OCT. 3

RADIO WORLD

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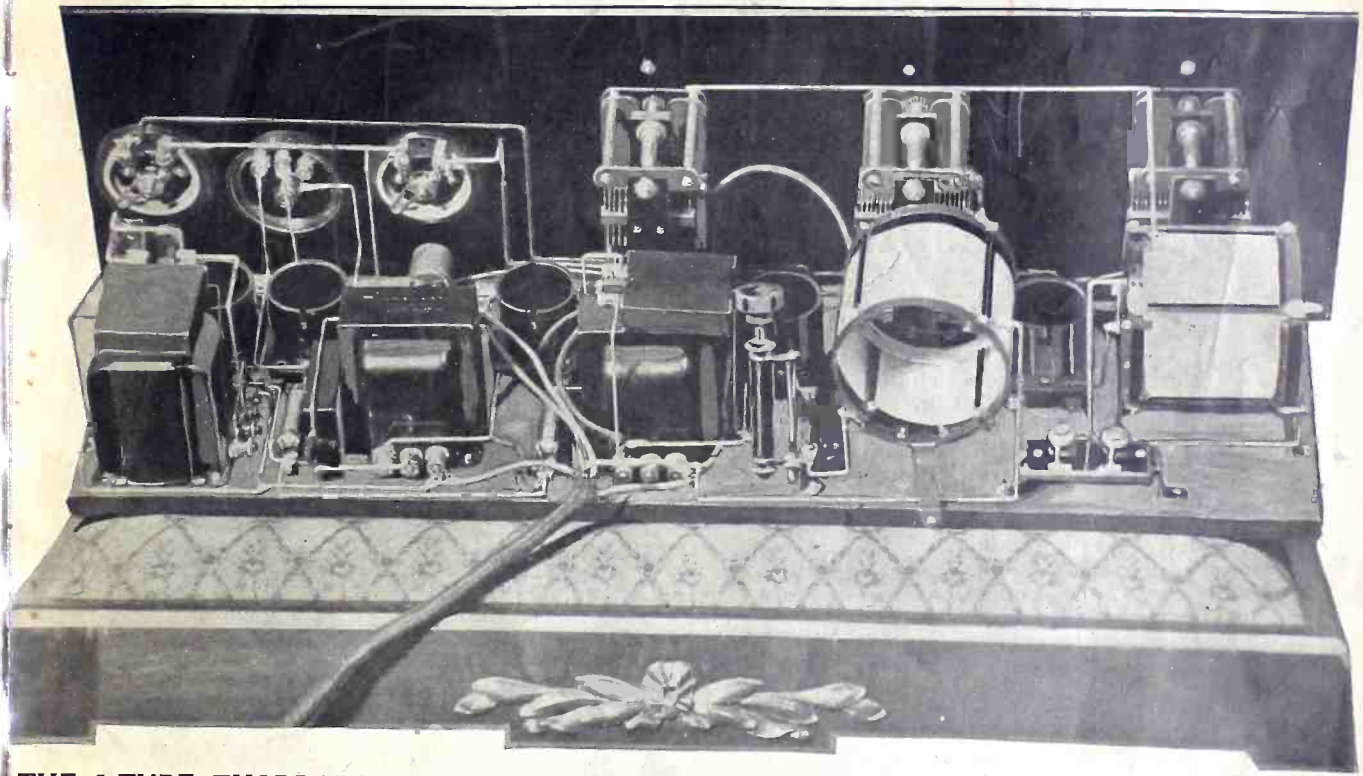
15 CENTS Vol. 8. No. 2 ILLUSTRATED Every Week

WORLD'S GREATEST ARTISTS GO ON THE AIR

(See Page 21)

THE THORDARSON-WADE SET

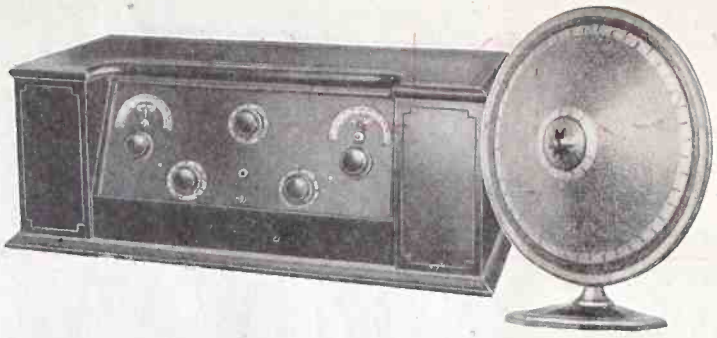


THE 5-TUBE THORDARSON-WADE SET (rear view above) comprises a stage of RF, regenerative detector and three steps of auto-transformer audio. A condenser smoothly controls regeneration, without any body capacity, and the audio hookup brings out the low notes, as well as the high ones, with full richness. See constructional article on page 4.

HOW TO MAKE A FIXED LEAK

J. E. Anderson Compares Audio Hookups

COMPLETE LIST OF STATIONS



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Crosley Musicone $17.50

Better Results from 3 Tubes Than from 5

Sounds improbable, doesn't it? But it is a scientific truth, first demonstrated in the Crosley laboratories and then confirmed by the performance of thousands of Trirdyns the country over.

Employing but 3 tubes, the Crosley Super-Trirdyn consistently equals, and in fact surpasses, the more costly 5 tube sets in performance.

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Then will you understand why the Crosley Super-Trirdyn represents a genuine achievement in radio performance and value which all America was quick to recognize and reward with increasing sales.

Write for attractive illustrated catalogue. Authorized sales and service stations everywhere.

Super-Trirdyn
DeLuxe Combination

Super-Trirdyn De Luxe	$60.00
Musicone De Luxe	27.50
Console Table	25.00
Complete	$112.50

Add 10 per cent to all prices West of Rocky Mountains

Crosley manufactures receiving sets which are licensed under Armstrong U. S. Patent No. 1,113,140 and priced from $9.75 to $60.00 without accessories.

Crosley owns and operates W L W first remote control supernower broadcasting station.

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Better—Costs Less

RADIO

THE CROSLEY RADIO CORPORATION - CINCINNATI, OHIO

RADIO WORLD, Vol. VIII, No. 2. Whole No. 184. October 3, 1925. 15c. per Copy, $6.00 a Year.
[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under Act of March 3, 1879. A Weekly Paper, Dated Every Saturday, and Published by Hennessy Radio Publication Corporation from Publication Office, 145 West 45th Street, New York, N. Y.

RADIO WORLD

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A Weekly Paper Published by Hennessy Radio Publications Corporation from Publication Office, 145 West 45th Street, New York, N. Y. Phones: Lackawanna 6976 and 2063

Vol. VIII. No. 2. Whole No. 184. October 3, 1925 15c per copy, $6.00 a year

RADIO WORLD
Presents

The Thordarson-Wade Set

A DX Receiver of Remarkable Tone Quality

Coils by Aero
Autoformers by Thordarson
Variable Condensers by Wade
Variable Grid Leak by Bretwood

HEAR THE GREAT OPERA AND CONCERT ARTISTS ON THIS SET

Sockets by Shaw
Resistors by Veby
Potentiometer by Centralab
Fixed Condensers by Dubilier

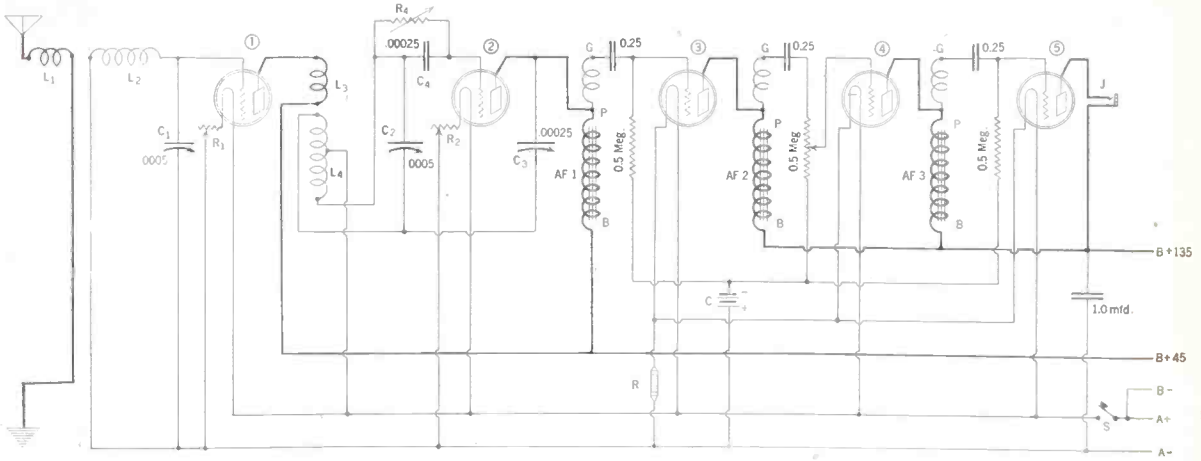


FIG. 1, the electrical wiring of the Thordarson-Wade 5-Tube set shown schematically. A switch S turns the set on and off as a unit. R3 (the 3 is blurred) is a ballast resistor, connected one side to A minus, other side to the F— posts of the three AF sockets (3, 4 and 5). Regeneration in the detector tube (2) is controlled with fine ease by means of C3. The Hartley oscillator is employed.

[Part I of the first article ever published about the Thordarson-Wade set is printed herewith. Part II, the conclusion, will be published next week.]

By Herman Bernard

Associate, Institute of Radio Engineers

PART I.

THE trend this year is toward the best possible quality of audio amplification, so that voice and music will be as pure and undefiled as is reasonably posible. This is indeed wholesome since radio has reached a point where the RF amplification is all that it need be, and we may remain satisfied for quite a while. But in the audio amplification there is just cause for complaint. The conventional pair of transformers will not satisfy most persons, at least after they have heard some real quality audio hookup at work. There are several very excellent AF amplifiers and one of them is the 3-stage auto-transformer design. This gives very good quality because it brings out the low notes with fine fidelity, while also reproducing excellent quality on the high notes. The volume is great. In fact, it may be too great at first. Hence a potentiometer is used in the grid of the second AF tube. If this does not suffice, use also a lower value of leak in the grid of the final tube, say 0.25 or even 0.1 megohm, instead of the usually recommended 0.5 meghom. At all hazards, the choking tendency can be cured with absolute success. Then you will enjoy a combination of volume and quality that will delight and thrill you.


Herman Bernard

Finest Combination

The radio side of the Thordarson-Wade circuit, which now makes its bow to the public, uses a stage of tuned radio-frequency amplification and a regenerative detector. This is the finest combination possible where two tubes are used. The detector tube rates as an RF amplifier, of course, although it combines with this performance some audio amplification, as is true in every set.

The manner of obtaining regeneration is the second outstanding feature of the set. Instead of a tickler coil, which is also a good way of obtaining feedback, a condenser is used. It should be one impervious to body capacity effects, since it is in an extremely sensitive part of the circuit. This condenser, C3 in Fig. 1, is connected with stator plates to the plate of the detector tube, and with rotor plates to the low potential terminal of L4. The grid return of the detector tuning coil L4 is connected to a tap on that secondary, thus making the entire L4 winding a secondary, and a small part of that same winding a primary. The plate current is fed back to the grid of the detector tube through the regeneration condenser C3, the location of the tap on L4 accounting for the degree of regeneration afforded by any given setting of C3.

A Great DX Getter

The Super-Heterodyne enthusiasts will recognize this as the Hartley oscillator, that is, a hookup with a single-winding coil, one part of this winding being in the grid circuit and the other part in the plate circuit. In the present case C3, the regeneration condenser, is in series with the smaller section of the tuning coil while C2, the detector input tuning condenser, is in parallel with the entire secondary. The oscillations induced are as effective as one can accomplish, hence the Thordarson-Wade set will rank among

Picture Diagram of the Thordarson-Wade Set With Coil Positions and Polarities Defined

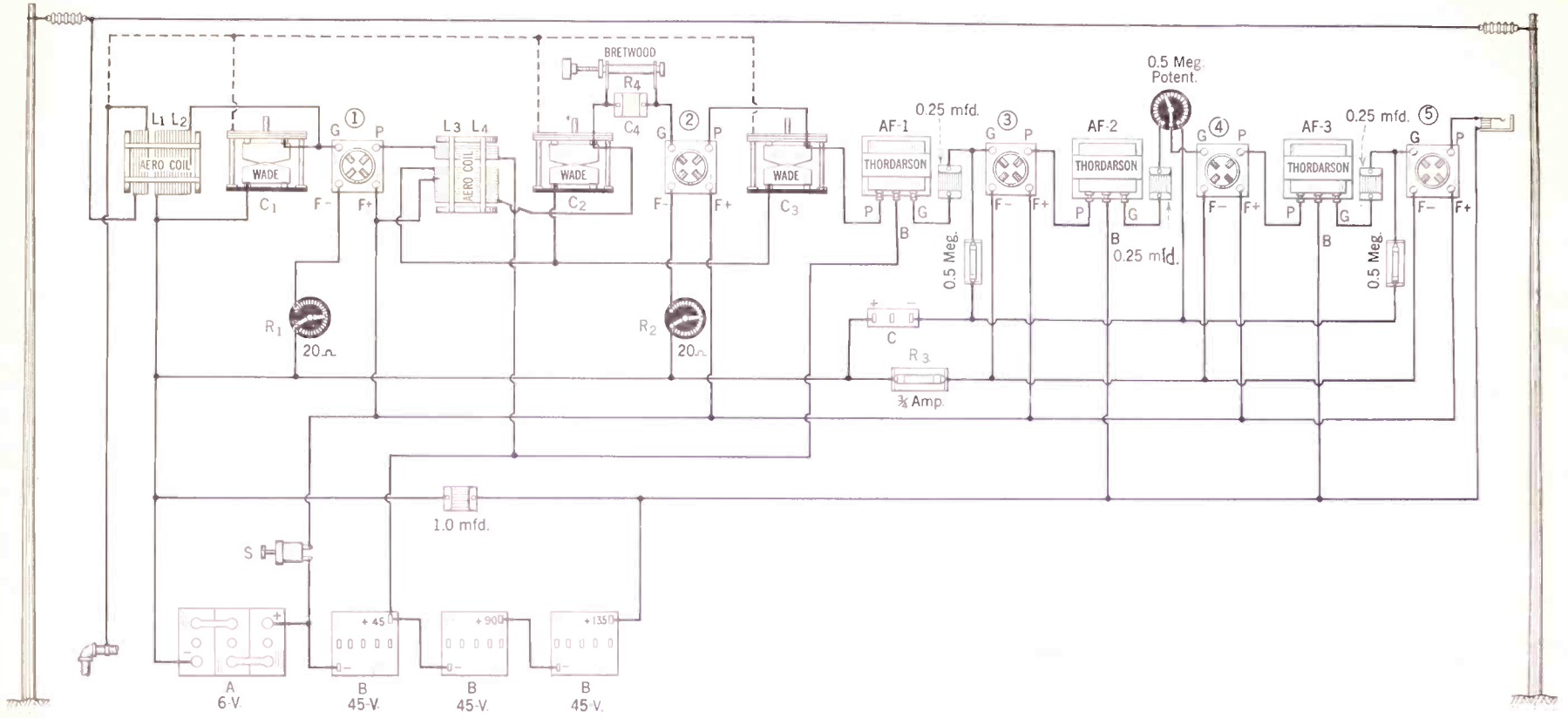
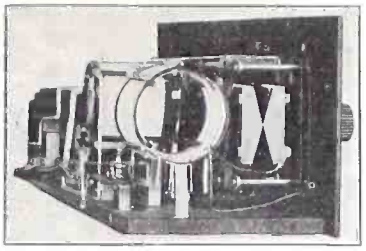


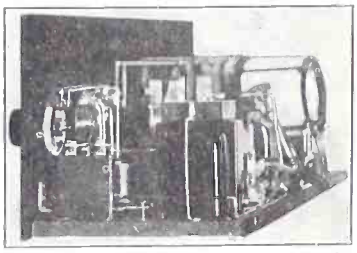
FIG. 2, the wiring diagram of the Thordarson-Wade Set. The Aero coils are shown with primaries outside the secondaries (instead of inside) to clarify the visualization of connections. L1L2 is mounted horizontally, L3L4 vertically.

Smooth Regeneration Control

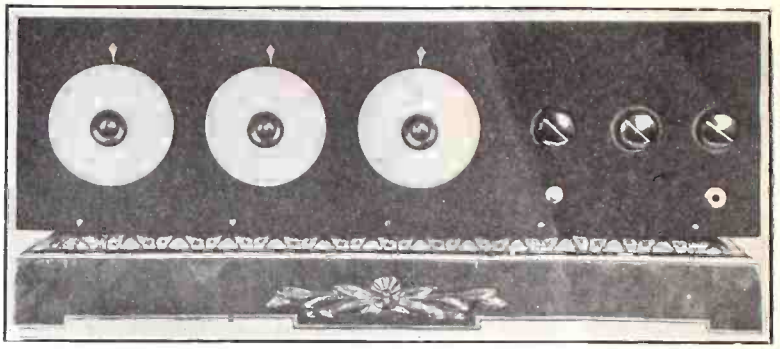
By the Parallel Feedback Method



THE COILS should be mounted with axes at right angles.



THE 1.0 mfd. by-pass condenser may be mounted atop the last auto-transformer.



(Foto Topics)

PANEL VIEW of the set. The dials, left to right, are RF, detector and regeneration. The knobs are RF rheostat, potentiometer and detector rheostat. The switch is under the RF knob, the jack under the detector rheostat knob.

the foremost DX-getters it is possible to construct at home.

The regeneration control is smooth and the settings on the C3 dial are spread out. This is due particularly to capacity means employed for varying the regeneration. Even with the semi-circular plate type of variable condenser, known as straight-line capacity, this spreadout on the lower waves is probably a little better than with a tickler used for inductive feedback. But to gain even a greater distribution a straight-line wavelength condenser was used. Normally this would not constitute much of an improvement over the semi-circular plate type, but the particular condenser employed has a 360-degree-rotation dial, hence the surface of the dial affords greater separation between low wavelength assignments even than would a straight-line frequency condenser, where the conventional 190-degree dial is used.

The approach to the oscillation point is very gradual. In fact, one can sense the excessive condition before it actually demonstrates its existence in the form of a squeal. Radiation is thus curtailed.

With the proper inductances the set will tune from about 180 meters to about 600 meters, provided condensers of low minimum capacity are used. This refers to the wavelength tuning capacities, C1 and C2. The regeneration control, C3, keeps apace with these to a marked degree. In other words, if the set will tune a given range the regeneration may be relied on for that belt, too. As the practical wavelength belt of broadcasting stations is from 209 to 545 meters it can be seen that the range of wavelengths will be more than amply covered.

Coil Connections

The coils are connected as indicated in Fig. 1, the electrical diagram of the wiring shown schematically. Also the coils may occupy the relative positions as shown, L1L2 being horizontal and L3L4 vertical.

