setting up standing waves on a pair of parallel wires, just as a broadcasting station sets up radio waves in your antenna by the use of a radio-frequency generating set.

How Measurement is Made

"The effect is the same as one sees when a rope which is fastened at one end is shaken so that a permanent wave is set up along its length. The actual length of the radio wave standing on the parallel wires can be measured by moving a sensitive current indicating instrument along the wires. At each crest or trough of these stationary waves a deflection of the instrument will occur. The distance between two deflections in a half wave length and is measured with a steel tape. To determine the true wavelength in air a slight correction factor has to be applied because the length of a radio wave is to a very small degree changed by the medium in which it travels| The change of this method is extended for use in wavemeter standardization by using harmonics from a second radio-frequency generating set."

(Copyright, 1925, by Stevenson Radio Syndicate)

THE RADIO TRADE

FRESHMAN OPENS FACTORY OFFICE AND WAREHOUSE IN CHICAGO

THE Charles Freshman Company, Inc., of New York, manufacturers of the Masterpiece line of radio receiving sets, has opened a direct factory office and warehouse at 327 South La Salle Street, Chicago. The new office will operate under the supervision of S. Freshman, vice-president of the company.

All sales in Central and Far-Western states will be handled from Chicago in the future. The trade in that territory will materially benefit by the fact that shipment of all sets will be made from the Chicago warehouse. A stock sufficiently large to meet any emergency will be carried at all times.

FORD RADIO TO MARKET BATTERY ELIMINATOR

THE Ford Radio & Mica Corp., of New York City, are adding a battery eliminator to their line of Super Tran & F.M.C. audio-frequency transformers, for the coming radio season.

The Ford Company have sold their factory building at 14 Christopher Street and soon will make an announcement to the trade of their new location. The office is still located at 33 East 8th Street.

ULTRA-VERNIER
TUNING CONTROL
A VERNIER DIAL ON WHICH YOU CAN PENCIL RECORD THE STATIONS. GEARED 20 TO 1. SILVER FINISH $2.50 - GOLD FINISH $3.50
PHENIX RADIO CORP., 116-F East 25 St., N.Y.C.

EXCLUSIVE TERRITORY
is now being allotted on a new line of
BROADCAST RECEIVERS
Popular priced—liberal discounts and exclusive territorial arrangement.
DEALERS, ARRANGE NOW FOR TERRITORY and be prepared when the rush comes.
GENERAL DISTRIBUTING COMPANY
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THE GENUINE LOUDSPEAKER
$1.50 Vacuum Tubes $1.50
C. O. D., JUST PAY POSTMAN
MONEY BACK GUARANTEE
JAMES H. KONKLE
192 Market Street Newark, N. J.

The Five Tube Set which startled the World!
FRESHMAN MASTERPIECE
The Greatest Value Ever Offered in A Radio Receiving Set
At all dealers!

Coming Events

[Readers are requested to send in dates and places of future events not scheduled in this department.]

AUG. 22 to 28—3d Annual Pacific Radio Exposition, Civic Auditorium, San Francisco. Write P. R. E., 905 Mission St., San Francisco.

SEPT. 6 to 12—National Radio Exposition, Grand Central Palace, N. Y. C. Write American Radio Exp. Co., 522 Fifth Ave., N. Y. C.

SEPT. 14 to 19—Second Radio World's Fair, 258th Field Artillery Armory, Kingsbridge Road and Jerome Ave., N. Y. C. Write Radio World's Fair, Times Bldg., N. Y. C.

SEPT. 14 to 19—Pittsburgh Radio Show, Motor Square Garden. Write J. A. Simpson, 420 Bessemer Bldg., Pittsburgh, Pa.

SEPT. 23 to OCT. 4—International Wireless Exp., Geneva, Switzerland.

SEPT. 28 to OCT. 3—National Radio Exposition, American Exp. Palace, Chicago. Write N. R. E., 440 S. Dearborn St., Chicago, Ill.

OCT. 5 to 11—Second Annual Radio Show, Convention Hall, Washington, D. C. Write Radio Merchants Association, 233 Woodward Bldg.

OCT. 17 to 24—Brooklyn Radio Show, 23d Regt. Armory. Write Jos. O'Malley, 1157 Atlantic Ave., Brooklyn, N. Y.

OCT. 12 to 17—St. Louis Radio Show, Coliseum. Write Thos. P. Convey, manager, 737 Frisco Bldg., St. Louis, Mo.

OCT. 19 to 25—Second Annual Cincinnati Radio Exp., Music Hall. Write G. B. Bodenhoff, care Cincinnati Enquirer.

NOV. 19 to 25—Milwaukee Radio Exp., Civic Auditorium. Write Sidney Neu, of J. Andrae & Sons, Milwaukee, Wis.

NOV. 17 to 22—4th Annual Chicago Radio Exp., Coliseum. Write Herrmann & Kerr, Cort Theatre Bldg., Chicago, Ill.

DEC. 1 to 6—Boston Radio Show, Mechanics' Hall. Write to B. R. S., 209 Massachusetts Ave., Boston, Mass.

New Corporations

Lee De Forest, New York, N. Y., radio, 2,500 common, no par; H. Bogdish, E. F. Meisler, S. D. Grosly. (Attys., Fisher & Deimet, 331 Madison Ave., N. Y. C.)

Magneto Corp., New York, N. Y., electrical engineers, 1,500 shares, $100 each; 500 common, no par; H. Krinsky, F. Balleta. ((Atty., W. A. Ulman, 25 West 43rd St., N. Y. C.)