Tracing the coil connections, aerial goes to the beginning of L1, ground to the end. A minus connects to the beginning of L2 (which adjoins the end of L1), while the end of L2 goes to the grid. The stator plates of C1 connect to grid, too, while the rotor plates go to A minus. The other RF transformer, or interstage coupler, is connected with beginning of L3 to plate, end to B plus, beginning of L4 to rotor plates of both C2 and C3, tap to A plus and end of L4 to grid condenser and to the stator plates of C2.

The radio side of the circuit requires no special precautions, beyond connecting the coil terminals correctly and mounting the coils at minimum or zero stray inductive coupling. The upright position may be preferred by some for L3L4, but the horizontal position may be maintained for it, as well, provided right-angle mounting, in respect to L1L2, or other angle for preventing unwanted feedback, is followed. The photographs show both coils mounted horizontally, but with axes at right angles.

The AF Hookup

In the audio circuit are a few important factors. For best quality the blocking condensers should be large. No smaller capacity than 0.25 mfd. should be used. It is safe to use up to 4 mfd., but the larger capacities are rather bulky and expensive, and 0.25 mfd. was used as a compromise between price and size, while still maintaining good quality. Do not use .006 mfd. blocking condensers in this hookup.

In Fig. 1 you will notice that a leak is placed in the grid to filament circuit of each of the three audio tubes. One of them is variable and is in fact a potentiometer of 500,000 ohms maximum (0.5 meg.). The grid is connected to the pointer and the two remaining poteniometer terminals respectively to the 0.25 mfd. condenser and to C battery minus. By turning the arm the resistance is changed. The higher the resistance in the circuit, the lesser the leakage path from the grid, hence if any tendency toward excessive volume exists at the expense of quality, turn the potentiometer to a lower setting, to allow more of the excess charge to leak off the grid of the tubes.

The question arises as to why the variable control or volume regulator is placed in the second audio instead of in the first. One good reason is that independent volume adjusters exist in prior tubes—R1 for RF, R2, R4 and C3 for the detector. It is always the better practice to regulate volume ahead of the AF, where practical. But supposing that the control is not ample, i. e., some overloading of tubes takes place in the audio stages. The first AF tube has been regulated as well as possible by the rheostats, variable detector leak and the regeneration control too. Hence it is logical to have the potentiometer in the second AF tube, the idea being to check the strain at the earliest practical stage where it occurs and where no compensator exists. Should the potentiometer fail to check choking effects, the final leak may be less than the prescribed 0.5 meg., 0.1 meg, being safe. Ordinarily the AF hookup will be very fine just as diagrammed, with the constants as given. But in this particular set the radio-frequency amplification is so strong that any tendency toward overloading that might exist in any other set is present here. However, as the solution is unfailing there is nothing to worry about.

The manner of connecting the auto-transformers is identified in Fig. 1. There is a single tapped winding. The beginning of the winding goes to the blocking condenser joined to the grid of the succeeding tube, the tap goes to plate of the preceding tube and the end of the winding to B plus. The posts are marked on commercial products. The primary part of the winding has a core, just as has the secondary, in fact, it is the same core.

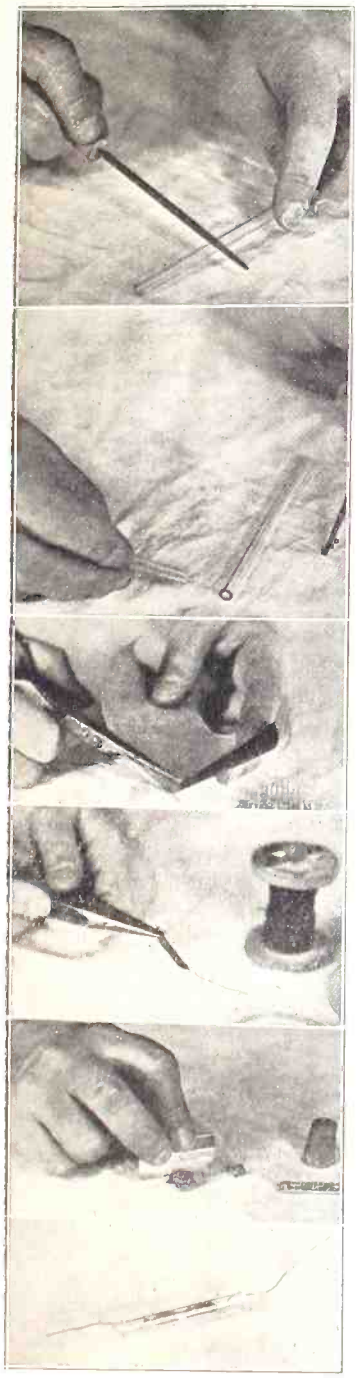
The B battery voltages and also the C

(*Concluded on page 27*)

LIST OF PARTS

One 7x24" panel.
One 8x23" baseboard.
One radio-frequency tuning tunit, L1L2.
One interstage RF tuner, tapped, L2L3.
Two .0005 mfd. variable condensers, C1, C2.
One .00025 mfd. variable condenser, C3.
One .00025 mfd. grid condenser, C4.
Three 0.25 mfd. "by-pass" condensers.
One 1.0 mfd. by-pass condenser.
Two 20-ohm. rheostats, R1, R2.
One ¾-ampere ballast resistor, R3.
Three auto-transformers.
One variable grid leak, R4.
One 0.5 meg. fixed leak.
One 0.5 meg. potentiometer.
One 0.1 meg. leak (or 0.25 or 0.5 meg.) for last tube.
Three dials.
Three dial pointers.
Five sockets.
One A battery switch.
One single-circuit jack.
One battery cable.
Accessories: C battery, B batteries, A batteries, five tubes, aerial wire, 50 ft. No. 14 insulated leadin wire cabinet, speaker, lightning arrestor, busbar, lugs, solder hardware.

How to Make a Fixed Grid Leak



TOP to bottom, Figs. 1, 2, 3, 4, 5 and 6.

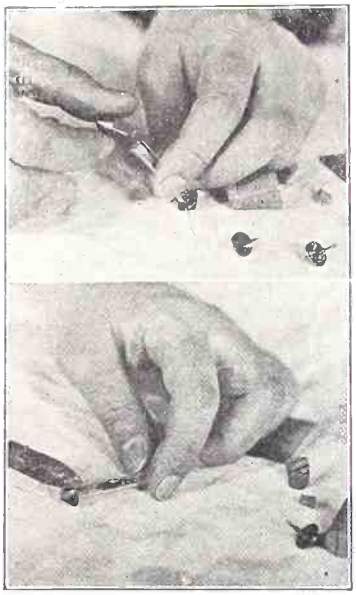


FIG. 7 (top) and Fig. 8.

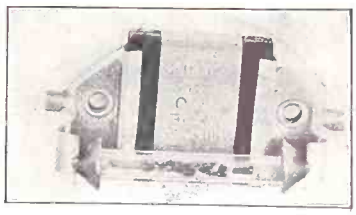


FIG. 9 the leak mounted on condenser.

By Herbert E. Hayden

Photographs by the Author

PROCURE a piece of glass tubing ¼" in diameter with a very thin wall. (Fig. 1). With a three-cornered file mark a line all around the tubing, cutting off a piece 2" long. (Fig. 2). File the tube all the way around. A quick firm snap with the fingers will break it off nicely. Obtain a piece of "pencil carbon paper." The ordinary kind used for typewriting does not contain enough carbon. Cut a thin ribbon, about ⅛" wide about ¾" long. (Fig. 3). Fig. 4 shows how the electrical contact with the carbon-coated paper is made. Take two small pieces of magnet wire about No. 26, wrap them around the ends of the carbon ribbon, and press down tightly with a pair of flat-nose pliers.

Having fastened the wire for connection purposes as explained, place the carbon paper ribbon in the glass tube, allowing the two magnet wires to protrude as shown in Figs. 5 and 6.

Fig. 5 also shows the method of cutting the small pieces of cork which will be used to plug up the ends of the glass tube, so as to keep the tube sealed up, and avoid moisture, etc. A razor blade makes this job easy.

HERBERT E. HAYDEN

Procure some conical pointed tacks (Fig. 7) and press them into the little cork stoppers, which have been fitted to the ends of the glass tube, the ends of the magnet wire connections still protruding.

To insure a good connection these magnet wires are soldered to the outside of the tack heads. Surplus ends are clipped off.

We now have a standard grid leak, the value of which we do not know for the moment, but it can be tested against any standard make and the resistance altered by either scraping off the surface of the carbon paper a little before the next leak is made, or cutting the carbon paper a little bit longer. The leak will snap right into a standard condenser (Fig. 9).

Broadcasters Seek Peace With Composers' Society

The National Association of Broadcasters at its annual meeting in New York City, discussed the problems of paid advertising on radio programs, censorship of broadcasting and the relationship of broadcasters with the Society of Authors, Composers and Publishers in so far as it concerned the broadcasting of music on which the society held the copyright.

The association opposed legal censorship and was in favor of keeping the control within the organization of broadcasters. It also opposed any legislation by Congress to compel the use of certain legal phraseology in any program that is being paid for by an advertiser. The association also opposed any ruling that would require a statement by an announcer that a program about to be broadcast was advertising.

The conference also expressed the desire to meet the Society of Authors, Composers and Publishers on equitable grounds. The opinion was expressed that by broadcasting selections controlled by the society the association aided composers by advertising their compositions.

A resolution was reported by a special committee favoring the extension to broadcasting of the present copyright law as it affected the mechanical reproduction of copyrighted music, Congress to determine the amount of royalties to be paid to owners of copyrights.

William E. Harkness of the American Telephone and Telegraph Company opposed the resolution on the ground that the members present were not representative of the 575 broadcasters in the United States. He suggested that every station be brought into the discussion before any attempt was made to approach Congress or the Society of Authors, Composers and Publishers.

Mr. Harkness said that the American Telephone and Telegraph Company had been advised that under the present copyright laws composers were entitled to revenue from the broadcasting of copyright selections, and that on the basis of this advice his company had obtained a license from the Society of Authors, Composers and Publishers. He said that under the present agreement the terms had increased in a ratio of five to one, that certain selections had been withdrawn and that the present rate was not satisfactory to his company. He was of the opinion that the American Telephone and Telegraph Company might have to give up the contract when it expired on Jan. 1, 1926, as indications for renewal looked even less satisfactory than the present terms.

The Mechanism of Meters

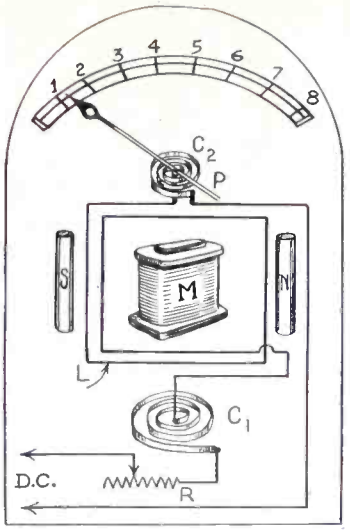


FIG. 1, showing the electrical wiring of the voltmeter. Note the added resistance R. Without this resistance the same instrument can be used as an ammeter or galvanometer, depending upon the number of turns which afford high or low resistance.

By Lewis Winner

Associate, Institute of Radio Engineers

THE instrument that measures or rather detects the presence of current in an electrical circuit is like a policeman on beat, always on the lookout for wrongdoing. The meter is the watchdog or policeman of the electrical circuit. It matters not if the circuit is of low power or high. Fundamentally there are only two types of meters used in radio. One is known as the ammeter, which indicates the current or the number of amperes flowing in the circuit. The other is the voltmeter which shows the potential difference in volts between two certain points. From these two meters by the increasing or decreasing of turns of wire, millivolts, milliamperes, microvolts and microamperes may be measured. The principle of the wattmeter is essentially the same.

LEWIS WINNER

There are two methods by which these instruments may be built to measure the current. One is by construction in such a manner that the heating of a certain number of wires connected up in the circuit actuates a needle so as to move it. The other, and the one most commonly used, is that type which employs the magnetic effect, to find out the current flowing in the circuit. The heating effect of instrument is used for measuring current at radio frequency. The magnetic effect is used for measuring currents which are direct and for currents which are of the low-frequency alternating type.

We will first discuss the magnetic type of instrument.

Fig. 1 shows how the magnetic effect is obtained in a voltmeter. Here the direct current is measured. This depends upon the inertia between a permanent magnet and a wire carrying the current. P, the rectangular coil, consists of a large number of turns of wire, which is usually of the No. 40 enameled type. The turns of wire which constitute this coil is wound upon a small and very light metal frame (sometimes is aluminum). This is then held in place by jewelled bearings, and in the same manner as that of a watch. C1 and C2 are the springs, spiral in shape and made up of a special material that will not be attracted by a magnetic field and yet a very good conductor. In this manner the current goes through the wires very easily. The coil position is also controllable. M, which looks like a magnet, is a round piece of very soft Swedish iron. N and S are a pair of permanent magnets. M is used to form a magnetic path between these magnets, N and S. By doing so, a vigorous and consistent magnetic field is created between the areas S and M and M and N.

Suppose that the arrows at the extreme left-hand side of the figure are connected to a source of electromotive force. The current will flow in through the bottom arrow (without the resistance R in series) and leave through the top (with the resistance R). If the pole marked S were N and the other S instead of N, then in the coil next to the new N pole, the current flows down in each specific turn of wire. We therefore see that the direction of the magnetic field is then from N to S (S to N in figure), and that the coils will tend to turn. The springs C1 and C2 oppose this motion. For every strength of the current there is a certain position of the coil, whereby the force due to the current and the force due to the springs are at equilibrium. We can attach a pointer or indicator to this coil, which coil will show by the needle's place over a scale what the voltage is. The current flowing through the meter equals the volts between the two points where the electromotive force is coming in, divided by the resistance of R plus the meter resistance. Any change in the voltage makes an exactly proportional change in the current of the meter. In this way the scale can be graduated in volts.

Most commercial meters are made thus: Around the end of a form or where the scale rests, which form is a permanent magnet, are a pair of Swedish iron pole-pieces, mounted on the ends. A round soft iron core mounted on supports, is between these poles. This gives us a strong and smooth magnetic field in the small gap between the coil and the magnets. The coil is movable and turns in this gap. just enough room being left for it to turn without it hitting the sides of the poles. There are two spiral springs, one at the beginning and one at the end of the coil. The one at the end of the coil is usually underneath the soft iron core. The indicator usually is made of aluminum tubing. The point which indicates the voltage is flattened.

The meter is then placed in a dust-tight case. This is to prevent any dirt from coming into the windings and holding the springs or the coil, so that the true readings will not be prevented.

The resistance of R depends upon the voltage that the meter is desired to read up to. It may be anywhere from 1,000 to 20,000 ohms or even higher or lower. If the instrument is to be used as a millivoltmeter, the resistance must be very low perhaps just the resistance of the wire in the meter being used.

The ammeter is of the same construction as the voltmeter. The operation is the same. The only difference is that the ammeter has low resistance coils and the voltmeter has high resistance coils. If the coil P had only 2 or 3 turns of No. 14 enameled wire it could be used as a galvanometer. Here we can measure

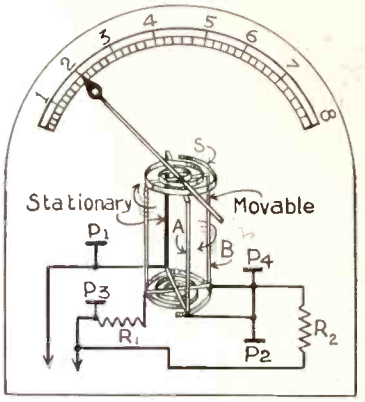


FIG. 2, the electrical diagram of the wattmeter.

.000001 of an ampere. If there were a few more turns, the same instrument could be used as an ammeter.

The Wattmeter

We now will leave these everyday types of meter and discuss the meter used mostly in power and transmitting systems, known as the wattmeter.

In the other circuits we could find out the number of volts or amperes, by some system of mathematics, but when we want to find out the number of watts in an AC circuit we cannot do so unless we employ a wattmeter. This instrument measures the power in a circuit. If we multiply amperes by volts, we do not obtain the true reading in watts. This is due to the self-induction of the circuit. The electromotive force and the current do not reach their maximum heights at the same fraction of a second. Due to the inductance in the circuit, the current lags behind the impressed electromotive force. When we multiply volts by amperes the result is only the approximate number of watts in the line. The lag of this current is known as phase displacement. To understand this fully let us take an example: Suppose 110 volts and 60 amperes were the readings of the respective meters which were placed in a line, and we wished to find out the actual number of watts in the circuit. Multiplying these two out, we obtain 6,600 watts. Put a wattmeter in the circuit and you will find that the true reading is 6,100 watts, or approximately so. This is because the meter is so constructed to register the true amount of power in a circuit, disregarding the phase displacement. Of course if we wish to tackle a bit more difficult mathematics (trigonometry), we may get along without the use of the wattmeter, but then again we have to know certain constants, which are not easy to find out, in that they are not given often. The latter only applies to alternating current circuits. In DC we have no lead or lag.

The formula for power in alternating current circuits is: W equals I x E x Cosine ϕ. The latter part of that formula requires trigonometrical knowledge, but only a little. The Cos. ϕ (theta) is the power factor expressed as the function of the angle. This is also equal to R (resistance) Z (impedance).

The coil A of the wattmeter is known as the current coil. and as you see, is connected in series with R2. This resistance is really the load on the circuit. The other coil, B, is the voltage coil and is connected in shunt with to R2. The heavy resistance R1 is connected in series with this coil. Coil A is stationary. but B. the movable coil, is mounted on jewelled bearings.

How Watts Are Measured

This coil has a pointer. This indicator is held in zero place by the spring S.

The constants of this meter as well as the others are not adaptable to ready public consumption. Such an instrument is too difficult for the novice to build. It is much cheaper to buy one. Unless you have the proper heating instruments, accuracy in such an instrument is very difficult to obtain. Even the meters of one of the largest and oldest meter manufacturers are not exactly accurate. They have an error factor. And if such a large company does not make the meter perfect, how can the individual, with all the handicaps that a majority of us will encounter, expect to make one even half as accurate?

Now as to the working of the wattmeter. If current passes through the two coils, two magnetic fields are set up. These fields help each other and pull the coil B in parallel relation to coil A. The current in the coil B varies as the potential or voltage difference between its terminals. The current in the series coil will vary as the current in the circuit in which it was placed. The manner in which the coil deviates is proportional to the power of the current flowing in the circuit. The coils may then be marked in watts. P1, P2 are the terminals for the coil A. P3, P4 are the terminals for the coil B.

Hot-Wire Meters

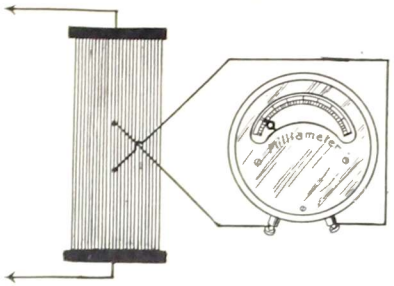
Radio frequency currents are measured by hot wire instruments. There are two types of these meters, one is the expansion and the other is the thermocouple. The expansion method is taken care of in the lengthening of a metal wire when it is heated. When two dissimilar metals are heated, an electromotive force is developed. The pair of metals used for this purpose is known as "thermocouple." Fig. 3, shows the thermocouple method of measuring radio frequency currents. Radio frequency current flows through the wires, which are stretched between the copper blocks. This injunction sets up a direct current which actuates the meter. Fig. 4 gives one a clearer vision of the thermocouple idea. Let I be a piece of bismuth and H be a piece of antimony. Let these two metals be soldered or welded. Their ends should be connected to a galvanometer or a milliameter. If the temperature of the junction is put to a higher value than the remainder of the circuit a current will flow from the antimony to the bismuth. If, however, we cool this junction to a degree where its temperature is below that of the rest of the circuit, the current will flow in the opposite direction.

These metals may also be copper and iron.

One of the commercial types of meters directly employing the hot wire scheme, is shown in the bottom diagram of Fig. 3. The instrument employs the expansion idea. There is no self induction of the hot wire in this meter and the danger of burnout is very small. There is a steel plate connected at the bottom of C. This plate pulls away from the wire DC. This is done by the spring.

One end of the wire DC is connected to the plate. This is then passed around the pulley B and again attached to the steel plate at a certain point R. This point is insulated from the rest of the circuit. The pulley also carries the arm I with two contacts. Between these two points is stretched a silk thread W. This is wound on the shaft S. This also carries the indicator P, which naturally moves over the scale.

The current that we are desiring to measure enters the wire at the point marked IN and leaves at the point B which is indicated by B out. As the current flows the temperature of the wire



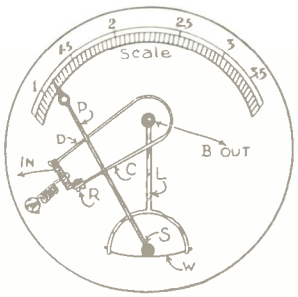


FIG. 3 (top), showing one method of employing the thermocouple idea. Bottom diagram shows the expansion idea of a hot wire used in an ammeter.

gets higher. This causes the wire to expand. However, due to the pulling strength of the spring the portion having no strain upon it is taken up at one side. A balancing effect can only be had, when the pulley B is rotated enough to equilibrize the strain on the spring. Since the rotating of B carries L with it (the same shaft), and L when moving makes the silk fiber rotate the shaft, the needle rotates also and the indicating action takes place.

The thermocouple idea is also used extensively as external shunts. The electromotive forced at the junction of heating depends not upon the direction of the current but upon the amount of heat manufactured. The heat made varies as the current squared. In the meters where the thermocouple is used, this is placed inside the meter.

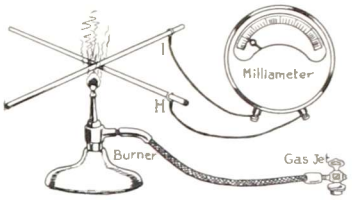


FIG. 4, showing how two different metals are heating, to obtain a current to flow in the meter.

50 KW Twice a Week For WGY in New Tests

WASHINGTON.

The first move toward the establishment of super-power has just been made by the Department of Commerce which has granted authority to WGY, at Schenectady, to use 50 Kilowatts power for regular broadcasting on Saturday and Sunday evenings, beginning October 3.

WGY'S Short-wave Heard Plainly 8,850 Miles Off

Short wave signals transmitted by WGY, at Schenectady, have been received with fair quality and easily read volume during the day 8,850 miles from the sending station and have been inaudible 200 miles from the transmitter. For several months tests have been conducted by the radio engineers of the General Electric Company on 41.88 meters wavelength using approximately one kilowatt of power and from the reports received over a great territory it is apparent that this wavelength is especially suitable for daylight transmission.

All programs of WGY have been transmitted on 41.88 meters, 109 meters and 1,560 meters, in addition to the assigned wavelength of the station, 379.5 meters. The 41.88 meters transmitter has been used under the call letters 2XAF.

WGY recently received a letter from Robert I. Simpson of Pretoria, South Africa, stating that he had picked up the short waves on the morning of August 2, at 4:50 o'clock South African time. His log checked with that of the station. His most interesting statement was: "As it got lighter here the signal strength increased gradually." Pretoria is 7,988 miles from Schenectady.

W. P. Huggins of Grey Lynn, Auckland, New Zealand reported reception of WGY's 41.88 meter signal on the afternoons of July 4 and 5, between 3:15 and 4:30 o'clock. His log checked with the records of WGY. Auckland is 8,850 miles from WGY.

Stanley McClatchie, a radio experimenter residing in Stuttgart, Germany, received WGY on a receiving set in the Alps in daylight. Fans living in Belfast, Ireland; Liverpool, London and Furness, England; La Platte, Argentina, and Calgary, Alberta, Canada, have successfully heard the Schenectady development transmitter.

In studying the behavior of short waves the radio engineers have made reception tests within a 200-mile radius of Schenectady. These tests have shown that the short wave signal was inaudible within that radius except on a few occasions when very weak signals were detected. This is known as the "skip distance" effect.

The transmitter used for the 41.88 meters broadcasting is located at the South Schenectady radio developmental laboratory of the General Electric Company where engineers are carrying on intensive research in all phases of transmission. The equipment is located in a separate frame building and uses not only the push pull circuits, but also intermediate amplifiers and crystal quartz in order to steady the frequency.

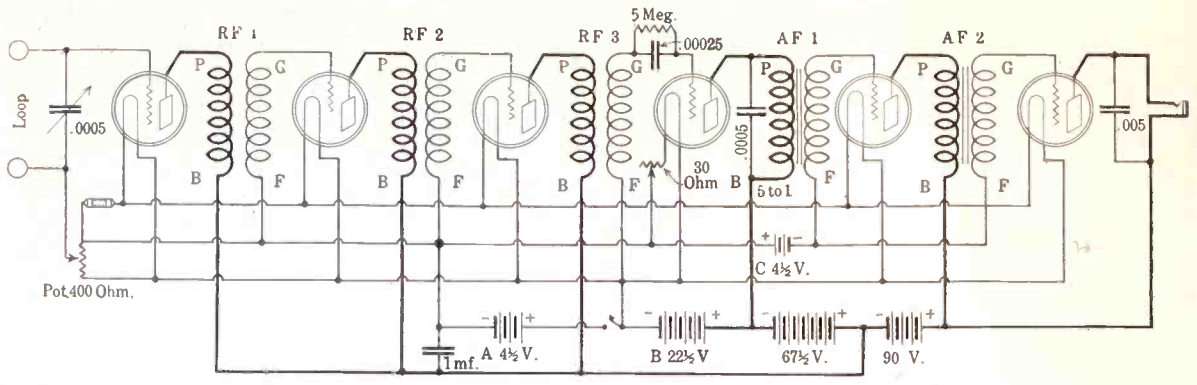
The antenna used is known as the vertical doublet. This is simply a vertical wire tuned in the middle. It is necessary on this type of antenna to have the meter in the middle with tuning coil on each side.

Next Week

Hookups for

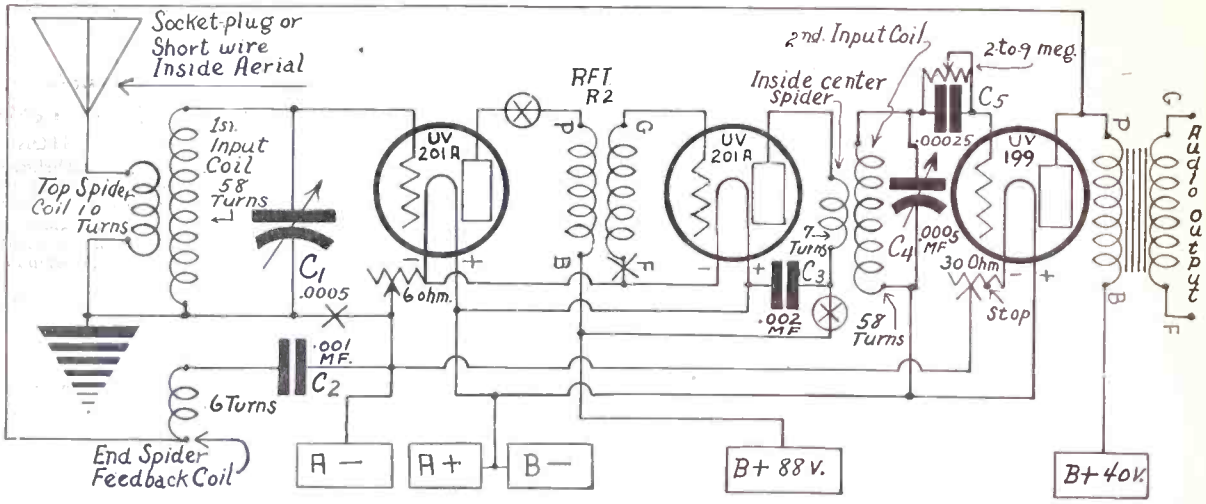
Short-Wave Sets

Hookups—Practice and Theory



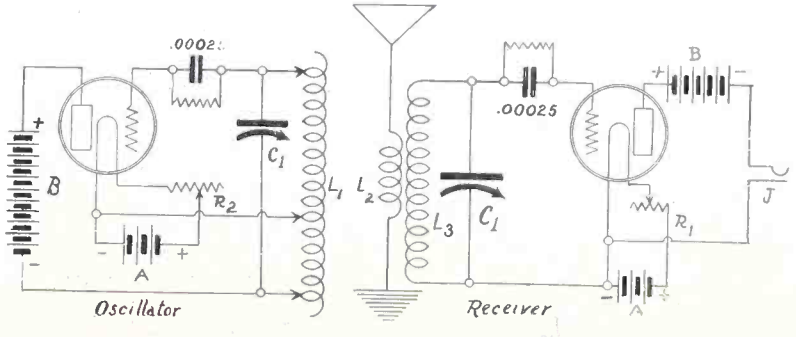
A 1-DIAL, 6-tube receiver. This set works on a loop and is fairly selective as well as voluminous. Note that the three stages of radio-frequency are untuned. The detector is non-regenerative. The audio-frequency hookup is of the standard transformer type, low ratio AFT being used in both cases

x indicates reflex input points
⊗ indicates reflex output points

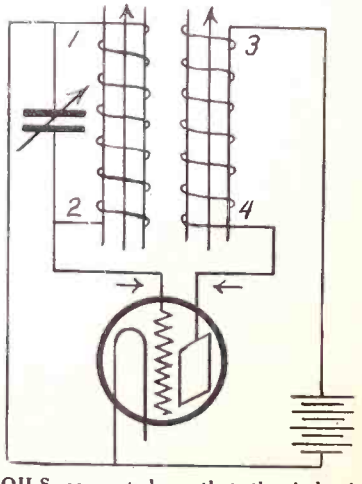


THE 3-TUBE dynamic receiver. Note that the detector part of the hookup is not regenerative in action. The feedback action is unique, in that the plate of the detector tube is coupled back to the grid of the first radio-frequency tube. This connection gives you a wonderfully voluminous output. If you wish to reflex this set, place the grid and filament posts at the X points. Place the B and P posts at the circled X points

How to Listen in for Pure CW

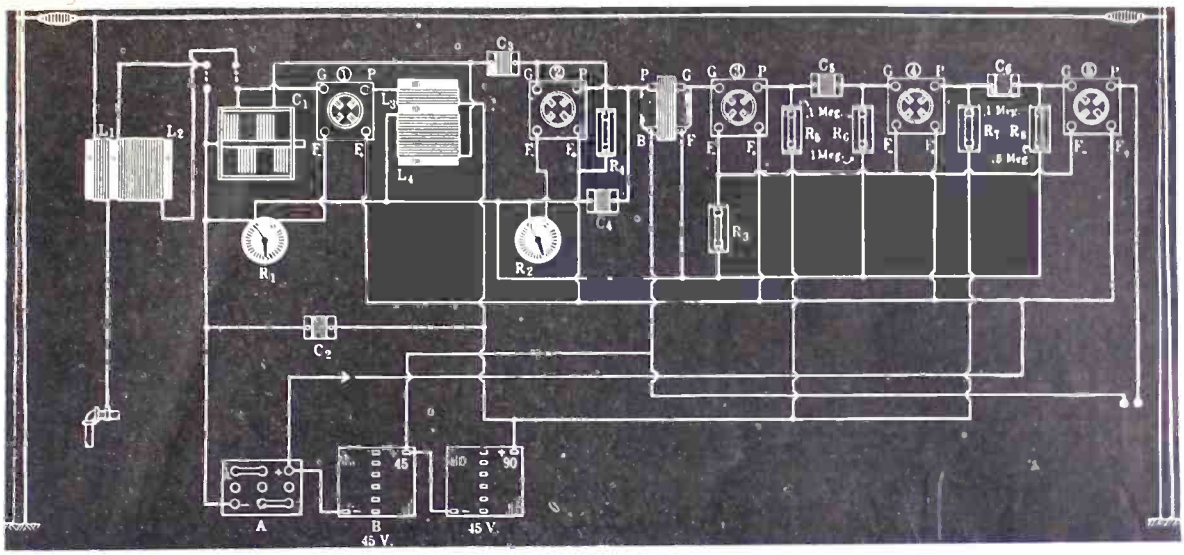


IF you have a non-regenerative receiver and you desire to listen into pure CW code signals, the above method will be the solution. L1 consists of 50 turns of No. 22 DCC wire wound on a 3½" tubing and tapped at every 3rd turn. C1 is a .0005 mfd. variable condenser. The arrow coming from the A minus is the only variable portion of the coil and goes to the 16 taps. By varying these taps, closer or looser coupling between the plate and the grid can be obtained. Use a WV 201A tube with 67½ volts on the plate



COILS connected so that the inductive fields aid (vertical arrows) cause current to flow (arrows at tube) in opposite directions, as each tube changes the phase 180°. To effectuate zero phase difference, reverse connections on one of the coils

Economy in the Powertone



FOR economy of operation, the 1-dial, 5-tube Powertone may be wired as shown above. Only 90 volts are used on the highest patential plate connections and 45 on the final plate. For more volume, at greater cost, use 135 volts where 90 are shown for the ends of resistors R5 and R7. Then connect the final plate to 90 volts. The four binding posts at left are connected by removable busbar for outdoor aerial operation and removed when a loop is to be used. The loop goes to the two posts shown in lower position. For details on construction of the set see RADIO WORLD, issues of August 29, September 5 and September 12

Trouble Shooting Advice for the 1926 Model Diamond

ONE of the peculiarities that may develop in tuning The Diamond of the Air or any other circuit is that the rheostat has some effect on tuning, most noticeable on the low waves. This is due to incorrect connection of the grid return. As explained in the constructional article on this circuit, the grid return of the RF and detector tubes should be to A battery. Follow the lead from the battery. See that the low potential end of the secondary of the RFT (or loop) goes to A minus. If the Sodion tube or a soft detector is used, see that the grid return here also is to negative A. Do not make the connection to the socket side of the rheostat, for that would include the rheostat in the radio-frequency part of the circuit, introducing the resistance of the rheostat where it is not wanted, and also causing the inductive effect of the wire on that type of rheostat to make itself felt. Many may have felt that there must be induction in a rheostat, for a coil of wire is there. Indeed, often such induction is more than trivial and by turning the rheostat one station may be tuned in and another tuned out. That should not be. Make the grid return connections properly and get rid of this nuisance feature of the rheostat.

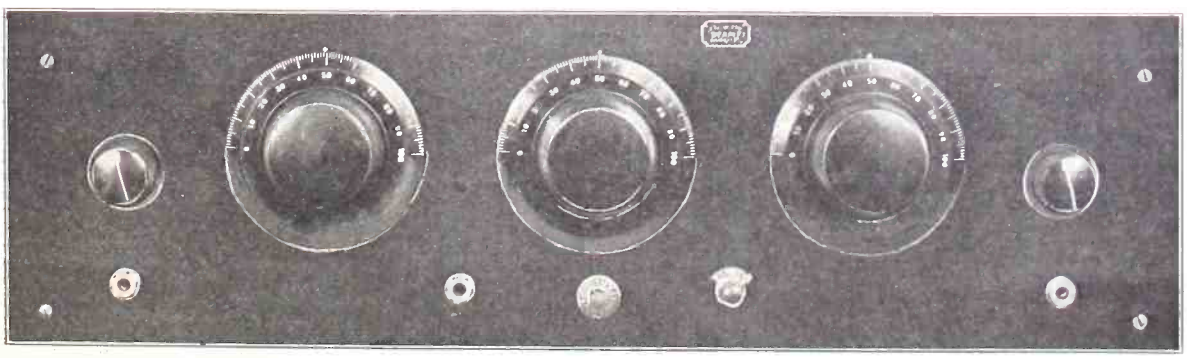
In tuning the diamond it may be noticed that the regeneration control is affected by the direction in which the loop is pointed. Suppose that the loop were properly pointed toward the station being received. That would mean that one horizontal support of the loop would point toward the station. Do not point the broad side of the loop toward the station, a mistake some make before they become familiar with loop use. Now granting all's well ,if the loop is the turned in an "off" direction, the regenerative whistle may be heard. In many cases, where one is receiving a strong local station on the loop, that station may be heard, no matter in which direction the loop is turned, but once the loop faces the station properly, a sudden increase in volume is the gratifying result. Sometimes the loop turned the wrong way will cause the set to oscillate, because of a heterodyne note set up. Soon, however, the right direction for every station within range is learned, and after that no such trouble develops.

The inclusion of the radio-frenquency transformer so that outdoor aerial and ground may be used, and loop cut out, introduces the possibility of stray coupling between the RF coil and the coupler.

It is important to remember that even the tiniest difference in the position of the two coils may make itself felt, so that the RF coil must be adjusted until there is no troublesome coupling. Total avoidance of any degree of coupling whatever, when both coils are within the set, is probably impossible, but there is no advantage in attempting the theoretical ideal. Practical success is all that counts, and you may achieve that readily.