Radio Development Corp., Wilmington, Del., patents, $3,000,000. (Colonial Charter Co.)

Rojas Electric Co., New York, N. Y., general electrical works, $5,000; F. A. Rojas, D. Berdon, E. L. Reade. (Atty., G. Hoerner, 220 West 42nd St., N. Y. C.)

Briscoe Radio Service Corp., New York, N. Y., 1,000 common, no par; M. Hoffman, S. Green, M. Rosenthal. (Atty., M. A. Vogel, 1431 Broadway, N. Y. C.)

Electric Power Radio Corp., New York, N. Y., 500 common, no par; B. F. Crowley, E. H. Womack, R. H. Taylor. (Attys., Roosevelt & O'Connor, 120 Broadway, N. Y. C.)

Thomas F. J. Howlett, Philadelphia, Pa., radio broadcasting stations; $100,000. (Corporation Guarantee & Trust Co., Delaware.)

Business Opportunities Radio and Electrical

Rates: 50c a line; Minimum, 2 lines.

RADIO—EVERY FAN A PROSPECT; $5 article easily made; patent rights on royalty or partnership basis. Box 25, Radio World.

HAVE NEW YORK OFFICE, factory space and ample capital to finance legitimate business. Box 35, Radio World.

RADIO MANUFACTURER HAS COMPLETED and in production with a real set at attractive price; $5,000 needed to market same, with services of inside man. Box 45, Radio World.

RADIO STORE IN 5TH AVE. shopping district, near Grand Central; beautiful furnishings; successful business past year; sell with or without stock. For full information write Box L. R. S., Room 308, 38 Park Row.

MACHINE SHOP open for additional work, dies, metal stamping and assembling; our equipment consists of tool room, power press department, nickel plating and japaning room. Novo Tool Corporation, 758 Whitlock Ave., New York.

Subscribers desiring to change their addresses should send in such changes at least two weeks in advance, because Radio World's subscription list is so large that this length of time is required for changes.

Subscription Manager, Radio World, 1493 Broadway, New York City.

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,
1493 Broadway, New York City.

I desire to receive radio literature.

Name .....

City or town.....

State .....

Are you a dealer?.....
If not who is your dealer?

His Name .....

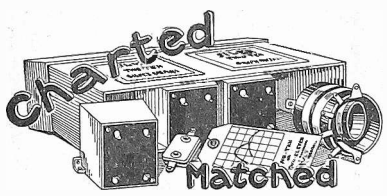
His Address .....

A. Kertes, 5307 Ave. M., Brooklyn, N. Y.
H. Knox, 57 Aspen Grove, Liverpool, Eng.
Franklin Center, R. R. No. 1, Quebec, Canada.
Edward Tanney, 1236 W. Delaware Ave., Toledo, O.
George Chandler, 65 Brown St., Portland, Me.
Ray Hull, 772½ Fulton St., San Francisco, Cal.
Smith Brenner, Fruitdale, O.
S. W. Williams, Huntsville, Ala.
Robert H. Layman, 702 W. 6th St., Bloomington, Ind.
Frank Bittner, 81 Irving Place, New York, N. Y.
John W. Watson, 6042 Brush St., Detroit, Mich.
D. McAvoy, 31 Grand Ave., Rochester, N. Y.
R. Liphant, Winslow, Ill.
Geo. F. Randolf, Denver, Col.
K. L. Beane, 127 Washington St., Hartford, Conn.
Otto Bamp, Joplin, Mo.
King's Radio Shop, 1639 Anaheim St., Long Beach, Cal.

RESISTANCE PAMPHLET

"RESISTANCE COUPLED AMPLIFIERS" is the title of a new 20-page booklet, written by A. B. Cole, one of the pioneers of radio.

A complete description is given of the methods of using resistance amplification instead of transformers with different kinds of sets, such as Neutrodyne, reflex, tuned RF and regenerative. Several full-page wiring diagrams are published. This booklet (10 cents) is published by the Cole Radio Mfg. Corp., Bloomfield, N. J.



Bring Your Super Up To Date
—with a set of Silver-Marshall Two-Ten (Inter-stage) and Two-Eleven (Filter) Transformers and a Silver Oscillator Coupler. Regardless of your super's previous efficiency, you can increase its amplification and general efficiency 1¾ to 2¾ times with this remarkable equipment! Each transformer is supplied with its characteristic curve on a tag. Set of matched and charted transformers and oscillator—Price $26.50
Plans for the "Silver-Super"
are now available. This is the set described in last week's "Radio World." Designed by McMurdo Silver, Assoc. I.R.E. Complete working blueprints, baseboard layout, wiring plans, etc..... 50c
Silver-Marshall, Inc.
112 S. WABASH AVENUE, CHICAGO

COMPLETE LIST OF STATIONS

Brought up to date and published in RADIO WORLD dated May 2. All American, Canadian, Mexican and Cuban stations in this issue. 15c copy, or start your subscription with any number. RADIO WORLD, 1493 Broadway, New York City.

Wright's 3-Tube Reflex Set

(*Concluded from page 9*)

other spring of the second jack goes to the P post of the third socket.

5. Connect the A plus with the B minus.

How to Tune the Set

The tuning of this set is comparatively simple, being somewhat similar to that of the Neutrodyne. The first two controls tune rather sharply, the third being slightly broader. You may be able to hear signals even though the set is incorrectly tuned, but all three circuits must be tuned to absolute resonance if maximum volume is to be obtained. It may take you a week to learn to tune the set properly. Then all you have to do is turn the dials and "listen to them roll in." The quality of reproduction is exceedingly good, due to the use of a crystal detector.

Stations within an 800 mile radius come in quite well on the loudspeaker using only the first two tubes. Station KFKX, a distance of 1,200 miles, has been brought in several times on the speaker using only the first two tubes. When you consider that only one audio transformer was being used in conjunction with tubes of the 199 type, you will admit that this was rather remarkable. The volume obtained by the use of all three tubes was very great.

It is not recommended that the novice attempt to construct this set, although the fan who has had some slight experience in building circuits should have no trouble.

Trouble Shooting

If, after turning on the tubes, a loud hum is heard it indicates that the crystal detector is out of adjustment. If a continuous high pitched whistle is heard, try reversing the primary connections to the first audio transformer. If a loud whistle is heard when tuning in stations, either of the first two tubes may be oscillating. Turn the potentiometer arm until the entire resistance is included in the circuit. If, when the potentiometer is turned, the pitch of the whistle does not change, it is the first tube which is oscillating. This may be eliminated by removing three or four turns from L3. If the pitch does change it is the second tube which is oscillating. This may sometimes be eliminated by changing the adjustment of the crystal detector. If this is ineffective several turns must be removed from L5. Of course the set may be stabilized by connecting the free end of the potentiometer to the positive A post, thus giving a slight positive bias to the grid of the second tube, but if this is done the volume will be reduced. If the volume on out-of-town stations is poor you probably have a defective crystal.

$3.25 COD

RADIO
Storage "B" Battery
12 Cells 24 Volts
Lasts Indefinitely—Pays for Itself

Economy and performance unheard of before. Recharged at a negligible cost. Approved and listed as Standard by leading Radio Authorities, including Pop. Radio Laboratories, Pop. Sci. Inst. Standards, Radio News Lab., Lefax, Inc., and other important institutions. Equipped with *Solid Rubber Case*, an insurance against acid and leakage. Extra heavy glass jars. Heavy, rugged plates. Order yours **today!**

SEND NO MONEY Just state number of batteries wanted and we will ship day order is received. **Extra Offer:** 4 batteries in series (96 volts), $12.75. Pay expressman after examining batteries. 5 per cent discount for cash with order. Mail your order **now!**

WORLD BATTERY COMPANY
1219 So. Wabash Ave., Dept. 82, Chicago, Ill.
Makers of the Famous World Radio "A" Storage Battery
Prices: 6-volt, 100 Amp. $12.25; 120 Amp. $14.25; 140 Amp. $15.00. All equipped with Solid Rubber Case.

World STORAGE BATTERIES FOR RADIO

KDKA ≠ WEAF ≠ WGN ≠ WJS ≠ KHJ ≠ KGO ≠ KFAF ≠ WJY ≠ KOP

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RESISTANCE COUPLED
AMPLIFIER KIT

The wave of public opinion in favor of Resistance Coupled Amplification is firmly established. The

DAVEN RESISTANCE COUPLED AMPLIFIER KIT

is the most ideal for the Home Set Builder to use.

Supplied in 3 or 4 stage Kits without Sockets and Condensers.

Buy of your dealer, the "RESISTOR MANUAL." It's full of information on Resistance Coupling.

Price 25c.

DAVEN RADIO CORP.
"Resistor Specialists"
Newark New Jersey

THE BLUEBIRD REFLEX 2-tube earphone marvel by Capt. Peter V. O'Rourke. Send 15c for February 7 issue. RADIO WORLD, 1493 Broadway, New York City.

GIBSON SEARS RADIO
Reg. Trade Mark

Sterling Five
Highest quality five tube tuned radio frequency set in solid mahogany cabinet. List Price,
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RADIO CATALOG FREE
Describes fully the complete line of radio frequency sets, regenerative sets (licensed under Armstrong U. S. Patent No. 1,113,149) and parts.
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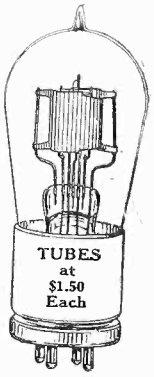

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Guaranteed equal to new. Send us your tubes by parcel post. We return them parcel post, C.O.D., and try to maintain 24-hour service.

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HARVARD RADIO LABORATORIES

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This latest and greatest Radio Atlas has four big maps, a list of all the Radio Stations in the United States, Canada, and the entire world, alphabetically arranged by states and cities, latest wavelengths, kilocycles, and names of operators. Liberal space for your private log. Post paid on receipt of 50c, or one sent free with new yearly subscription for Radio World ($6.00 for 52 issues), but with no other premium.

THE COLUMBIA PRINT
1493 Broadway New York City

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RADIO WORLD'S
Fourth Annual Vacation Number
Dated June 6, 1925
LAST COLOR FORM CLOSES MAY 25 LAST BLACK FORM CLOSES MAY 26
REGULAR ADVERTISING RATES IN FORCE
Address Advertising Manager, RADIO WORLD, 1493 Broadway, New York City

GLORIA ON THE AIR

GLORIA SWANSON, movie star, with her husband, the Marquis James Henry de la Falaise et de la Coudrey, at the microphone of WGN, Chicago. She answered questions by the radio fans, many of them relating to her movie life. (Underwood & Underwood)

JOIN THE A. B. C.

A. B. C. stands for the American Broadcast Club. Join it today. It involves no dues or payment of any kind, and no obligations. It was founded by RADIO WORLD simply to unite the broadcast listeners and radio fans in general in a common bond to promote their welfare as occasion requires. Send your name and address to A. B. C. Editor, RADIO WORLD, 1493 Broadway, New York City.