Many may desire to have the left-hand tuning control read the same, whether loop or outdoor aerial is used. That may be done readily by altering the number of turns on the secondary of the RFT. If the loop gives higher readings, then turns must be taken off the RFT secondary, to push the condenser readings up higher. If the loop gives a lower reading for the same

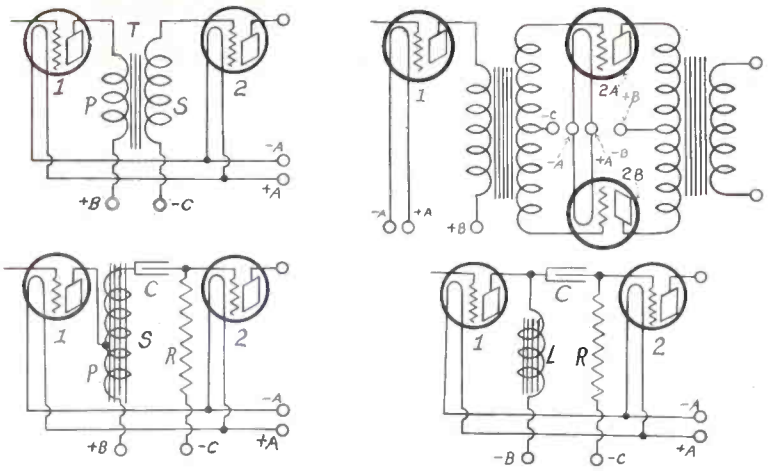
(Concluded on page 30)



THE PANEL of the 1926 Model Diamond of the Air. The loop jack is at left, the speaker jack at right.

Audio Circuits Compared

By J. E. Anderson, Noted Engineer



AT top left (Fig. 1), is the wiring of a transformer stage of audio. At bottom, left, is an auto-transformer hookup (Fig. 2). Push-pull is shown in Fig. 3, top, right, and choke coil coupling in Fig. 4, bottom, right.

Noted Authority Puts Resistance, Choke Coil and Auto-Transformer Coupling in the Quality Class — Stopping Condensers Should Be 1.0 Mfd.. for Auto-Transformer Stages, He Advises — Primaries Too Small in Most AF Transformers.

By J. E. Anderson
Consulting Engineer

PART I.

AMPLIFIERS in general may be divided into two classes, power amplifiers and voltage amplifiers. The classification depends on the purpose for which a tube is used and on the nature of the impedance in its plate circuit. An amplifier which delivers power into some device, such as a loudspeaker or a coupling transformer, is a power amplifier regardless of the absolute level of power involved; and an amplifier which is used primarily to step up voltage is a voltage amplifier. In the latter class come all direct coupled amplifiers such as resistance and choke coil coupled circuits.

The most common type of amplifier, and the most economical to operate, is a power amplifier employing audio-frequency transformers to couple the several tubes. This type is exemplified in Fig. 1. In this circuit the first tube is operated as a power amplifier because it is made to deliver power to the primary of the audio-frequency transformer T. The transformer is used to step up the voltage before it is impressed on the second tube. The tube and the transformer taken together constitute a voltage amplifier. If a loudspeaker or another transformer were connected to the output of the second tube, this also would be a power amplifier.

Amplification Computed

The voltage amplification of a complete stage of this type of coupling is equal to the amplification constant of the tube multiplied by the square root of the product of the primary and the secondary impedances of the transformer, divided by the sum of the plate output impedance and the impedance of the primary of the transformer. For instance, consider the amplification of a stage consisting of a 201A tube and a General Radio Type 285 transformer when the tube is operated under conditions which make its plate output impedance equal to 12,000 ohms. Its amplification factor is then eight. The primary impedance at 1,000 cycles of the given transformer is 155,000 ohms and its secondary impedance at the same frequency is 5,500,000 ohms. Hence the square root of the product of the two impedances is 923,000 ohms, and the sum of the plate impedance and the primary impedance is 167,000 ohms. This makes the voltage amplification of the stage equal to 8x923,000/167,000, or 44.2 times. This is a theoretical value. The actual value is usually less than this. For a grid bias of 6 volts and a plate voltage of 110 volts, the manufacturers give the amplification for this transformer and tube as 35. A higher plate voltage would boost the amplification up nearer the calculated value.

At 100 cycles the impedances of the primary and secondary windings are about one-tenth as high as those given above. Hence at this frequency the square root of the product of the two is 92,300 ohms and the sum of the primary and the plate impedance is 27,500 ohms. Hence the amplification is 8x92,300/27,500, or 26.8 times. These figures are only roughly correct, and they do not show up the given transformer fairly, but they do show the trend of the amplification curve of transformers in general.

Most Amplification Per Tube

No other form of coupling gives as much amplification per tube as does transformer coupling. In this form the amplification may be several times the amplification factor of the tube. In other types of coupling this factor can only be approached but never reached, so that for the 201A tube the amplification cannot exceed 8 unless transformers are used. It is this high voltage gain per stage that makes transformer coupled circuits most economical as well as most popular, and it is their chief advantage. The disadvantage of transformer coupling is that the amplification is not uniform throughout the musical range. **It does not bring out either the low notes or the high as well as it does the notes in the middle of the range.** The failure to bring out the low notes is due the transformer becoming inefficient at lower frequencies, and the failure to bring out the high notes is due to the by-pass effect of the distributed capacity of the windings.

A somewhat special type of transformer coupling is shown in Fig. 2, in which an auto-transformer is used. Some would insist that this is not a transformer but a choke coil since it has only one winding. But it is a transformer because part of the single winding is used as the primary and the entire winding as the secondary, and the amplification of a stage employing this kind of coupling may be estimated in the same way as was done above for the

How to Determine Series-Aiding Status

Two practical ways of testing a transformer to determine if it is connected in series-aiding for choke-coil or auto-transformer coupling, (1) Hartley oscillator test, and (2) condenser test.

J. E. ANDERSON

Transformers are usually marked P, B, F and G. In most cases they are so marked that if B and F are joined they are connected in series aiding. To make sure, connect the transformer as a Hartley oscillator. Connect G to the grid of the tube, B and F joined together to the filament, P to the negative of the plate battery, the positive terminal of the plate battery to the phone, and the other side of the phone to the plate of the tube. If the circuit howls when the tube is lighted the transformer windings are in series aiding. If oscillation fails, reverse connections and renew test. The howl denotes correct connection.

The second method uses a .01 mfd. or similarly large condenser. Connect P of AFT to one side of this condenser and to an external—45 volts. B and F are interconnected. G goes to one of the phone leads. The other side of the condenser goes to the arm of a DPST switch. One switch point goes to plus 45, the other to the the open phone lead. Using the switch, connect condenser to battery. Then quickly throw switch to the phone post. Thus a charge and discharge of the condenser occur. If the condenser is not too large, the circuit formed by the headset, the transformer and the condenser is oscillatory. Charge and discharge the condenser several times in rapid succession until the pitch is impressed on the mind. Then reverse the connections of the transformer so that P and B are interchanged. Again note the pitch. The connection which gives the lower pitch is the series aiding.

Push-Pull AF Called Poor

"Its Practical Advantage Often Nil"

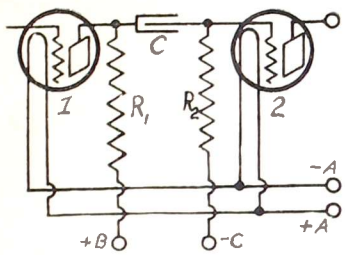


FIG. 5, resistance coupling.

straight transformer. It is superior in some respects to the conventional transformer method, particularly for the higher frequencies, since it requires a fewer number of turns to obtain a given step-up of voltage. Hence the distributed capacity will be less; and the coupling between the secondary and the primary is closer.

Advises 1.0 Mfd. Condenser

The use of this kind of coupling requires a stopping condenser C as well as a grid leak R to keep the plate voltage off the grid of the succeeding tube and to give that grid the proper negative bias. Both condenser and leak modify the amplification slightly, since the input to the second tube is the voltage drop across the resistance R and not the voltage existing across the secondary of the transformer. However, if both the condenser and the leak are large the modification is very slight except for the lowest frequencies. R should be about 0.5 megohm and C should not be less than 1.0 mfd.

Any transformer may be used as an auto-transformer in this manner. All that is necessary is to connect the two windings of the transformer in series aiding and then connect the junction point to the plate and the two extremes to the stopping condenser and the plate battery. The step-up ratio of this auto-transformer would be greater than the step-up for the ordinary transformer because the primary turns would remain the same and the secondary turns would be increased by the number of turns in the primary. This change would not be desirable for a high-ratio transformer, but for a low-ratio transformer it may be advantageous. For instance take the General Radio Type 285 L transformer. This has a ratio of 1-to 2. If this is connected as an auto-transformer the ratio would become 1-to-3 and the step-up would be considerably greater. This transformer has a primary of ample size so that the increased step-up would not result in distortion, yet the additional volume, if needed, would be enough to make it worth while to change the connection to an auto-transformer.

Primaries are Too Small

The trouble with most of the audio frequency transformers on the market is that the primary winding is not large enough. The tube works at a disadvantage; it cannot deliver enough power to the transformer, and consequently the amplification will be low even if the ratio is high, except for some one frequency at which the transformer is more or less a tuned circuit. Quality will be horrible.

But even a bad transformer, one having a small primary, may be used as an auto-transformer with good results. The windings should be reversed, that is, the secondary portion should be used in the plate circuit and the entire winding in the secondary. This would cause a slight step-up of voltage due to the additional small winding in the secondary circuit. However, for a high ratio instrument the step-up would be slight. When a transformer is used in this reversed manner, the coupling approaches that of choke coil coupling and the amplification that of voltage. This method of connecting up a bad transformer is worth trying as it may be the means of salvaging instruments that have been rated as junk.

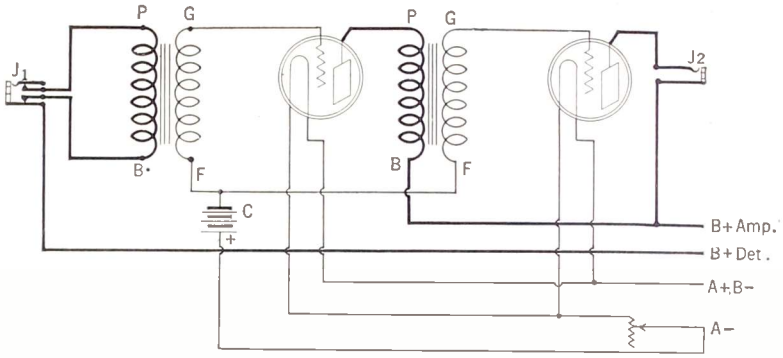


FIG. 6, two stages of transformer-coupled audio, with C battery.

Since the impedance of the secondary is very high, a tube which has a very high output impedance may be used to good advantage, that is a hi-Mu tube. These tubes cannot be well used for transformer coupling because the impedance of the primary of the transformer is too small, but if the secondary is connected to the tube, the matching of impedances will be more advantageous.

Push-Pull AF Criticized

Another special type of power amplifier is that known as push-pull, shown in principle in Fig. 3. The theoretical advantage of this type of amplifier is that it eliminates all harmonics of even order which may arise in the two tubes. It does not eliminate any of the harmonics of odd order arising in these tubes nor any harmonics or any order which may have been introduced into the signal before it reached the push-pull amplifier. **The practical advantage of the push-pull circuit is often nil; perhaps in most cases it is an actual liability in the set.** The volume is often less than it would have been with a single tube, and the distortion may be much greater. The difficulty lies in the transformers used, not so much in the principle of the circuit.

But even with the best transformers there is no appreciable increase in the purity of the output, except when the volume is so great as to overload the tubes. Part of the better showing of the push-pull circuit on loud signals over the single tube is due to the elimination of the even order harmonics, but the greater part is due to division of the load between two tubes. The input voltage is divided equally between the two so that for a given volume in the output each tube is working well within the straight portion of the characteristics, where no harmonics are generated; while if a single tube were made to handle the same output this tube would be overloaded, harmonics would be introduced and all of them would be transmitted to the loud speaker.

Distortion due to harmonics is not so serious as distortion due to unequal amplification over the entire tonal scale. If the middle registers are brought out very strongly and the high and the low are suppressed, the signal will be unnatural and often intolerable. The use of an extra transformer which is required in a push-pull circuit tends to accentuate this unequal amplification. Many of the output transformers intended for push-pull amplifiers which may be obtained are merely ordinary windings tapped in the middle for the B battery connection. Ordinarily such primary windings are so small as to make it impossible to bring out the low notes, even when the entire winding is connected into the plate circuit of a tube. Then when they are tapped at the middle point only half the number of turns is used in each tube. This makes the load impedance only one-fourth as great as before. If the entire winding was not large enough to bring out the low notes, how can these be brought out with only one-half the number of turns and one-fourth the impedance. They are not brought out. Not only that but the great reduction in the plate output impedance puts it below the value required to have the dynamic characteristic of the tubes a straight line. This will result in the introduction of more harmonics, so that even after the circuit has eliminated the even ones there will be more energy in the odd ones than if a single tube had been employed. Unless exceptionally good transformers are used in a push-pull amplifier the greater purity of tone is largely a

Choke Coil AF Very Good

At present choke coil-coupled amplifiers are gaining favor among the fans. These amplifiers are a compromise between transformer-coupled circuits and resistance-coupled, both as to the cost of operation and the quality they yield. A typical choke coil coupled with circuit is shown in Fig. 4.

This circuit is essentially a voltage amplifier. The voltage stepup is due to the amplification factor of the tube and not to any stepup in the coupling. In fact the coupling causes a reduction of the stepup caused by the tube, unless the impedance of the choke is infinite in value. The plate current from the first tube flows through the choke coil L and establishes a voltage across its terminals which is equal to the current flowing multiplied by the impedance of the coil. This voltage is impressed on the grid of the following tube through the condenser C and across the grid leak R.

(Part II, the Conclusion, next week)

HOW TO BUILD THE POWERTONE, 1 dial, 5 tubes, described in RADIO WORLD, issues of Aug. 29 and Sept. 5. Powertone Trouble-shooting, Sept. 12. Send 15c for all three. Special diagrams and "blueprint in black" included among the many illustrations. RADIO WORLD, 145 West 45th St., N. Y. City.