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Clement Pack, 131 Broad St., Menasha, Wis.
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A. B. C. Editor, RADIO WORLD,
1493 Broadway, New York City.

Please enroll me as a member of the American Broadcast Club.

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Write Today For Descriptive Folder of

THE HOWARD 5-TUBE NEUTRODYNE

This Remarkable Set Has Created a Sensation Among Radio Enthusiasts.

Beautiful Walnut Cabinet with Special Howard Neutroformers, Tube Sockets and Rheostats.

Licensed by Independent Radio Manufacturers, Inc. NEUTRODYNE Pat. March 27, 1923 and April 1, 1924 Satcliffe Pats. Nos. 1,450,080 and 1,489,270 Other Patents Pending Reg. U.S. Pat. Off.

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"Hear As You Have Never Heard Before"

Power Line Interferences Absolutely Eliminated, Making Broadcast Reception a Pleasure and Not a Pain

The Kane Antennae absolutely eliminates all power line interferences, eliminates over 50 per cent of static and squeals from reradiating sets. No special poles required. Will hang in the same place as your present antenna. Can be erected in thirty minutes.

You know that leaky power lines cause more interference with broadcast reception than all other sources of interference.

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Here are six reasons why every radio receiving set should be hooked on to a KANE ANTENNAE

1. The strength of signals is increased because the Kane Antennae filters out all extraneous noises.
2. Weak signals can be heard which would never be received on any single-wire aerial.
3. All power noises are eliminated, making broadcast reception a pleasure and not a pain.
4. Static and reradiating squeals are cut in two.
5. The worst possible locality is changed into the finest kind of locality for broadcast reception.
6. Last, but not least, any radio receiving set, no matter what the make, becomes a better receiving set when hooked on to a Kane Antennae.

AND THE PROOF? READ THIS LETTER

218 S. Center Street,
Casper, Wyoming,
April 27, 1925.

Gentlemen:—

Some time ago I received one of your Antennae for a Super Het and have tried it out both on a Super and on a set using a ground (I built a Counterpoise according to your plans) and I can truthfully say it does all you claim and more too.

I am using this at my place of business in the heart of the down town district where it has been almost impossible to get reception due to the terrific power leakage, and even a Radiola Super could not cut it out.

I am getting better reception here than I do at my home where there is no interference to contend with.

You cannot realize what it means to get good reception now, as I have never been able to make any kind of demonstration before.

Thanking you again, and assuring you that I am a big booster for the Kane Antennae, I am

Very truly yours,
WATSON RADIO SHOP,
(signed) A. M. Watson.

SEE FOR YOURSELF JUST WHAT THE KANE ANTENNAE IS

We will sell you working drawings with instructions for erecting this wonderful Antennae for a dollar bill. If after looking over the drawings you decide you would rather have a factory-built Antennae than build one yourself, we will take back the drawing and allow you full purchase price on an order for an Antennae.

The Special Kane Antennae for Radiola Super-Hets $6.50
The Regular Kane Antennae for all other sets that use a ground connection $13.00
Working Drawings with Instructions for Erecting $1.00
(Stamps Not Accepted)

Postpaid to any part of the United States, or sent C. O. D. when 25 per cent of price accompanies order.

THE KANE ANTENNAE COMPANY

(Dept. W.) ABERDEEN, WASHINGTON

A SURVEY OF 1-TUBE DX SETS, by Lieut. Peter V. O'Rourke. Seven circuit diagrams. Great material for DX fans. Send 15c for April 11 issue. RADIO WORLD, 1493 Broadway, New York City.

THE OFFICIAL LIST OF STATIONS in the United States, Canada, Cuba, etc., with list of station slogans, was published in May 2 issue. Send 15c for copy to RADIO WORLD, 1493 Broadway, New York City.

HOW TO BUILD A NEUTRALIZED LOOP, by Frank Freer. Send 15c for May 2 issue, RADIO WORLD.

A 3-TUBE REFLEX FOR THE NOVICE, by Feodor Rofpatkin. Schematic and picture diagrams, panel and assembly. Send 15c for March 28 issue of RADIO WORLD.

THE BLUEBIRD REFLEX 2-tube earphone marvel by Capt. Peter V. O'Rourke. Send 15c for February 7 issue. RADIO WORLD, 1493 Broadway, New York City.

Expert Analyzes Coil Action

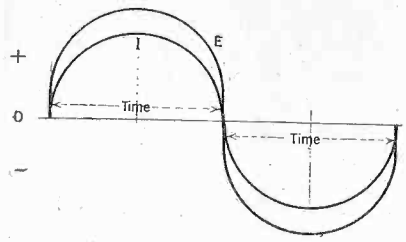

FIG. 3—A sketch showing the voltage and amperage cycle in phase.

(*Concluded from page 6*)

duced, viz, when the lead-in or ground is near a telephone or A. C. lines, which

Famous for Quality and Service
Amplitron Tubes
Bonded to Give Service **$3.**
List Price.....
Send in your old and burnt out Tubes—We will send you new AMPLITRON—any model—at.....$2.50
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"HOW TO KEEP STATIC OUT OF YOUR RADIO"
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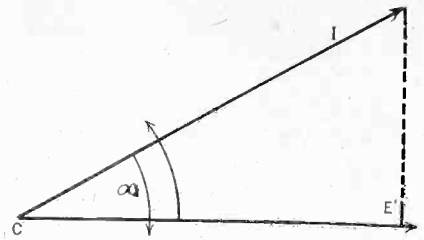

FIG. 2—A diarammatical sketch of a lagging current. The arrows indicate the direction in which the voltage cycle and the ampere cycle go, both in opposite directions. The peculiar letter between the angle is called "alpha."

it shouldn't be, but which can't be helped sometimes.

Questions

1. Where does inductance occur? Why?
2. What governs the amount of inductance in a circuit?
3. Describe induction in detail.
4. What is inductance used for?
5. Can we have inductance elsewhere than in a coil?
6. What is inductance?
7. Do we have inductance in a condenser?
8. What type of inductance is a coil and how is it distinguished from any other inductance?

THE BABY PORTABLE

(*Concluded from page 11*)

get the polarities wrong, was to connect the terminal of the primary that ordinarily goes to ground, to the aerial instead, thus making it easy to connect the beginning of the secondary, right next to it, and sometimes marked G. to one side of the grid condenser. Therefore the like potentials, in this case high, were not only together but were conductively coupled. Next I connected the remaining terminal of the primary to ground, although that terminal was marked for aerial, and joined the remaining end of the secondary to the A positive. The condenser was joined with stator plates to the coil side of the grid condenser and rotor plates to positive A. The open side of the grid condenser goes to the grid and the fixed leak is placed across the condenser, in mounting clips provided on the condenser.

One terminal of the tickler L3 (see Fig. 2, last week) goes to the plate or P post of the tube, the other side terminal of the tickler to one side of the .005 mfd. bypass condenser and simultaneously to the second from bottom prong of the filament-control jack. The B battery positive is connected to the frame or right angle of the jack. Thus when the plug is inserted the end of the tickler and the B battery positive are connected to the

S. HAMMER RADIO CO.
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FILL OUT AND MAIL

THE BLUEBIRD REFLEX 2-tube earphone marvel by Capt. Peter V. O'Rourke. Send 15c for February 7 issue. RADIO WORLD, 1493 Broadway, New York City.

HOW TO BUILD A NEUTRALIZED LOOP, by Frank Freer. Send 15c for May 2 issue, RADIO WORLD.

LIST OF PARTS

One 7½x5" panel.
Two Eby posts.
Three K-K knobs.
One Bruno No. 99 coil.
One La Cault condenser, straight-line frequency, .005.
One Dublier No. 640G .00025 grid condenser.
One 2-meg. Daven grid leak.
One .005 Dublier No. 601 condenser.
One WD 11 Alden Na-ald socket.
Two feet 3 conductor McAvoy Cable.
One No. 4 Saturn jack.
One pair Towers phones.
One Saturn plug.
One WD 11 tube.
One General Radio 10-ohm rheostat.
Two 763 Eveready B batteries.
One Red Seal dry cell.
One wood case as directed.
Bus Bar, etc.

phones. A battery positive is connected directly to F plus of the socket, the variable condenser and coil connections thereto already having been made. The movable of shrdluetaoinshrdluetaoinshrdlunun able arm of R1 (usually making contact anyway with one post of the rheostat) goes to the top prong of the jack. The second prong from top goes both to A minus and B minus. So does the open side of the bypass condenser. That completes the wiring.

SPECIAL ! Timmon's B-Lim...$16.00 Sodion Tubes..... 2.75
Write me your RADIO wants. Lowest Prices. Immediate Delivery.
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A Home-Made Fixed Crystal

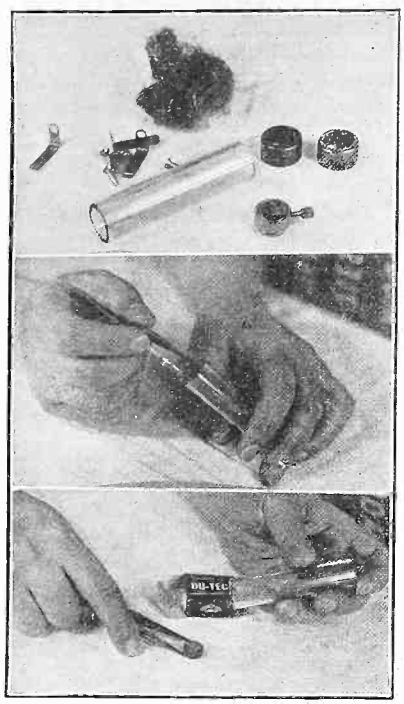


FIG. 1 (top). The parts required for making a fixed crystal detector are: One piece of steam gauge glass tubing; one crystal; small quantity of No. 00 steel wool; four clips for mounting; screws; two end cups taken from an old cartridge-type fuse. Fig. 2 (center). Fill one end of the tube with steel wool about half way. Fig. 3. Insert the crystal as shown.