The Official List of Stations

Corrected and Revised Up to September 23

Station	Owner and Location	Meters
KDKA	Westinghouse E. & M. Co., E. Pittsburgh, Pa.	309
KDLR	Radio Elec. Co., Devils Lake, N. D.,	231
KDPM	Westinghouse E. & M. Co., Cleveland, Ohio	250
KDYL	Newhouse Hotel, Salt Lake City, Utah	250
KDZB	F. E. Seifert, Bakersfield, Cal.	210
KFAB	Nebraska Buick Auto Co., Lincoln Neb.	340
KFAD	McArthur Bros. Merc. Co., Phoenix Ariz.	273
KFAE	State College, Pullman, Wash.	349
KFAF	Western Radio Corp., Denver, Colo.	278
KFAJ	University of Colorado, Boulder, Colo.	261
KFAN	University of Idaho, Moscow, Idaho.	231
KFAU	Boise High School, Boise, Idaho	278
KFAW	Radio Den, Santa Ana, Cal.	214
KFBB	F. A. Buttrey Co., Havre, Mont.	275
KFBC	W. K. Azbill, San Diego, Cal.	224
KFBG	1st Presbyterian Church, Tacoma, Wash.	250
KFBK	Kimball Upson So., Sacramento, Cal.	248
KFBL	Leese Bros., Everett, Wash.	224
KFBS	School District No. 1, Trinidad, Col.	238
KFBU	Bishop N. S. Thomas, Laramie, Wyo.	270
KFCB	Nielson Radio Co., Phoenix, Ariz.	238
KFCC	1st Congregational Church, Helena, Mont.	248
KFCF	F. A. Moore, Walla Walla, Wash.	256
KFCY	Western Union College, Lemars, Iowa	252
KFCZ	Central High School, Omaha, Neb.	258
KFDD	St. Michael's Cathedral, Boise, Idaho	278
KFDH	University of Arizona, Tuscon, Ariz.	268
KFDJ	Oregon Agricultural College, Corvallis, Ore.	254
KFDM	Magnolia Petroleum Co., Beaumont, Texas	316
KFDX	1st Baptist Church, Shreveport, La.	250
KFDY	State College of Agriculture, Brookings, S. D.	273
KFDZ	H. O. Iverson, Minneapolis, Minn.	231
KFEC	Meier & Frank Co., Portland, Ore.	248
KFEL	Winner Radio Corp., Denver, Colo.	254
KFEQ	J. L. Scroggin, Oak, Neb.	268
KFEY	Bunker Hill & Sullivan, Kellog, Idaho	233
KFFP	1st Baptist Church, Moberly, Mo.	242
KFFV	Graceland College, Lamoni, Iowa	250
KFGC	Louisiana State University, Baton Rouge, La.	268
KFGD	College for Women, Chickasha, Okla.	252
KFGH	Leland Stanford Junior University, Stanford University, Cal.	270
KFGQ	Crary Co., Boone, Iowa	226
KFGX	1st Presbyterian Church, Orange, Texas	250
KFHA	Western State College, Gunnison, Colo.	252
KFHL	Penn College, Oskaloosa, Iowa	240
KFI	E. C. Anthony, Inc., Los Angeles, Cal.	469
KFIF	Benson Institute, Portland, Ore.	248
KFIO	North Central High School, Spokane, Wash.	266
KFIQ	1st Methodist Church, Yakima, Wash.	256
KFIU	Alaska Elec. Co., Juneau, Alaska	226
KFIZ	Daily Commonwealth, Fond du Lac. Wis.	273
KFJB	Marshall Elec. Co., Marshalltown, Ia.	248
KFJC	R. B. Fegan, Junction City, Kan.	219
KFJF	National Radio Co., Oklahoma City, Okla.	261
KFJI	Liberty Theatre, Astoria, Ore.	246
KFJM	University of N. D., Grand Forks, N. D.	278
KFJR	Ashley C. Dixon & Son, Portland, Ore.	263
KFJX	State Teachers College, Cedar Falls, Ia.	258
KFJY	Tunwall Radio Co., Ft. Dodge, Iowa.	246
KFJZ	W. E. Branch, Ft. Worth, Tex.	254
KFKA	State Teachers College, Greeley, Colo.	273
KFKQ	Conway Radio Laboratory, Conway, Ark.	250
KFKU	University of Kansas, Lawrence, Kans.	275
KFKX	Westinghouse E. & M. Co., Hastings, Neb.	288
KFKZ	F. M. Henry, Kirksville, Mo.	226
KFLP	Everette M. Foster, Cedar Rapids, Ia.	256
KFLR	University of N. M., Albuquerque, N. M.	254
KFLU	Rio Grande Radio Sup. Co., San Benito, Texas	236
KFLV	Swedish Evangelist Church, Rockford, Ill.	229
KFLX	George R. Clough, Galveston, Texas	240
KFLZ	Atlantic Auto Co., Atlantic, Iowa.	273
KFMB	Christian Churches of Little Rock, Little Rock, Ark.	254
KFMO	University of Ark., Fayetteville, Ark.	300
KFMR	Morningside College, Sioux City, Iowa	261
KFMT	Dr. G. W. Young, Minneapolis, Minn.	263
KFMX	Carleton College, Northfield, Minn.	337
KFNF	Henry Field Seed Co., Shenandoah, Iowa	266
KFNG	Wooten Radio Shop, Coldwater, Miss.	254
KFNL	Union High School, Paso Robles, Cal.	240
KFNV	L. A. Drake, Santa Rosa, Cal.	229
KFOA	Rhodes Company, Seattle, Wash.	454
KFOL	L. M. Schaffbuch, Marengo, Iowa	234
KFON	Echophone Radio Shop, Long Beach, Cal.	233
KFOO	Latter Day Saints University, Salt Lake City, Utah	236
KFOR	David City Tire & Elec. Co., David City, Neb.	226
KFOT	College Hill Radio Club, Wichita, Kan.	231
KFOX	Technical High School, Omaha, Neb.	248
KFOY	Beacon Radio Service, St. Paul, Minn.	252
KFPG	Oliver S. Garretson, Los Angeles, Cal.	238
KFPL	C. C. Baxter, Dublin, Texas	252
KFPM	New Furniture Co., Greenville, Texas	242
KFPR	Forestry Department, Los Angeles, Cal.	231
KFPW	St. John's Church, Carterville, Mo.	258
KFPY	Symonds Investment Co., Spokane, Wash.	266
KFQA	The Principia, St. Louis, Mo.	261
KFQB	Searchlight Publishing Co., Ft. Worth, Texas	263
KFQC	Kidd Bros., Taft, Cal.	231
KFQH	Radio Service Co., Burlingame, Cal.	220
KFQP	G. S. Carson, Jr., Iowa City, Ia.	224
KFQT	National Guard, Denison, Tex.	252
KFQU	W. Riker, Holy City, Cal.	222
KFQW	F. C. Knierim, North Bend, Wash.	216
KFQA	Farmers State Bank, Belden, Neb.	273
KFOZ	Taft Radio Co., Hollywood, Cal.	226
KFRB	Hall Bros., Beevile, Texas	248
KFRC	Paris Dry Goods Co., San Francisco.	268
KFRL	Men's Club, Grand Forks, N. D.	240
KFRU	Etherical Studio, Bristow, Okla.	295
KFRW	United Churches, Olympia, Wash.	220
KFRX	J. G. Klemgard, Pullman, Wash.	217
KFRY	College of Agriculture, State College, N. M.	266
KFRR	College of Agriculture, State College, N. M.	266
KFRZ	The Electric Shop, Hartington, Neb.	222
KFSG	Echo Park Evangelistic Ass'n, Los Angeles, Cal.	275
KFSY	The Van Blaricom Co., Helena, Mont.	243
KFUJ	Hoppert P. and H. Co., Breckenridge, Minn.	242
KFUL	T. Goggan & Bro., Galveston, Tex.	258
KFUM	W. D. Corley, Colorado Springs, Colo.	242
KFUO	Concordia Theo. Seminary, St. Louis, Mo.	545
KFUP	Fitzsimmons General Hospital, Denver, Colo.	234
KFUR	H. W. Peery and R. Redfield, Ogden, Utah	224
KFUS	Louis L. Sherman, Oakland, Cal.	233
KFUT	University of Utah, Salt Lake City, Utah	261
KFUU	Colhurn Radio Laboratories, San Leandro, Cal.	224
KFUV	G. P. Ward, Springfield, Mo.	252
KFUZ	Y. M. C. A., Virginia, Minn.	248
KFVD	Chas. & W. J. McWhinnie, San Pedro, Cal.	205
KFVE	Film Corp., St. Louis, Mo.	240
KFVF	Clarence B. Juneau, Hollywood, Cal.	208
KFVG	1st Meth-Epis. Church, Independence, Kan.	236
KFVH	Herbert Whan, Manhattan, Kans.	219
KFVI	56th Cav. Brigade, Houston, Tex.	248
KFVO	F. M. Henry, Kirksville, Mo.	226
KFVR	Moonlight Ranch, Denver, Col.	246
KFVS	Cape Girardeau Battery Station, Cape Girardeau, Mo.	224
KFVU	The Radio Shop, Eureka, Cal.	210
KFVW	Airfan Radio Corp., San Diego, Cal.	246
KFVX	Radio Shop, Bentonville, Ark.	236
KFVY	Radio Supply Co., Abuquerque, N. M.	250
KFVZ	Glad Tidings Tabernacle, Inc., San Francisco Cal.	234
KFWA	Browning Bros. Co., Ogden, Utah.	261
KFWB	Warner Bros. Pictures, Inc., Hollywood, Cal.	252
KFWC	L. E. Wall & C. S. Myers, Upland, Cal.	211
KFWD	Ark Light Co., Arkadelphia, Ark.	266
KFWF	St. Louis Truth Center, St. Louis, Mo.	214
KFWH	F. Wellington Morse, Jr., Chico, Cal.	254
KFWO	Lawrence Mott, Avalon, Cal.	211
KFWP	Rio Grande Radio Supply House, Bronsville, Texas	214
KFWI	Radio Entertainers, Inc., South San Francisco, Cal.	220
KFWM	Oakland Educational Soc., Oakland, Cal.	207
KFWU	Louisiana College, Pineville, La.	238
KFWV	Wilbur Jerman, Portland, Ore.	213
KFYN	Carl E. Bagley, Welcome, Minn.	227
KFXB	B. O. Heller, Big Bear Lake, Cal.	203
KFXC	Santa Maria Valley R. R. Co., Santa Maria, Cal.	210
KFXD	L. H. Strong, Logan, Utah	205
KFXE	Electric Research and Mfg. Co., Waterloo, Ia.	236
KFXH	Bledsoe Radio Co., El Paso, Texas	242
KFXJ	Mt. States Radio District, Inc., (Portable), Col.	216
KFXF	Pikes Peak Broadcasting Station Co., Colo. Springs, Colo.	250
KGB	The Ledger, Tacoma, Wash.	250
KGO	General Electric Company, Oakland, Cal.	361
KGU	M. A. Mulrony, Honolulu, Hawaii	270
KGW	The Oregonian, Portland, Ore.	492
KGY	St. Martin's College, Lacey, Wash.	246
KHJ	The Times, Los Angeles, Cal.	405
KHQ	Louis Wasmer, Seattle, Wash.	273
KJBS	J. Brunton & Sons Co., San Francisco, Cal.	236
KJR	Northwest Radio Co., Seattle, Wash.	384
KJS	Bible Institute, Los Angeles, Cal.	294
KLDS	Reorganized Church of Jesus Christ of Latter Day Saints, Independence, Mo.	441
KLS	Warner Bros. Radio Co., Oakland, Cal.	242
KLX	Tribune, Oakland, Cal.	508
KLZ	Reynolds Radio Co., Denver, Col.	266
KMA	May Seed & Nursery Co., Shenandoah, Ia.	252
KMJ	San Joaquin Corp., Fresno, Cal.	234
KMO	Love Elec. Co., Tacoma, Wash.	250
KNX	Express, Hollywood, Cal.	337
KOA	General Electric Co., Denver, Col.	322
KOB	College of Agri., State College, N. M.	349
KOIL	Monarch Manufacturing Co., Council Bluffs, Ia.	278
KOP	Detroit Police Department, Detroit Mich.	273
KPO	Hale Brothers, San Francisco, Cal.	429
KPPC	Pasadena Presbyterian Church, Pasadena, Cal.	229
KPRC	Houston Print Co., Houston, Tex.	297
KQP	Apple City Radio Club, Hood River, Ore.	270
KQV	Doubleday Hill Elec. Co., Pittsburgh, Pa.	275
KRE	Gazette, Berkeley, Cal.	258
KSAC	Kansas State Agricultural College, Manhattan, Kans.	341
KSD	Post Dispatch, St. Louis, Mo.	545
KSL	Radio Service Corp., Salt Lake City, Utah	308
KTAB	Tenth Ave. Baptist Church, Oakland, Cal.	216
KTBI	Bible Inst., Los Angeles, Cal.	294
KTCL	American Radio Tel. Co., Inc., Seattle, Wash.	306
KTHS	New Arlington Hotel, Hot Springs, Ark.	375
KTW	1st Presbyterian Church, Seattle, Wash.	454
KUO	Examiner, San Francisco, Cal.	246
KUOM	State University of Montana, Missoula, Mont.	245
KUPR	Union Pacific R. R. Co., Omaha, Neb.	270
KWG	Portable Wireless Tel. Co., Stockton, Cal.	248
KWWG	City of Brownsville, Brownsville, Tex.	278
KYW	Westinghouse E. & M. Co., Chicago, Ill.	535
KZKZ	Electric Supply Co., Manila, P. I.	270
KZM	Western Radio Inst., Oakland, Cal.	241
KZRQ	Far Eastern Radio. Inc., Manila, P. I.	222
WAAB	V. Jensen, New Orleans, La.	268
WAAC	Tulane University, New Orleans, La.	275
WAAD	Ohio Mech. Institute, Cincinnati, O.	258
WAAF	Drovers Journal, Chicago, Ill.	278
WAAM	I. R. Nelson Co., Newark, N. J.	263
WAAW	Omaha Grain Exchange, Omaha, Neb.	278
WABA	Lake Forest University, Lake Forest, Ill.	227
WABB	Harrisburg Sporting Goods Co., Harisburg, Pa.	266
WABC	Asheville Battery Co., Inc., Asheville, N. C.	254
WABI	Bangor Ry. & Elec. Co., Bangor, Me.	240
WABL	Agricultural College, Storrs, Conn.	275
WABO	Lake Avenue Baptist Church, Rochester, N. Y.	278
WABQ	Haverford College Radio Club, Haverford, Pa.	261
WABR	Scott High School, Toledo, O.	263
WABW	College of Wooster, Wooster, O.	207
WABX	H. B. Joy, Mt. Clemens, Mich.	246
WABY	John Magaldi, Philadelphia, Pa.	242
WABZ	Coliseum Place Baptist Church, New Orleans, La.	275
WADC	Allen Theatre, Akron, Ohio.	258
WAFD	A. B. Parfet Co., Port Huron, Mich.	256
WAHG	A. H. Grebe Co., Richmond Hill, N. Y.	316
WAIT	A. H. Waite & Co., Taunton, Mass.	229
WAMD	Hubbard & Co., Minneapolis, Minn.	244
WARG	American Radio Res. Corp., Medford Hillside, Mass.	261
WBAA	Purdue University, West Lafayette, Ind.	273
WBAK	State Police, Harrisburg, Pa.	276
WBAO	James Millikia University, Decatur, Ill.	270
WBAP	Star Telegram, Fort Worth, Tex.	476
WBAV	Erner Hopkins Co., Columbus, O.	294
WBAX	J. H. Stenger, Jr., Wilkes-Barre, Pa.	256
WBBA	Plymouth Congregational Church, Newark, O.	226
WBBL	Grace Covenant Presbyterian Church, Richmond, Va.	248
WBBM	H. L. Atlass, Chicago, Ill.	229
WBBP	Petoskey High School, Petoskey, Mich.	226
WBBR	Peoples Pulpit Ass'n., Rossville, N. Y.	238
WBBS	1st Baptist Church, New Orleans, La.	273
WBBU	Jenks Motor Sales Co., Monmouth, Ill.	252
WBBW	Ruffner City High School, Norfolk, Va.	234
WBBY	Washington Light Infantry, Charleston, S. C.	222
WBCN	Southtown Economist, Chicago, Ill.	268

Station	Owner and Location	Meters
WBDC	Baxter Laundry Co., Grand Rapids, Mich.	256
WBES	Bliss Electrical School, Takoma Park, Md.	222
WBOQ	A. H. Grebe & Co., Richmond Hill, N. Y.	236
WBR	State Police, Butler, Pa.	203
WBRC	McDonald Radio Co., (portable), Joliet, Ill.	298
WBRE	Baltimore Radio Ex., Wilkes-Barre, Pa.	231
WBS	D. W. May, Inc., Newark, N. J.	252
WBT	Southern Radio Co., Charlotte, N. C.	275
WBZ	Westinghouse E. & M. Co., Springfield, Mass.	333
WBZA	Westinghouse Electric and Mfg. Co., Boston, Mass.	242
WCAC	Agricultural College, Mansfield, Conn.	275
WCAD	St. Lawrence University, Canton, N. Y.	263
WCAE	Kaufman & Baer, Pittsburgh, Pa.	461
WCAH	Entrekin Electric Co., Columbus, O.	266
WCAJ	Nebraska Weslevan University, University Place, Neb.	254
WCAL	St. Olaf College, Northfield, Minn.	337
WCAO	Sanders & Stayman, Baltimore, Md.	275
WCAP	C. & P. Tel. Co., Washington, D. C.	469
WCAR	Southern Radio Corp., San Antonio, Texas.	263
WCAT	School of Mines, Rapids City, S. D.	240
WCAU	Durham & Co., Philadelphia, Pa.	278
WCAX	University of Vermont, Burlington, Vt.	250
WCAZ	Carthage College, Carthage, Ill.	246
WCBA	Queen City Radio, Allentown, Pa.	254
WCBC	University of Michigan, Ann Arbor, Mich.	229
WCBD	W. G. Voliva, Zion, Ill.	345
WCBE	Uhalt Radio Co., New Orleans, La.	263
WCBG	H. S. Williams, Mayleld, Ky.	268
WCBH	University of Mississippi, Oxford, Miss.	242
WCBM	Hotel Chateau, Baltimore, Md.	229
WCBQ	1st Baptist Church, Nashville, Tenn.	242
WCBR	C. H. Messter (Portable), Providence, R. I.	205
WCBU	Arnold Wireless Co., Arnold, Pa.	220
WCBY	Forks Electrical Shop, Buck Hill Falls, Pa.	231
WCBZ	Neutrowound Radio Mfg. Co., Chicago Heights, Ill.	217
WCCO	Washburn Crosby Co., Minneapolis, Minn.	416
WCEE	C. E. Erbstein, Elgin, Ill.	275
WCK	Stix Baer & Fuller Co., St. Louis, Mo.	273
WCLO	C. W. Whitmore, Camp Lake, Wis.	231
WCLS	H. M. Church, Joliet, Ill.	214
WCM	Texas Market Department, Austin, Texas	268
WCSH	Henry P. Rines, Portland, Me.	256
WCSO	Wittenberg College, Springfield, Ohio.	248
WCTS	C. T. Sherer Co., Worcester, Mass.	268
WCUW	Clark University, Worcester, Mass.	238
WCX	Detroit Free Press, Detroit, Mich.	517
WDND	Dodd's Auto Accessories, Inc., 160-164 8th Ave., N., Nashville, Tenn.	226
WDZ	S. L. Bush, Tuscola, Ill.	278
WDAE	Tampa Daily News, Tampa, Fla.	273
WDAF	Kansas City Star, Kansas City, Mo.	366
WDAG	J. L. Martin, Amarillo, Tex.	263
WDAY	Radio Equipment Corp., Fargo, N. D.	261
WDBC	Kirk, Johnson & Co., Lancaster, Pa.	258
WDBE	Gilham-Schoen Elec. Co., Atlanta, Ga.	278
WDBF	R. G. Phillips, Youngstown, O.	222
WDBJ	Richardson Wayland Elec. Co., Roanoke, Va.	229
WDBK	M. F. Broz, Furn., Cleveland, O.	227
WDBL	Department of Markets, Stevens Point, Wis.	278
WDBO	Rollins College, Winter Park, Fla.	240
WDBQ	Morton Radio Supply Co., Salem, N. J.	234
WDBR	Tremont Temple Baptist Church, Boston, Mass.	261
WDBS	S. M. K. Radio Corp., Dayton, O.	275
WDBX	Dyckman Radio Shop, New York, N. Y.	233
WDBY	North Shore Congregational Church, Chicago, Ill.	258
WDBZ	Boy Scouts of America, Kingston, N. Y.	233
WDOD	Chattanooga Radio Co., Chattanooga, Tenn.	256
WDRC	Doolittle Radio Corp., New Haven, Conn.	268
WDWF	Dutee Wilcox Flint, Inc., Cranston, R. I.	441
WDZ	J. L. Bush, Tuscola, Ill.	278
WEAA	F. D. Fallain, Flint, Mich.	234
WEAF	A. T. & T. Co., New York, N. Y.	492
WEAH	Wichita Board of Trade, Wichita, Kans.	268
WEAI	Cornell University, Ithaca, N. Y.	254
WEAJ	University of South Dakota, Vermillion, S. D.	278
WEAM	Borough of North Plainfield, N. Plainfield, N. J.	261
WEAN	Shepard Co., Providence, R. I.	270
WEAO	Ohio State University, Columbus, O.	294
WEAR	Goodyear T. and R. Co., Cleveland, O.	390
WEAU	Davidson Bros. Co., Sioux City, Ia.	275
WEAY	Iris Theatre, Houston, Texas	270
WEBA	The Electric Shop, Highland Park, N. J.	233
WEBC	W. C. Bridges, Superior, Wisc.	242
WEBD	Elec. Equipment & Service Co., Anderson, Ind.	246
WEBE	Roy W. Waller, Cambridge, Ohio.	234
WEBH	Edgewater Beach Hotel, Chicago, Ill.	370
WEBJ	Third Avenue R. R. Co., New York, N. Y.	273
WEBK	Grand Rapids Radio Co., Grand Rapids, Mich.	242
WEBL	Radio Corp. of Ama. (Portable)	226
WEBM	Radio Corp. of Ama., Portable Mobile Station	226
WEBP	E. B. Peddicord, New Orleans, La.	280
WEBQ	Tate Radio Co., Harrisburg, Ill.	226
WEBR	H. H. Howell, Buffalo, N. Y.	244
WEBT	Dayton High School, Dayton, Ohio.	256
WEBW	Beloit College, Beloit, Wisc.	268
WEBZ	Savannah Radio Corp., Savannah, Ga.	263
WEEI	Edison Electric Illuminating Co., Boston, Mass.	476
WEHS	Robert E. Hughes, Evanston, Ill.	203
WEMC	Emm. Missionary College, Berrien Springs, Mich.	286
WENR	All-Amer. Radio Corp., Chicago, Ill.	266
WEW	St. Louis University, St. Louis, Mo.	248
WFAA	Dallas News & Journal, Dallas, Texas	476
WFAM	The Times, St. Cloud, Minn.	273
WFAV	University of Nebr., Lincoln, Nebr.	275
WFBB	Eureka College, Eureka, Ill.	240
WFBC	1st Baptist Church, Knoxville, Tenn.	250
WFBE	J. V. De Walle, Seymour, Ind.	226
WFBG	W. F. Gable Co., Altoona, Pa.	278
WFBH	Concourse Radio Corp., New York, N. Y.	273
WFBI	Galvin Radio Supply Co., Camden, N. J.	236
WFBJ	St. Johns University, Collegeville, Minn.	236
WFBL	Onondaga Hotel, Syracuse, N. Y.	252
WFBM	Merchants Lighting Co., Indianapolis, Ind.	268
WFBQ	Wynne Radio Co., Raleigh, N. C.	252
WFBR	Maryland National Guard, Baltimore, Md.	254
WFBY	Signal Corps, Ft. Ben Harrison, Ind.	258
WFBZ	Knox College, Galesburg, Ill.	254
WFI	Strawbridge & Clothier, Philadelphia, Pa.	395
WFBK	Francis K. Bridgman, Chicago, Ill.	217
WGAL	Lancaster Elec. Supply Co., Lancaster, Pa.	248
WGAQ	W. G. Patterson, Shreveport, La.	263
WGAZ	The Tribune, South Bend, Ind.	275
WGBA	Jones Elec. & Radio Co., Baltimore, Md.	254
WGBB	H. H. Carman, Freeport, N. Y.	244
WGBC	1st Baptist Church, Memphis, Tenn.	266
WGBF	The Finke Furniture Co., Evansville, Ind	236
WGBG	Breitenbach's Radio Shop, Thrifton, Va.	226
WGBI	Frank S. Megargee, Scranton, Pa.	240
WGBK	L. W. Campbell, Johnstown, Pa.	248
WGBL	Elyria Radio Assn., Elyria, Ohio.	227
WGBM	T. N. Saaty, Providence, R. I.	234
WGBN	Hub Radio Shop, La Salle, Ill.	256
WGBO	Dr. Roses Artlan, San Juan, P. R.	275
WGBQ	Stout Institute, Menomonie, Wis.	234
WGBU	Florida Cities Finance Co., Fulford By-the-Sea, Fla.	278
WGBR	Marshfield Broadcasting Association, Marshfield, Wis.	229
WGBS	Gimbel Brothers, New York, N. Y.	316
WGBT	Furman University, Greenville, S. C.	236
WGBW	Hub Radio Shop, Spring Valley, Ill.	256
WGBX	University of Maine, Orono, Maine.	252
WGES	Oak Leaves Broadcasting Station, Oak Park, Ill.	250
WGN	The Tribune, Chicago, Ill.	370
WGMU	A. H. Grebe & Co., Inc., Richmond Hill, N. Y.	236
WGNP	George H. Phelps, Inc., Detroit, Mich.	270
WGCP	Grand Central Palace, N. Y. City.	273
WGHP	G. H. Phelps, Inc., Detroit, Mich.	270
WGR	Federal Telephone Mfg. Co., Buffalo, N. Y.	319
WGST	Ga. School of Tech., Atlanta, Ga.	270
WGY	General Elec. Co., Schenectady, N. Y.	380
WHA	University of Wisconsin, Madison, Wis.	525
WHAD	Marquette University, Milwaukee, Wis.	275
WHAG	University of Cincinnati, Cincinnati, Ohio	233
WHAM	University of Rochester, Rochester, N. Y.	278
WHAP	Wm. H. Taylor Finance Corp., Brooklyn, N. Y.	240
WHAR	F. P. Cooks Sons, Atlantic City, N. J.	275
WHAS	The Courier Journal-Times, Louisville, Ky.	400
WHAT	Dr. G. W. Young, Minneapolis, Minn.	263
WHAV	Wilmington Elc. Spec. Co., Wilmington, Del.	266
WHAZ	Rensselaer Polytechnic Institute, Troy, N. Y.	280
WHB	Sweeney School Co., Kansas City, Mo.	366
WHBA	Shaffer Music House, Oil City, Pa.	250
WHBB	Hebal's Store, Stevens Point, Wis.	240
WHBC	Rev. E. P. Graham, Canton, Ohio.	254
WHBD	Charles W. Howard, Bellefontaine, Ohio	222
WHBF	Beardsley Specialty Co., Rock Island, Ill	222
WHBG	John S. Skane, Harrisburg, Pa.	231
WHBH	Culver Military Academy, Culver, Ind.	222
WHBJ	Laver Auto Co., Ft. Wayne, Ind.	234
WHRK	Franklin St. Garage, Ellsworth, Me.	231
WHBL	J. H. Slusser, Logansport, Ind.	216
WHBM	C. L. Carroll (Portable), Chicago, Ill.	233
WHBN	1st Ave. Methodist Church, St. Petersburg, Fla.	238
WHBO	Y. M. C. A., Providence, R. I.	231
WHBP	Johnstown Auto Co., Johnstown, Pa.	256
WHBQ	St. John's M. E. Church, Memphis, Tenn.	233
WHBR	Scientific E. & M. Co., Cincinnati, O.	216
WHRS	E. W. Loche, Mechanicsburg, Ohio.	208
WHBU	B. L. Bing's Sons, Anderson, Ind.	219
WHBW	D. R. Kienzle, Philadelphia, Pa.	216
WHBY	St. Norbert's Coll., West DePere, Wis.	250
WHDI	Wm. Hood Dunwoody Ind. Inst., Minneapolis, Minn.	278
WHEC	Hickson Elec. Co., Rochester, N. Y.	258
WHK	Radiovox Company, Cleveland, Ohio.	273
WHN	George Schubel, New York, N. Y.	361
WHO	Bankers Life Co., Des Moines, Ia.	526
WHT	Radiophone Corp., Deerfield, Ill.	238
WIAD	H. R. Miller, Philadelphia, Pa.	250
WIAS	Home Elc. Co., Burlington, Iowa.	254
WIBA	Capital Times, Madison, Wis.	236
WIBC	L. M. Tate Post, V. F. W., St. Petersburg, Fla.	222
WIBH	Elite Radio, New Bedford, Mass.	210
WIBI	Fredk. B. Zittell, Flushing, N. Y.	219
WIBJ	C. L. Carrell, Chicago (portable)	216
WIBK	Univ. of Toledo, Toledo, O.	205
WIBO	Nelson Bros., Chicago, Ill.	226
WIBN	Elite Radio Stores, New Bedford, Mass.	210
WIBM	Billy Maine, Chicago, Ill.	216
WIBP	First Presbyterian Church, Meridian, Miss.	210
WIBO	F. M. Schmidt, Farina, Ill.	226
WIBR	Thurman A. Owings, Weirton, W. Va.	246
WIBS	N. J. National Guard, Elizabeth, N. J.	203
WIBT	Orlando E. Miller Portable Station, N. Y.	211
WIBU	The Electric Farm, Paynette, Wis.	222
WIBW	Dr. L. L. Dill, Logansport, Ind.	220
WIBX	Grid-Leak, Inc., Utica, N. Y.	205
WIBZ	Powell Electric Co., Montgomery, Ala.	231
WIL	Benson Radio Co., St. Louis, Mo.	273
WIP	Gimbel Brothers, Philadelphia, Pa.	508
WJAD	Jackson's Radio Elec. Co., Waco, Tex.	353
WJAG	Norfolk Daily News, Norfolk, Nebr.	270
WJAK	Rev. C. L. White Greentown, Ind.	254
WJAM	D. M. Perham, Cedar Rapids, Ia.	268
WJAR	The Outlet Co., Providence, R. I.	306
WJAS	Pittsburgh Radio Supply House, Pittsburgh, Pa.	275
WJAZ	Zenith Radio Corp., Chicago, Ill.	268
WJBA	D. H. Lentz, Jr., Joliet, Ill.	207
WJBB	L. W. McClung, St. Petersburg, Fla.	207
WJBI	H. M. Couch, Joliet, Ill.	214
WJBC	Hummer Furniture Co., 2nd and Joliet Sts., La Salle, Ill.	234
WJBD	Ashland Broadcasting Committee, Ashland, Wis.	233
WJBI	R. S. Johnson, Red Bank, N. J.	219
WJD	Dennison University, Granville, O.	217
WJJD	Loyal Order of Moose, Mooseheart, Ill.	303
WJY	Radio Corp. of Ama., New York, N. Y.	405
WJZ	Radio Corp. of Ama., New York, N. Y.	455
WKAA	H. F. Paar, Cedar Rapids, Iowa.	278
WKAF	WKAF Broadcasting Co., Milwaukee, Wis.	261
WKAP	D. W. Flint Cranston, R. I.	234
WKAQ	Radio Corp. of Porto Rico, San Juan, P. R.	341
WKAR	Mich. Agricultural College, Lansing.	285
WKAV	Laconia Radio Club, Laconia, N. H.	210
WKBE	K. & B. Electric Co., Webster, Mass.	231
WKBG	C. L. Carrell, (Portable) Chicago, Ill.	216
WKRC	Kodel Radio Corp., Cincinnati, O.	326
WKY	WKY Radio Shop, Oklahoma City, Okla.	275
WLAL	1st Presbyterian Church, Tulsa, Okla.	250
WLAP	W. V. Jordan, Louisville, Ky.	275
WLAX	Greencastle Commun. Broad. Sta., Greencastle, Ind.	231
WLB	University of Minneapolis, Minneapolis, Minn.	278
WLBL	Wisconsin Department of Markets, Stevens Point, Wis.	278
WLIT	Lit Brothers, Philadelphia, Pa.	395
WLS	Sears Roebuck Co., Chicago, Ill.	345
WLTS	Lane Technical High School, Chicago, Ill.	258
WLW	Crosley Radio Corp., Cincinnati, O.	422
WLWL	Missionary Society of St. Paul the Apostle, N. Y. City.	288
WMAC	C. B. Meredith, Cazenovia, N. Y.	275
WMAF	Round Hills Radio Corp., Dartmouth, Mass.	441
WMAK	Norton Laboratory, Lockport, N. Y.	266
WMAN	1st Baptist Church, Columbus, Ohio	278
WMAQ	Chicago Daily News, Chicago, Ill.	448
WMAY	Kings Highway Presbyterian Church, St. Louis, Mo.	248
WMAZ	Mercer University, Macon, Ga.	261
WMBB	Trianon Ball Room, Chicago, Ill.	250
WMBF	Fleetwood Hotel, Miami Beach, Fla.	384
WMC	The Commercial Appeal, Memphis, Tenn.	500
WMCA	Hotel McAlpin, N. Y. C.	341
WNAB	Shepard Stores, Boston, Mass.	250
WNAC	Shepard Stores, Boston, Mass.	280
WNAD	University of Okla., Norman, Okla.	254
WNAL	Omaha Central High School, Omaha, Nebr.	258
WNAP	Wittenberg College, Springfield, O.	248
WNAR	1st Christian Church, Butler, Mo.	231
WNAT	Lenning Bros. Co., Philadelphia, Pa.	250
WNAX	Dakota Radio App. Co., Yankton, S. D.	244
WNJ	Radio Shop, Newark, N. J.	233
WNOX	Peoples Tel. & Tel. Co., Knoxville, Tenn.	268
WNYC	Municipal Station, New York, N. Y.	526
WOAC	Page Organ Co., Lima, Ohio.	261
WOAI	South East Equipment Co., San Antonio, Texas	395
WOAN	Vaughan Con. of Music, Lawrenceburg, Tenn.	283
WOAW	Woodmen of the World, Omaha, Neb.	526
WOAX	F. J. Wolff, Trenton, N. J.	240
WOC	Palmer School of Chiro, Davenport, Ia.	484
WODA	Odea Radio, Paterson, N. J.	224
WEBZ	Savannah Radio Corp., Savannah, Ga.	234

(Concluded on page 26)

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

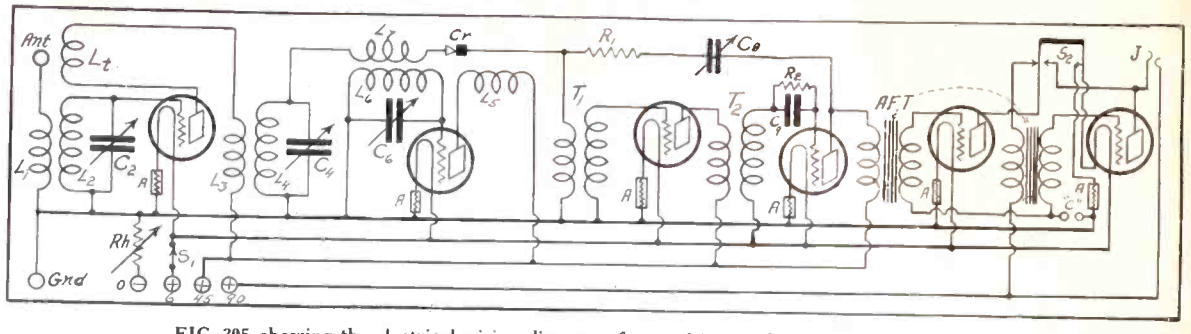


FIG. 205, showing the electrical wiring diagram of a sensitive 6-tube Super-Heterodyne.

WILL YOU please give me a diagram of a selective 6-tube super-heterodyne?—R. T. Bottomely, Jersey City, N. J.

Fig. 205 shows the electrical diagram of the receiver. The first tuning unit, comprising the primary winding L1, the secondary L2 and the tickler L3, may be any 3-circuit tuner on the market which tunes with a .0005 mfd. condenser. The primary and the secondary is wound on a 3" bakelite tubing with No. 22 DSC wire, using 10 turns on the primary and 43 turns on the secondary. The tickler is wound on a 2" tubing using about 40 turns of fine gauge wire, say No. 36 DCC. C2 and C4 are a double condenser, each section having a capacity of .0005 mfd. L3, L4 is wound as per; use a wooden spool 1" in diameter and 1" long. The primary was wound next to the core and has 20 turns of No. 36 DCC wire. The secondary contained 33 turns of the same sized wire. L6 is wound on a 3" tubing with 43 turns of No. 24 DSC wire. L5 contains 35 turns of the same size wiring on the same piece of tubing. L7 is wound on a tubing 1½" in diameter, and contains 50 turns of No. 36 DCC wire. T1 and T2 are made thus: They are wound on spool 2" in diameter and 1" long. The primary of T1 and T2 respectively contains 180 turns of No. 36 DCC wire. The secondary of T1 and T2 respectively contains 760 turns of the same wire. The windings are separated by two layers of heavy wrapping paper. The primary is next to the core. C9 is a .00025 mfd. grid condenser. The grid leak should be variable. R1 has a resistance of 100,000 ohms. C8 is a midget condenser.

* * *

IS THE Blue Bird Reflex as described by Capt. Peter V. O'Rourke in the February 7 issue of RADIO WORLD selective and a good DX receiver? (2) Will this set deliver enough power to operate a loud speaker? (3) Please describe the winding of the coils.—Joseph L. Munzer, 4313 Lancaster Ave., West Philadelphia, Pa.

(1) Yes. (2) Yes. (3) L1 the primary of the antenna coil has 10 turns, wound on a 3½" tubing, with No. 22 DCC wire. L2 the secondary of the antenna coil is wound on the same tubing, with the same wire and contains 45 turns. L3 the tickler, is wound on a 2½" tubing with No. 22 DCC wire and contains 36 turns. L4 the plate coil, contains 45 turns, wound on a 3½" tubing, with No. 22 DCC wire.

* * *

IS IT possible to use the Bremer Tully Air Core RFT and 3-circuit tuner in the Diamond? The secondaries of both coils are shunted by a .00025 mfd. condenser. (2) Where can I obtain data for the making of a loop to use with the Diamond?—H. Mortimer, Outlook, Saskatchewan, Canada.

(1) Yes. (2) Such an article will appear soon in RADIO WORLD.

* * *

I HAVE on hand one of the latest Uncle Sam 3-circuit tuners. Can I use this in building the Diamond of the Air?—L. F. Goss, 4 West Cottage St., Roxbury, Mass.

Yes.

* * *

IN THE Sept. 5 issue of RADIO WORLD, Fig. 197, a "Super" hookup is shown. Will you please advise if any previous number had full information regarding this hookup? (2) Is just one coil used for the oscillator. (3) Are both A and B coils wound on the same form? (4) Is the tap in the center. (5) Is there any space between A and B? (6) What is the capacity of the balancing condenser? (7) What is the proper capacity of the grid leaks and condensers?—E. H. Orr, 1430 K. St., N. W., Wash., D. C.

(1) The April 18 and 25 issues of RADIO WORLD give complete data on this hookup. (2) Yes. (3) Yes. (4) The tap is taken off at the 23rd turn. (5) Yes, ½". (6) It is a midget condenser. (7) They are of a standard value, the condenser having a capacity of .00025 mfd. and the grid leak having a resistance of 2 megohms.

* * *

WILL YOU kindly tell me the capacity of all the fixed condensers that are used in the Handsome Portable Set, which was published in the July 4 issue of RADIO WORLD. (2) Where can I obtain a Quartzite form?—Andrew Wong, P. O. Box 402, Sonoma, Cal.

(1) C3, C5 and C6 are all .001 mfd. fixed condensers. C4 is a .00025 mfd. grid condenser. (2) Write to the Bruno Radio Corp., 222 Fulton St., N. Y. City.

* * *

IN REGARDS to Hayden's Easy Tuning 1-Tube set, described in the Aug. 29 issue of RADIO WORLD, what changes should be made so that a UV200 tube may be employed.—F. D. Earnhardt, 2104 Chaffin St., Richmond, Va.

The socket will have to be changed to the standard type. Place the grid return to the negative side instead of the positive side. A storage battery with an output of 6 volts should be used to light the filament of the tube.

* * *

I WOULD like very much to have a picture diagram of how a basketweave form could be made; also coil winding directions. (2) How many turns should be placed upon a form of this type, when using this coil as RFT in the Diamond?—Y. Parson, Tenton, Col.

(1) Fig. 206 shows the template for a basketweave coil form. There are fifteen dowel sticks, each dowel being 5" long and ¼" in diameter. These are placed in a form, which is circular. The diameter of this circle is 3". The sticks are held in place by ¼" drilled holes, into which these sticks fit. The base is wood, 6x6". (2) When used as an RFT, and the secondary tuned by a .0005 mfd. variable condenser the turns are 10 wound for the primary and 45 for the secondary. The wire used is No. 22 DCC. Note that the "over two, under two" method of winding is used. The heavy line is the first turn, the long dashed line the second, the dotted the third, etc.

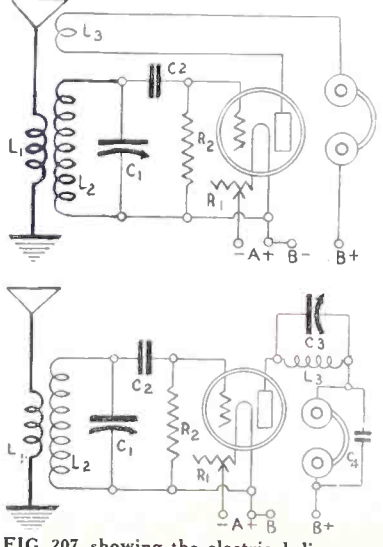


FIG. 207, showing the electrical diagram of the two 1-tube regenerative circuits.

I HAVE two RF coils, constructed as follows: primary, 12 turns; secondary, 60 turns; wire used, No. 22 DCC on a 2" tubing. (1) Could they be used with a .0005 mfd. variable condenser? (2) How should I make the tickler?—Victor Brouillette, 63 Orleans St., Lowell, Mass.

(1) No, increase the number of turns on the primary to 16 and the number of turns on the secondary to 64. (2) The tickler should contain 56 turns on a 1½" form.