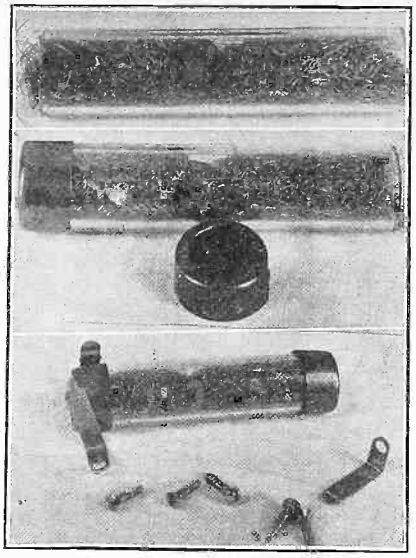
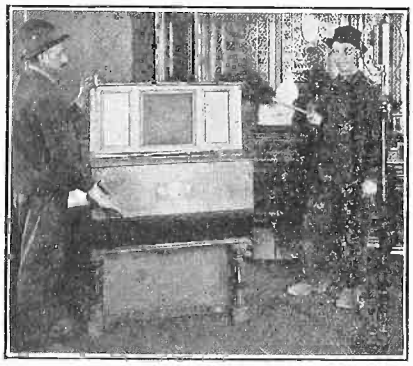


FIG. 4—Fill up the other end of the glass tube with steel wool. This makes it possible to touch a great number of sensitive spots at once. Fig. 5. The metal end caps are placed on after making sure that enough steel wool has been placed in the glass tube to "spring" against the crystal and end caps, thus making good contact. Fig. 6 shows a method of mounting clips to hold the completed unit, which resembles a Myers tube.

TIPS ON TOOLS

(*Concluded from page* 5)

ing attachment (Fig. 7) and scratch lines drawn where the circumference meets the result is a straight line right across the center. (Very useful in laying out shaft holes.) A grained surface (Fig. 8) is made on a panel of Bakelite or other material by wrapping sandpaper around a block of wood and rubbing the surface back and forth. Do not rub sideways or in a circle.



TWO sons of Italy and a Cockatoo—the Neapolitan Trio—announce the arrival of Spring over the microphone of WGY, Schenectady, N. Y.

THE BLUEBIRD REFLEX 2-tube earphone marvel by Capt. Peter V. O'Rourke. Send 15c for February 7 issue. RADIO WORLD, 1493 Broadway, New York City.

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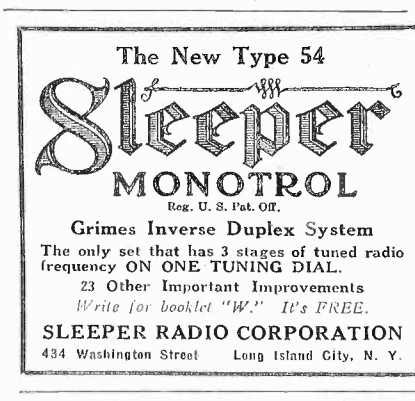

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IF YOUR INVENTION is new and useful it is patentable. Send me your sketch. Z. H. POLACHEK, 76 Wall St., New York.
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Reduces the cost of radio. At your dealer's or write.
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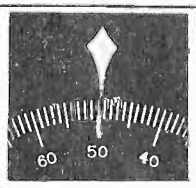
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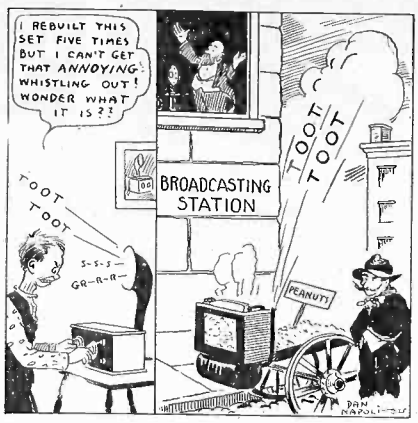

Speaker That Works From Crystal Set Invented

ST. LOUIS.

A NEW loud speaker capable of rendering sounds from an ordinary radio crystal set almost in the same volume as given at the sending point was demonstrated at the convention of the American Institute of Electrical Engineers here. The instrument was demonstrated by engineers of the General Electric Company who developed it.

In perfecting the device they discarded the horn, and in place of a diaphragm a flexibly supported paper cone is used to reflect the sound. A flat board, known as a "baffle board," placed in front of the cone, it was said, tends to abolish the resonances and metallic sounds found in ordinary diaphragms and horns and other loud speakers using paper cones.

MICRO SUPER JACK

THE Micro Super Jack, manufactured by the H. W. Berns Co., 672 Broadway, Brooklyn, N. Y., is a substantially-made instrument recently put on the market and embodying the best principles of jack construction. The springs are phospher bronze, terminating in cupped lugs, that are in stepped formation, thus being easy of access with soldering iron and reducing the capacity effect. The contacts are silver and the insulation is radion. The jack may be mounted on from 1/8" to 5/16" panels. It is a single-mount instrument, with an attractive bevelled nickel plated washer reinforcing the sextagonal screwhead. Single and double-circuit jacks are available.

(*Tested and approved by* RADIO WORLD)

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DIALS, KNOBS, TUBING, SOCKETS
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"THAT SPECIAL SIZE" FOR YOUR PHONOGRAPH, PORTABLE OR SUPER
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All the latest and best Kits in our new
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SUPERDYNE FANS
ATTENTION!
Send $1.00 currency to W. S. Logan, 262 Lawton Avenue, Atlanta, Ga., in return for which will send you a list of suggestions for improving the Superdyne. This should interest fans who cannot use outside aerials. No re-wiring necessary, and inexpensive. Try it.

Fourth Annual Vacation Number
RADIO WORLD
Dated June 6

Last color form closes May 25. Last black form closes May 26.

Hundreds of thousands of radioists or potential radio fans will be going to the country within the coming few weeks. This issue is intended for their guidance in buying radio sets and parts.

RADIO WORLD dated June 6 will be our Fourth Annual Vacation Number, and will contain special summer features, service articles, illustrations and warm weather helps by experts.

The regular advertising rates in force: $300 per page; $150 half page; one-third page (1 column) $100; one-quarter page $75. $10 inch, 75c per line. Times Discounts.