* * *

I AM contemplating building the Powertone, described by Herman Bernard in the Aug. 29, Sept. 5 and 12th issues. I have two 21-plate condensers (.0005 mfd. capacity). (1) Could I join the rotor shafts together, leaving the stationary plates, insulated from each other. (2) Will the coils L1, L2, L3, L4, be O.K., if they are wound on bakelite tubing?

(1) If you are one who handles tools easily, you can go ahead. Otherwise place these two condensers across the secondaries of both RFT, thereby making the receiver a 2-control, instead of a 1-control. (2) Yes.

* * *

WOULD YOU please publish the circuit diagram of two standard 1-tube regenerative hookups.—George Fashen, Plattenville, N. Y.

Fig. 207 shows the electrical diagrams of the 1-tubers. In the top diagram, L1L2L3 is a standard 3-circuit tuner. The constants are: L1, the primary, is wound on a 4" diameter tubing, 4" high, and contains 8 turns of No. 22 DCC wire. L2, the secondary, is wound right next to L1 and contains 36 turns of the same wire. L3, the tickler, is wound on a 2½" form, and contains 31 turns of No. 22 DCC wire. C1 is a .0005 mfd. variable condenser. C2 is a .00025 mfd. grid condenser. R2 is a 2 megohm grid leak. R1 is a 6-ohm rheostat. The tube used is a UV201A, WD11 or 12.

In the bottom diagram L1L2L3 have the same constants as the above L1L2L3. The same applies to all the other constants, viz., C1 is the same as the above C1 (.0005 mfd. variable condenser), etc. C3 is also a .0005 mfd. variable condenser.

C4 is a .001 mfd. fixed condenser.

* * *

WOULD you please tell me whether it is best to wind the antenna coil for the Diamond as a single winding, taking off a tap, or as two separate windings? If two windings are employed should there be a space between the secondary and the primary? How wide should the space be? (2) In winding the tickler, should the sec-

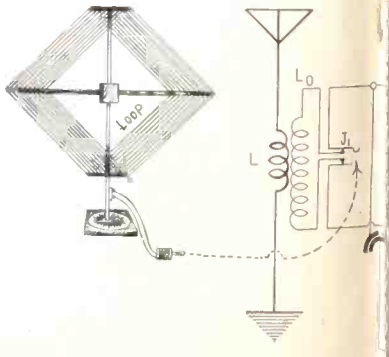


FIG. 209,

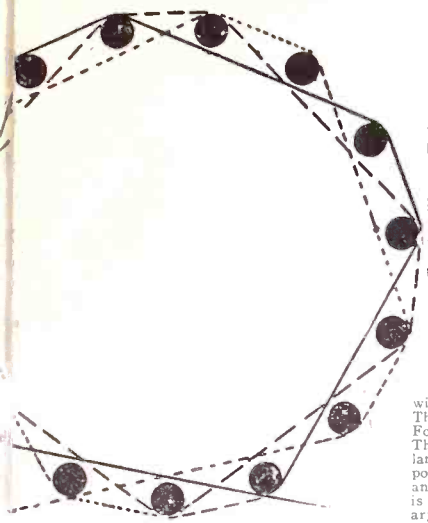


FIG. 206, a basketweave form template.

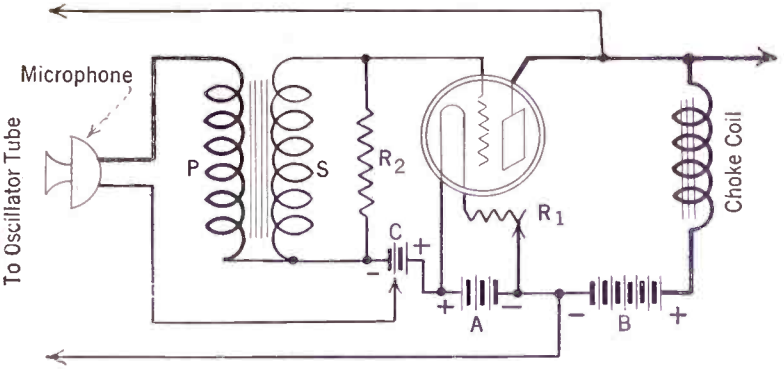


FIG. 208, showing the electrical diagram of the Heising system of Modulation.

dary or the primary be right next to the rotor?
Will you please give me the wiring diagram the Browing-Drake receiver?—Geo. Wilson, gona, Ia.

(1) Two separate windings are made. There ould be a ⅛" space between the primary and the condary. (2) The secondary winding should next to tickler coil (rotor). (3) See the Sept. issue of RADIO WORLD, page 9.

* * *

I WOULD like to build the 1-Tube DX set scribed in the May 23 issue of RADIO WORLD Percy Warren. I have two condensers of 025 mfd. How many turns and what size re you would advise to go with these con-nsers?—Walter Lorenz, 1454 Lexington Ave., Y. City.

The antenna coil consists of 15 turns of No. 22 C wire wound on a tubing 3" in diameter d 6" high. The grid coil consists of 70 turns the same wire and wound on the same tubing. e plate consists of 55 turns of the same wire the same tubing. The antenna winding is ced in between the grid and plate winding. ere is a ½" separation between these points.

* * *

I HAVE the same trouble that many fans have d that is, I do not receive the low wavelengths. Roy C. Bagley, 34 Whiting Street, Roxbury, ass.

nsert a .0005 mfd. variable condenser in series h the antenna or place a coil in parallel with antenna coil. This coil should have the same mber of turns as the antenna coil e.g., antenna rimary) 10 turns, additional coil 10 turns.

* * *

PLEASE GIVE the electrical diagram of the lising system of modulation.—T. Loose, Kastas, b.

Fig. 208 shows the electrical wiring diagram the Heising system of modulation.

The C battery supplies the microphone current. the same time the grid is kept at a negative ential. About 20 volts C battery are used for 5 watt tube and about 50 volts are used for the watt tube. As to the choke coil used. There 3,000 turns of No. 28 enameled wire used for 5 watt tube. For the 50 watt tube, use 24 ameled wire but the same number of turns. The width of the air gap ranges from 1/32" to 3/32". The core dimensions for the 5 watt tube are 2x1". For the 50 watt tube the dimensions are 3½x1½". The core is composed of No. 26 silicon steel laminations. The modulation transformer is composed as per: The primary contains 230 turns and the secondary contains 24,000 turns. This is for the 5 watt tube. When winding the primary use No. 24 enameled wire, and when winding the secondary use No. 40 enameled wire. The core used is No. 30 silicon steel. The width of the horizontal core is ⅛". There is a ¼" separation between inner laminations. R2 is a 10,000 ohm resistance.

* * *

WOULD YOU kindly tell me if the Diamond could be made from the following parts: Two .001 mfd. variable condensers, one 400-ohm potentiometer, five UV199 sockets, five UV199 tubes, three 30-ohm rheostats, two Atwater-Kent AFTS, two RFTS (iron core), one three circuit tuner, 3½ inch stator. The set is to be used three hundred miles from the nearest station.—E. J. Marshall, 189 Pinewood Ave., Toronto, Ontario, Canada.

The two iron core RFT will be of no use. The 3-circuit tuner will have to be of a special construction. The primary (wound on a 3½" diameter tubing 4" high, with No. 22 DCC wire) is wound with 6 turns. The secondary which is wound right next to the primary contains 30 turns, using the same type of wire. The tickler is wound on a 2½" diameter tubing, 2½" high and contains 25 turns of the same wire as used on the primary and the secondary. The primary and the secondary windings of the RFT are of the same number of turns as that of the P and S of the 3-circuit tuner. All the other parts can be used.

* * *

IS THE Powertone set very selective?—F. Yuidrock, 421 4th Ave., Dofton, Ky.

Yes.

* * *

I HAVE a Gen-Win Lo-Loss 3-Circuit tuner and would like to know if I could use it in the Diamond. (2) How many turns should the primary and secondary of the RFT have to match this tuner? The secondaries of both are to be tuned by a double condenser of .0005 mfd. capacity in each section. (3) What is the smallest size panel that the Diamond could be built upon?—J. William Coburn, 1825 North Park Ave., Philadelphia, Pa.

(1) Yes. (2) The primary should contain 8 turns of No. 22 DCC wire, wound on a 3½" tubing. The secondary should contain 41 turns of the same wire on the same tubing. Leave ¼" space between the primary and the secondary windings. (3) A 7x18" panel is the smallest size that the parts for the Diamond can be placed, without jamming parts and thereby decreasing the efficiency of the receiver due to inter-magnetic field losses.

* * *

WILL TWO antennas running parallel to each other and about 150 ft. apart (each antenna connected to an 8-tube superheterodyne) have any effect upon each other as regards strength of signal received? (1) Will the diminution of signal be in evidence only when both receivers are tuned to the same station? (2) While extremely inconvenient to run antenna at right angles would same be absolutely necessary when the separation is 150 ft.? (3) What effect would a Kane antenna have when used with one receiver? (4) Will Kane antenna with counterpoise cut volume or increase selectivity, more DX? (5) Will the antenna when run parallel to a 110-volt lighting secondaries be affected by same at a distance of 40 ft.?—J. Shortt, Box 411, Cumberland, British Columbia, Canada.

(1) Yes. (2) Yes. (3) Not absolutely necessary; the diminution of signal is very small. (4) The signals will be slightly louder. 5) The volume, selectivity, and distance will be increased. (6) Yes, to a great extent.

* * *

CAN 90 volts B battery be used successfully on the plates of the amplifier tubes in the Diamond? (2) Is the Diamond or Powertone hard on the B batteries?—Elmer Norris, 28 Wolfe St., Athens, O.

(1) Yes. (2) No, very economical.

* * *

I CONSTRUCTED Herman Bernard's Superdyne from the Dec. 27 issue of RADIO WORLD. I don't get enough volume to operate the loud speaker. I cannot hear at all on the first jack. I switched the tubes around but to no avail. My aerial is seventy-five feet long including lead-in. I use the UV201A tubes throughout. (2) Are they alright? I use 90 volts of B battery.—Robert Jones, 611 West 9th St., Los Angeles, Cal.

(1) Reverse L3 (tickler coil) add more turns to this coil. Try placing a .001 mfd. fixed condenser across the primary of the first audio-frequency transformer. Reverse the leads of the variable condenser shunted across the plate coil. Reverse your A battery leads. See if the terminals of the first jack are making contact where contact should be made. Run the grid leak from the grid post to the F plus post. Reverse the secondary L2 of the coil. (2) UV201A tubes are O.K.

* * *

PLEASE GIVE the electrical diagram of the diamond as a 2-control, using 2 steps of transformer coupled audio-frequency amplification.—L. Timmons, Sioux City, Utah.

Fig. 209 gives a wiring diagram of the Diamond as a 2-control. L1, L2, L3 are a 3-circuit coil and the constants for such a coil in the reply to Mr. Fashen in these columns. The primary and the secondary of the RFT are the same as the primary and the secondary of the 3-circuit tuner. C1 is a double condenser, each portion having a maximum capacity of .0005 mfd. UV201A tubes are to be used throughout the set. R1 and R2 are both 10-ohm rheostats. J1 and J2 are both double circuit jacks, while J3 is a single circuit jack. Both audio-frequency transformers are of the low ratio type.

* * *

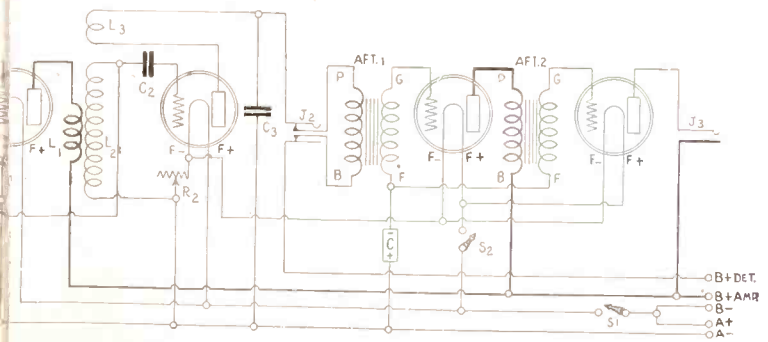
IS THE Foote Coast Coil a good one? (2) Can it be used in the Diamond of the Air with due success?—Walter Ott, 1810 East 32nd St., Cleveland, O.

(1) Yes. (2) Yes.

* * *

I JUST built the 2-tube reflex described in the August 15 issue of RADIO WORLD. When I turn first condenser dial and set the tickler at about 30 on the dial, it just crackles. If I strike my finger on the tickler dial, it just sounds like a bell. The tubes whistle when the rheostat is turned ¾ on.—Frank Ehersole, 232 West Baptist Ave., York, Pa.

Reverse the secondary of AFT1. Reverse the crystal detector leads. There is an open circuit in the tickler coil. See that the B battery connections are tight. Test AFT1 for an open circuit.



ng the electrical diagram of the 2-Control Diamond, 1925 Model.

THE KEY TO THE AIR

KEY

Abbrevations: EST, Eastern Standard Time; CST, Central Standard Time; MST, Mountain Standard Time; PST, Pacific Standard 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 staton s under (EST, CST, 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*
EST	CST	....	1 hr.
EST	MST	....	2 hrs.
EST	PST	....	3 hrs.
CST	EST	1 hr.	....
CST	MST	....	1 hr.
CST	PST	....	2 hrs.
MST	EST	2 hrs.	....
MST	CST	1 hr.	....
MST	PST	....	1 hr.
PST	EST	3 hrs.	....
PST	CST	2 hrs.	....
PST	DST	1 hr.	....

FRIDAY, OCTOBER 2

WAAM, Newark, N. J., 263 (EST)—11 AM to 12; 7 PM to 10:30.
WAHG, Richmond Hill, N. Y., 316 (EST)—12:30 to 1:05 PM; 7:30 to 11:05 PM.
WAMD, Minneapolis, Minn., 243.8 (CST)—12 to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 to 10 PM.
WBBR, New York City, 272.6 (EST)—8 PM to 10.
WBOQ, Richmond Hill, N. Y., 236 (EST)—7:30 PM to 11:30.
WBZ, Springfiedl, Mass., 333.1 (EST)—6 PM to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 to 4; 5:30 to 10.
WCAE, Pittsburgh, Pa., 461.3 (EST)—12:30 to 1:30 PM; 4:30 to 5:30; 6:30 to 11.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 to 7 PM; 8 to 10; 11:45 to 1 AM.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 11 to 12; 4 PM to 5; 6 to 12.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 8 to 11.
WEAO, Ohio State University, 293.9 (EST)—8 PM to 10.
WEEI, Boston, Mass., 476 (EST)—6:45 AM to 7:45; 2 PM to 3:15; 5:30 to 10.
WEMC, Berrien Springs, Mich., 286 (CST)—9 PM to 11.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30.
WFBH, New York City, 272.6 (EST)—2 PM to 6.
WGBS, New York City, 316 (EST)—10 AM to 11; 1:30 PM to 4; 6 to 7:30.
WGCP, New York City, 252 (EST)—2:30 PM to 5:15; 8 to 11.
WGES, Chicago, Ill., 250 (CST)—7 to 9 PM; 11 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (EST)—12 M to 12:45 PM; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (EST)—1 PM to 2; 5:30 to 10:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8:30 to 10.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (EST)—12:30 PM to 1; 2:15 to 5; 7 to 11; 12 to 12:30 AM.
WHO, Des Moines, Iowa, 526 CST)—7 PM to 9; 11 to 12; 12:30 to 1:30; 4:30 to 5:30; 6:30 to 9:30.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 8:45 to 10:05; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (EST)—6:45 AM to 7:15; 10 to 11; 1 PM to 2; 3 to 5; 6 to 7.
WJY, New York City, 405 (EST)—7:30 PM to 11:30.
WJZ, New York City, 455 (EST)—10 AM to 11; 1 PM to 2; 4 to 6; 7 to 10:30.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 7:30 to 1 AM.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15; 1:30 to 2:30.
WMCA, New York City, 341 (EST)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (EST)—3:45 PM to 4:45; 6:20 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1; 5:45 to 7:10; 9 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 5:45 to 12.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7.
WPAK, Fargo, N. D., 283 (CST)—7:30 PM to 9.
WPG, Atlantic City, N. J., 299.8 (EST)—7 PM to 8:30; 10 to 12.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—9 AM to 10; 12 PM to 1; 5 to 7.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (EST)—11:59 to 2 PM; 7:59 to 9:45.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 10; 12 PM to 1 AM.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30; 3 to 4; 6 to 7; 8 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:20 PM; 1:30 to 3:20; 3:30 to 11.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFDY, Brookings, S. D., 273 (MST)—8 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 10.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 9:30 to 12.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 11.
KGO, Oakland, Cal., 261.2 (PST)—11:10 AM to 1 PM; 1:30 to 3; 4 to 7.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 3:30 PM; 5:30 to 11:30.
KJR, Seattle, Wash., 484.4 (PST)—10:30 AM to 11:30 AM; 1 PM to 6:30; 8:30 to 11.
KNX, Hollywood, Cal., 337 (PST)—11:30 AM to 12:30 PM; 1 to 2; 4 to 5; 6:30 to 12.
KOA, Denver, Col., 322.4 (MST)—11:45 AM to 12:30 PM; 330 to 4:15; 6 to 10.
KOB, State College of New Mexico, 348.6 (MST)—11:55 AM to 12:30 PM; 7:30 to 8:30; 9:55 to 10:10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 8:45; 11 to 12 M.
KPO, San Francisco, Cal., 429 (PST)—7:30 AM to 8; 10:30 to 12 M; 1 PM to 2; 4:30 to 11.
KSD, St. Louis, Mo., 545.1 (CST)—4 PM to 5.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:20 to 10.
KYW, Chicago, Ill., 536 (CSTDS)—6:30 AM to 7:30; 10:55 to 1 PM; 2:25 to 3:30; 6:02 to 7:20; 9 to 1:30 AM.
CNRA, Moncton, Canada, 313 (EST)—8:30 PM to 10:30.
CNRE, Edmonton, Canada, 516.9 (MST)—8:30 PM to 10:30.
CNRS, Saskatoon, Canada, 400 (MST)—2:30 PM to 3.
CNRT, Toronto, Canada, 357 (EST)—6:30 PM to 11.