If you want to increase your summer sales among radio fans who actually buy radio goods during the summer, be sure to be represented in RADIO WORLD'S FOURTH ANNUAL VACATION NUMBER.

Wire, write or phone for space in this Business-Increasing Number.

Advertising Manager, F. S. CLARK, 1493 Broadway, New York City
Phones: Lackawanna 2063-6976

Amateurs Reduce Interference by Co-operative Plan

HARTFORD, CONN.

VIGILANCE committees designed to reduce interference in radio communication have been formed by the traffic department of the American Radio Relay League and are already functioning in a number of communities in the United States. These committees are designed to promote local co-operation between broadcast listeners and amateur radio enthusiasts.

These committees consist of three transmitting amateurs, who are members of the League, a representative local broadcast listener and a representative of the press.

According to QST, official organ of the American Radio Relay League, these organizations will "solicit interference reports from the public, will endeavor to identify the causes of interferences experienced and cure them, and, when the causes are beyond their control, explain to the aggrieved parties what they are.

"The committees will also be able to exercise the necessary influence upon violators of law or flagrant interference, should any be encountered."

EVERY SET BUILDER NEEDS THIS

"Morsing Bus-Bar Union"

Makes for quick assembling. Repairs can be made by using Morsing Bus-Bar Union without taking set apart.

Assemble round or square Bus-Bar and solder three wires at a time. Order No. 1 for No. 14, No. 2 for 12 wire. Send 25 cents for enough for building one set, or ten dozen for $1.00.

Newark Watch Case Material Co.
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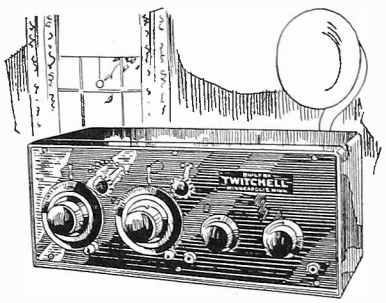

ONLY THREE TUBES

and it is the equal of any five-tube set ever built. It has selectivity and volume equal to any Superheterodyne or Neutrodyne.

It has brought in Honolulu, Paris, London and other foreign stations on a loud speaker.

It gets distant stations while a 500-watt station only three blocks away is broadcasting.

Any novice can build one successfully from our diagrams with complete instructions and special coil.

PRICES

Diagram instructions and coil..... $5.00
Three-tube instrument ready to use..... 50.00

Build or buy one of these wonderfully sensitive instruments and you will want no other.

All goods shipped prepaid.

S. A. TWITCHELL CO.
1930 WESTERN AVE. MINNEAPOLIS, MINN.

Romance

A REAL radio romance has resulted in wedding chimes and Arthur Murray, whose voice over the air has carried Broadway dance steps into the parlors of the Middle West, is absent from broadcast circles for a few months. In fact just now he is in Europe with his bride who was Katherine Hazel Kornfelder, of No. 68 Borraem Avenue, Jersey City, N. J. To make it a real radio wedding, for the couple met in the broadcasting studios, Joseph M. Barnett, director of WOR, who introduced them, was the best man.

Straight-Line Condensers

WHEN a condenser is said to be straight line, little is meant unless some information is imparted on the nature of the straight line; that is, whether it has to do with capacity, wavelength or frequency. Most condensers are manufactured for straight line capacity. This means in effect that the capacity is calibrated against the dial setting.

When tuning more than one circuit simultaneously, it is essential that condensers be uniform and synchronous in variation throughout the entire change of rotor with respect to stator. Any slight discrepancy that may exist between any of the tuned circuits due to either change of apparent inductance and capacity will cause a phase change difference with respect to the tuned circuits and thereby cause a drop in amplification due to the deresonating conditions.

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

SPECIALISTS

The Famous Wallace Low-Loss Coil for Superdyne, $7.50
The Flewelling Condenser for Superdyne.....$9.00
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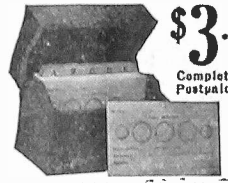

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RESULTS

What Results Have You Obtained from Circuits Described in RADIO WORLD? *State name of Article and Date of Issue. Address Results Editor,* RADIO WORLD, 1493 *Broadway, New York City.*

RESULTS EDITOR:

MY FIRST 1-tube set, shown in the photo, was built by me, under the direction of Miss Pauline Wenting, of 127 No. El Molino Ave., Pasadena, Cal., (a subscriber to your paper). The article by Capt. Peter V. O'Rourke in the December 6 issue of RADIO WORLD was followed in the work. This is a 1-dial DX set. It is a dandy. Volume is almost enough to operate a speaker on the one tube. I use 301A tube, three 1½-volt dry cells.

KENNETH C. SLOAN,
(Nine Years Old)
127 No. El Molino Ave.,
Pasadena, Cal.

* * *

RESULTS EDITOR:

HERE is a photo of a set I built to carry from place to place in the auto. It is the Bluebird Reflex by Capt. Peter V. O'Rourke in Feb. 7 issue. The set is

KENNETH C. SLOAN and his 1-tube, 1-control set, built on plans described by Capt. Peter V. O'Rourke in RADIO WORLD, issue of Dec. 6.

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Sept. 6, 1924—A simplified Neutrodyne with Grid-Biased Detector, by J. E. Anderson. A Low-Loss Wave Trap, by Brewster Lee.

Nov. 15—A Sturdy Low-Loss Coil, by Lieut. P. V. O'Rourke. An Ultra 2-Tube Receiver, by Byrt C. Caldwell.

Dec. 6—A 6-Tube Super-Heterodyne Using a Variometer, by J. E. Anderson. A $1 Coil Winder, by Herbert E. Hayden.

Dec. 13—The World's Simplest Tube Set, by Lieut. P. V. O'Rourke.

Dec. 20—A 1-Tube DX Wonder, Rich in Tone, by Herman Bernard. An Interchangeable Detector, by Chas. M. White.

Dec. 27—A 2-Tube Variometer Set, by Lieut. P. V. O'Rourke.

Jan. 3, 1925—A 3-Tube Portable That Needs No Outdoor Aerial, by Abner J. Gelula.

Jan. 10—A Low-Loss DX Inductance, by Herbert E. Hayden.

Jan. 17—A $25 1-Tube DX Wonder, by Abner J. Gelula.

Jan. 24—A Selective $15 Crystal Set, by Brewster Lee. A Variometer-Tuned Reflex, by Abner J. Gelula. An $18 1-Tube DX Circuit for the Beginner, by Feodor Rofputkin.

Jan. 31—A Transcontinental 2-Tube Set, by H. F. Wright. An Experimental Reflex, by Lieut. P. V. O'Rourke.

Feb. 7—The Bluebird Reflex, by Lieut. P. V. O'Rourke. A $5 Home-Made Loudspeaker, by Herbert E. Hayden.

Feb. 14—A Super-Sensitive Receiver, by Chas. H. M. White. A Honeycomb RFT for DX, by Herbert E. Hayden.

Feb. 21—A 1-Tube Reflex for the Novice, by Feodor Rofputkin. A Set for Professional Folk, by Lieut. P. V. O'Rourke. A Honeycomb Crystal Receiver, by Raymond B. Watles.

Feb. 28—A Set That Does the Most Possible With 6 Tubes, by Thomas W. Benson. Three Resistance Stages of AF on the 3-Circuit Tuner, by Albert Edwin Sonn.

March 7—Storage B Battery, by Herbert E. Hayden. Benson's Super-Heterodyne.

March 14—The Reflexed 3-Circuit Tuner That You Can Log, by Herman Bernard.

March 21—A Variable Leak, by Herbert E. Hayden. A 4-Tube, 3-Control Set That Gets the Most DX, by Lieut. P. V. O'Rourke.

March 28—The Improved DX Dandy Set, by Herbert E. Hayden. A 3-Tube Reflex for the Novice, by Feodor Rofputkin.

April 4—The Diamond of the Air, by Herman Bernard. What the New Sodion Tube Is, by Sidney E. Finkelstein. Sets for the DX Devotee, by Lieut. P. V. O'Rourke.

April 11—Audio Hookups for Fine Volume and Quality as Well, by Brewster Lee. The Coils for The Diamond, by Herman Bernard. 1-Tube Distance-Getting Sets, by Lieut. P. V. O'Rourke.

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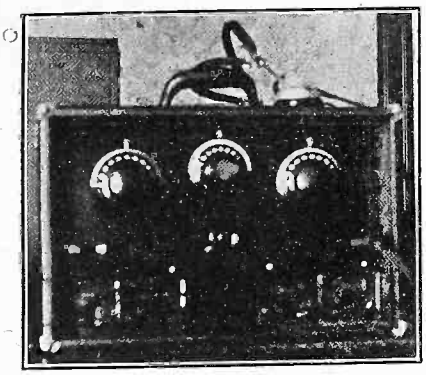

crystal. The coupler is a basket weave and the plate coil diamond weave.

The cabinet measures 16" long by 9¾" high and 6¾ deep inside. The baseboard measures 16x5½".

The first night I used the set I received 1,000 miles on the phones with outside aerial. I have used the set with a small loop for locals, working a loudspeaker.

I hope to get a lot of pleasure with the set this Summer, as it is very clear and just right for earphones.

I am well pleased with your magazine and read it every week-end.

W. E. OSBORNE,
123 Broadway,
Cambridge, Mass.

* * *

RESULTS EDITOR:

TELL Frank Freer that I wound the neutralized loop, as explained in his article in the May 2 issue. It is a dandy, I am glad he gave the information, and so clearly, too. I have several other loops, but this is the best yet.

H. K. MAYER,
Fort Collins, Col.

WRNY to Go on Air at Hotel About June 1

STATION WRNY expects to add its voice to the Metropolitan area, June 1. "Radio News," edited by Hugo Gernsback, sponsors of this newest station, which is located on the eighteenth floor of the Roosevelt Hotel, New York City, are requesting of the Department of Commerce, the lowest possible wavelength permissible in the Class A division.

An unusual quirk has developed between this station and the New York Central Railroad, whose yards are overshadowed by the hotel structure. Officials of the raliroad have objected to the aerial masts as a peril.

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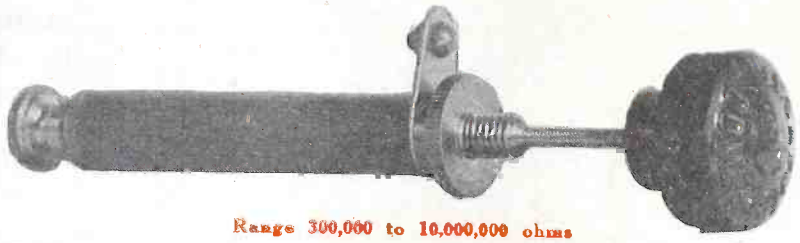

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