SATURDAY, OCTOBER 3

WAAM, Newark, N. J., 263 (EST)—7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (EST)—12:30 PM to 1:05; 12 to 2 AM.
WAMD, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 1 AM.
WBBR, New York City, 272.6 (EST)—8 PM to 9.
WBOQ, Richmond Hill, N. Y., 236 (EST)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (EST)—11 AM to 12:30 PM; 7 to 9.
WCAE, Pittsburgh, Pa., 461.3 (EST)—10:45 AM to 12 M; 3 PM to 4; 6:30 to 7:30.
WCBD, Zion, Ill., 344.6 (CST)—8 PM to 10.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12:30 PM; 2:30 to 5; 6 to 10.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 4 PM to 5; 6 to 12.
WEEI, Boston, Mass., 476 (EST)—6:45 AM to 7 AM.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 7 to 8.
WEMC, Berrien Springs, Mich., 286 (CST)—11 AM to 12:30 PM; 8:15 to 11.
WFAA, Dallas, Texas, 475.9 (CST)—12:30 PM to 1; 6 to 7; 8:30 to 9:30; 11 to 12:30 AM.
WFBH, New York City, 272.6 (EST)—2 PM to 7:30; 11:30 to 12:30 AM.
WGBS, New York City, 316 (EST)—10 AM to 11; 1:30 PM to 3; 6 to 11.
WGCP, New York City, 252 (EST)—2:30 PM to 5:15.
WGES, Chicago, Ill., 250 (CST)—7 PM to 9; 11 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 2:30 PM; 3 to 5:57; 6 to 11:30.
WGY, Schenectady, N. Y., 379.5 (EST)—7:30 PM to 10.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:30 PM; 4 to 5; 6 to 7:30.
WHAR, Atlantic City, N. J., 275 (EST)—2 PM to 3; 7:30 to 9.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (EST)—2:15 PM to 5; 7:30 to 10.
WHO, Des Moines, Iowa, 526 (CST)—11 AM to 12:30 PM; 4 to 5:30; 7:30 to 8:30.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (EST)—7 AM to 8; 10:20 to 11; 1 PM to 2; 3 to 4; 6 to 11:30.
WJY, New York City, 405 (EST)—2:30 PM to 5; 8 to 10:30.
WJZ, New York City, 455 (EST)—9 AM to 12:30 PM; 2:30 to 4; 7 to 10.
WKRC, Cincinnati, O., 326 (EST)—10 to 12 M.
WLWC, Cincinnati, O., 422.3 (EST)—9:30 AM to 12:30 PM; 7:30 to 10.
WMAK, Lockport, N. Y., 265.5 (EST)—10:25 AM to 12:30 PM.
WMCA, New York City, 341 (EST)—3 to 5 PM; 6:30 to 2.
WNYC, New York City, 526 (EST)—1 to 3 M; 7 to 11.
WOAW, Omaha, Neb., 526 (CST)—10 AM to 1; 2:15 to 4; 9 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 5:45 to 7:10; 9 to 12.
WOO, Philadelphia, Pa., 508.2 (EST)—11 AM to 1 PM; 4:40 to 5; 10:55 to 11:02.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7:30; 8 to 11.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 3 AM.
WPG, Atlantic City, N. J., 299.8 (CST)—7 PM to 12.
WRC, Washington, D. C., 469 (EST)—1 PM to 2; 6:45 to 12.
WREO, Lansing, Mich., 285.5 (EST)—10 PM to 12.
WRNY, New York City, 258.5 (EST)—11:59 to 2 PM; 7:59 to 9:30; 12 M to 1 AM.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 3 to 4; 5 to 6; 10:45 to 12.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10; 11:55 to 1:30 PM; 3 to 4.
KDKA, Pittsburgh, Pa., 309 (EST)—10 AM to 12:30 PM; 1:30 to 6:30; 8:45 to 10.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 268 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10:30.
KFOA, Seattle, Wash., 455 (PST)—Silent.
KGO, Oakland, Cal., 361.2 (PST)—11 AM to 12:30 PM; 3:30 to 5:45; 7:30 to 9.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 6 to 7; 10 to 11.
KHJ, Los Angeles, Cal., 405.2 (EST)—7 AM to 7:30; 10 to 1:30 PM; 2:30 to 3:30; 5:30 to 2 AM.
KJR, Seattle, Wash., 484.4 (PST)—1 PM to 2:45; 6 to 6:30; 8:30 to 10.
KNX, Hollywood, Cal., 337 (PST)—1 PM to 2; 6:30 to 2 AM.
KOA, Denver, Colo., 322.4 (MST)—11:30 AM to 1 PM; 7 to 10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9.
KPO, San Francisco, Cal., 429 (PST)—8 AM to 12 M; 2 PM to 3; 6 to 10.
KSD, St. Louis, Mo., 545.1 (CST)—7 PM to 8:30.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10:30.
KYW, Chicago, Ill., 536 (CST)—11 AM to 12:30 PM; 4 to 5; 7 to 8.
CKAC, Montreal, Canada, 411 (EST)—4:30 PM to 5:30.
CNRO, Ottawa, Ontario, Cana la, 435 (EST)—7:30 PM to 10.
PWX, Havana, Cuba, 400 (EST)—8:30 PM to 11:30.

SUNDAY, OCTOBER 4

WBBM, Chicago, Ill., 226 (CST)—4 PM to 6; 8 to 10.
WBBR, New York City, 272.6 (EST)—10 AM to 12 M; 9 PM to 11.
WCCO, St. Paul and Minneapolis, Minn., 416 (CST)—11 AM to 12:30 PM; 4:10 to 5:10; 7:20 to 10.
WDAF, Kansas City, Mo., 365.6 (CST)—4 PM to 5:30.
WEAF, New York City, 492 (EST)—3 PM to 5; 7:20 to 10:15.
WEAR, Cleveland, O., 390 (EST)—3:30 PM to 5; 7 to 8; 9 to 10.
WFBH, New York City, 272.6 (EST)—5 PM to 7.
WGBS, New York City, 316 (EST)—3:30 PM to 4:30; 8 to 10.
WGCP, New York City, 252 (EST)—8 PM to 11.
WGES, Chicago, Ill., 250 (CST)—5 PM to 7; 10:30 to 12 M.
WGN, Chicago, Ill., 370 (CST)—11 AM to 12:45 PM; 2:30 to 5; 9 to 10.
WGR, Buffalo, N. Y., 379.5 (EST)—9:30 AM; 7:15 to 8 PM.
WGY, Schenectady, N. Y., 379.5 (EST)—9:30 AM to 12:30 PM; 2:35 to 3:45; 6:30 to 10:30.
WHAD, Milwaukee, Wis., 275 (CST)—3:15 PM to 4:15.
WHAR, Atlantic City, N. J., 275 (EST)—2:30 PM to 3:45; 7:50 to 10; 11:15 to 12.
WHN, New York City, 360 (EST)—1 PM to 1:30; 3 to 6; 10 to 12.
WHT, Chicago, Ill., 238 (CST)—9:30 AM to 1:15 PM; 5 to 9.
WIP, Philadelphia, Pa., 508.2 (EST)—10:45 AM to 12:30 PM; 4:15 to 5:30.
WJZ, New York City, 455 (EST)—9 AM to 12:30 PM; 2:30 to 4; 7 to 11.
WKRC, Cincinnati, O., 326 (EST)—6:45 PM to 11.
WMCA, New York City, 341 (EST)—11 AM to 12:15 PM; 7 to 7:30.
WNYC, New York City, 526 (EST)—9 PM to 11.
WOCL, Jamestown, N. Y., 275.1 (EST)—9 PM to 11.
WOO, Philadelphia, Pa., 508.2 (EST)—10:45 AM to 12:30 PM; 2:30 to 4.
WPG, Atlantic City, N. J., 209.8 (EST)—3:15 PM to 5; 9 to 11.
WQJ, Chicago, Ill., 448 (CST)—10:30 AM to 12:30 PM; 3 PM to 4; 8 to 10.
WREO, Lansing, Michigan, 285.5 (EST)—10 AM to 11.
WRNY, New York City, 258.5 (EST)—3 PM to 5; 7:59 to 10.
WSBF, St. Louis, Mo., 273 (CST)—9 to 11 PM.
WWJ, Detroit, Mich., 352.7 (EST)—11 AM to 12:30 PM; 2 to 4; 6:20 to 9.
KDKA, Pittsburgh, Pa., 309 (EST)—9:45 AM to 10:30; 11:55 to 12 M; 2:30 PM to 5:30; 7 to 11.
KFNF, Shenandoah, Iowa, 266 (CST)—10:45 AM to 12:30 PM; 2:30 to 4:30; 6:30 to 10.
KOA, Denver, Col., 322.4 (MST)—10:55 AM to 1 PM; 4 PM to 5:30; 7:45 to 10.
KOIL, Council Bluffs, Iowa, 278 (CST)—11 AM to 12:30 PM; 7:30 to 9.
KGW, Portland, Oregon, 491.5 (PST)—10:30 AM to 12:30 PM; 6 to 9.
KHJ, Los Angeles, Cal., 405.2 (EST)—10 AM to 12:30 PM; 6 to 9.
KJR, Seattle, Wash., 384.4 (PST)—11 AM to 12:30 PM; 3 to 4:30; 7:15 to 9.
KTHS, Hot Springs, Ark., 374.8 (CST)—11 AM to 12:30 PM; 2:30 to 3:40; 8:40 to 11.

MONDAY, OCTOBER 5

WAAM, Newark, N. J., 263 (EST)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12:30 M to 1:05 PM; 7:30 to 12.
WAMB, Minneapolis, Minn., 243.8 (CST)—10 PM to 12.
WBBM, Chicago, Ill., 226 (CST)—6 PM to 7.
WBBR, New York City, 272.6 (ESTDS)—8 PM to 9.
WBZ, Springfield, Mass., 333.1 (EST)—6 PM 11:30.
WCAE, Pittsburgh, Pa., 461.3 (EST)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 12.
WCBD, Zion, Ill., 344.6 (CST)—8 PM to 10.
WCCO, St. Paul and Minneapolis, Minn., 416 (CST)—9:30 AM to 12 M; 1:30 PM to 6:15.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 PM to 7; 8 to 10; 11:45 to 1 AM.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 4 PM to 5; 6 to 11:30.
WEAR, Cleveland, O., 300 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 7 to 8.
WEEI, Boston, Mass., 476 (EST)—6:45 AM to 8; 3 PM to 4; 5:30 to 10.
WEMC, Berrien Springs, Mich., 286 (CST)—8:15 PM to 11.
WFAA, Dallas, Texas, 475.9 (EST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30.
WFBH, New York City, 272.6 (EST)—2 PM to 6:30.
WGCP, New York City, 252 (EST)—2:30 PM 11; 1:30 to 3:10; 6 to 7:30.
WGES, Chicago, Ill., 250 (CST)—5 PM to 8.
WGCP, New York City, 252 (EST)—2:30 PM to 5:18; 8 to 10:45.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 3:30 to 5:57.
WGR, Buffalo, N. Y., 319 (EST)—12 M to 12:30 PM; 2:30 to 4:30; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (EST)—1 PM to 2; 5:30 to 8:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10.
WHAR, Atlantic City, N. J., 275 (EST)—2 PM to 3; 7:30 to 9.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (EST)—2:15 PM to 5; 6:30 to 12.
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 7:30 to 9; 11:15 to 12.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (EST)—7 AM to 8; 1 PM to 2; 3 to 8.
WJZ, New York City, 455 (EST)—10 AM to 11; 1 PM to 2; 4 to 5:30; 6 to 6:30; 7 to 11.
WKRC, Cincinnati, O., 326 (EST)—8 PM to 10.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 1; 2 to 3; 4:30 to 6; 7:30 to 11:30.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15 PM; 1:30 to 2:30; 3 to 5; 6 to 10.
WMAK, Lockport, N. Y., 265.5 (EST)—8 PM to 12.
WMCA, New York City, 341 (EST)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (EST)—3:15 PM to 4:15; 6:20 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1:30; 5:45 to 10:30.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 5:45 to 6.
WOO, Philadelphia, Pa., 508.2 (EST)—11 AM to 1 PM; 4:40 to 6; 7:30 to 11.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 to 4; 6:15 to 11:30
WPAK Fargo, N. D., 283 (CST)—7:30 PM to 9.
WPG, Atlantic City N. J., 299.8 (EST)—7 PM to 11.
WQJ, Chicago, Ill., 488 (CST)—11 AM to 12 M; 3 PM to 4.
WRC, Washington, D. C., 469 (EST)—9 AM to 10; 12 M to 2; 6:15 PM to 6:30.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (EST)—11:59 AM to 2 PM; 7:30 to 11.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 10:30; 12 to 1 AM.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 5 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:15 PM; 2:30 to 3:20; 5:30 to 10.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:45 PM to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (PST)—9 AM to 10:30; 11:30 AM to 1 PM; 1:30 to 6; 6:45 to 7; 8 to 1 AM.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30; 5 to 8.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 1:30 PM; 5:30 to 10.
KJR, Seattle, Wash., 384.4 (PST)—1 PM to 2:45; 6 to 6:30; 7 to 11.
KNX, Hollywood, Cal., 337 (PST)—12 M to 1 PM; 4 to 5; 6:30 to 12.
KOB, State College of New Mexico, 348.6 (MST)—11:55 AM to 12:30 PM; 7:30 to 8:30; 9:55 to 10:10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 10.
KPO, San Francisco, Cal., 428 (PST)—10:30 AM to 12 M; 1 PM to 2; 2:30 to 3:30; 4:30 to 10.
KSD, St. Louis, Mo., 545.1 (CST)—7:30 PM to 10.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10.
KYW, Chicago, Ill., 536 (CSTDS)—6:30 AM to 7:30; 10:55 to 1 PM; 2:15 to 3:30; 6:02 to 7.

TUESDAY, OCTOBER 6

WAAM, Newark, N. J., 263 (EST)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (EST)—12 PM to 1:05 AM.
WAMB, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 12.
WBOQ, Richmond Hill, N. Y., 236 (EST)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (EST)—6 PM to 11.
WCAE, Pittsburgh, Pa., 461.3 (EST)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 PM to 4; 5:30 to 10.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 PM to 7; 11:45 to 1 AM.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 11 to 12 M; 4 PM to 5; 6 to 12.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 7 to 10; 10 to 11.
WEEI, Boston, Mass., 476 (EST)—6:45 AM to 8; 1 PM to 2; 6:30 to 10.
WFAA, Dallas, Texas, 457.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30; 11 to 12.
WFBH, New York City, 272.6 (EST)—2 PM to 6:30; 11:30 to 12:30 AM.
WGBS, New York City, 316 (EST)—10 AM to 11; 1:30 PM to 3; 6 to 11:30.
WGCP, New York City, 252 (EST)—2:30 PM to 5.15.
WGES, Chicago, Ill., 250 (CST)—7 PM to 9; 11 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (EST)—11 AM to 12:45 PM; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (EST)—11 PM to 2:30; 5:30 to 7:30; 9:15 to 11:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHAR, Atlantic City, N. J., 275 (EST)—2 PM to 3; 7:30 to 9; 11:15 to 12.
WHN, New York City, 360 (EST)—12:30 PM to 1; 2:15 to 3:15; 4 to 5:30; 7:30 to 10:45; 11:30 to 12:30 AM
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 7:30 to 9; 11:30 to 12.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (EST)—7 AM to 8; 1 PM to 2; 3 to 4:30; 6 to 11.
WJY, New York City, 405 (EST)—7:30 PM to 1:30.
WJZ, New York City, 455 (EST)—10 AM to 11; 1 PM to 2; 4 to 6; 7 to 11.
WKRC, Cincinnati, O., 326 (EST)—6 PM to 12.
WLIT, Philadelphia, Pa., 395 (EST)—11 AM to 12:30 PM; 2 to 3; 4:30 to 7.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 1 PM; 1:30 to 2:30; 3 to 5; 6 to 11.
WMCA, New York City, 341 (EST)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (EST)—3:45 PM to 5; 6:50 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1:30; 5:45 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 5:45 to 10.
WOO, Philadelphia, Pa., 508.2 (EST)—11 AM to 1 PM; 4:40 to 5; 10:55 to 11:02.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7:30.
WPG, Atlantic City, N. J., 299.8 (EST)—7 PM to 11.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 2 AM
WRC, Washington, D. C., 469 (EST)—9 AM to 10; 12 M to 2; 6:55 PM to 11.
WREO, Lansing, Michigan, 285.5 (EST)—8:15 PM to 11.
WRNY, New York City, 258.2 (EST)—11:59 AM to 2 PM; 4:30 to 5; 8 to 11.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 8 to 10; 11:30 to 1 AM.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 6 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—9:45 PM to 12 M; 1:30 PM to 3:20; 5:30 to 10:45.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFMQ, Fayettville, Ark., 299.8 (CST)—9 PM to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 11.
KGO, Oakland, Cal., 361.2 (PST)—11:30 AM to 1 PM; 1:30 to 3; 4 to 6:45; 8 to 1 AM.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 3:20 PM; 5:30 to 11.
KJR, Seattle, Wash., 384.4 (PST)—9 AM to 6:30 PM; 8:30 to 1 AM
KNX, Hollywood, Cal., 337 (PST)—9 AM to 10; 1 PM to 2; 4 to 5; 6:30 to 12.

WEDNESDAY, OCTOBER 7

WAAM, Newark, N. J., 263 (EST)—12:30 PM to 1:05; 7:30 to 11:05.
WAHG, Richmond Hill, N. Y., 316 (EST)—12 M to 1:05 PM; 8 to 12.
WAMB, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 10.
WBZ, Springfield, Mass., 333.1 (EST)—6 PM to 11.
WCAE, Pittsburgh, Pa., 461.3 (EST)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 PM to 4; 5:30 to 11.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 PM to 7; 8 to 9:15; 11:45 to 1 AM.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 11 to 12 M; 4 PM to 5; 6 to 12.
WEAO, Ohio State University, 293.9 (EST)—8 PM to 10.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 6:45 to 7:45.
WEEI, Boston, Mass., 476 (EST)—6:45 AM to 8; 3 PM to 4; 5:30 to 10.
WEMC, Berrien Spring, Mich., 266 (CST)—8:15 PM to 11.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1.
WFBH, New York City, 270.6 (EST)—2 PM to 7:30; 12 M to 1 AM.
WGCP, New York City, 252 (EST)—2:30 PM to 5:18; 8 to 10.
WGES, Chicago, Ill., 250 (CST)—7 PM to 9; 11 to 1 AM.
WGBS, New York City, 316 (EST)—10 AM to 11 PM; 1:30 to 4; 6 to 7.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (EST)—12 M to 12:45 PM; 2:30 to 4:30; 6:30 to 11.
WGY, Schenectady, N. Y., 379.5 (CST)—5:30 PM to 7:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10; 11:30 to 12:30 AM.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 368 EST)—2:15 PM to 5:30; 7:30 to 11; 11:30 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 6:30 to 12 M.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 568 EST)—7 AM to 8; 10:20 to 11; 1 PM to 2; 3 to 4; 6 to 8.
WJZ, New York City, 455 (EST)—10 AM to 11; 1 PM to 2; 4 to 6; 6 to 11:30.
WKRC, Cincinnati, Ohio, 326 (EST)—8 PM to 10.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 7:30 to 9.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15 PM; 1:30 to 2:30; 3 to 5; 6 to 11.
WMCA, New York City, 341 (EST)—10:45 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (EST)—6:30 PM to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 4 to 7:05; 9 to 11.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 12 M.
WPAK, Fargo, N. D., 283 (CST)—7:30 PM to 9.
WOJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to ; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—9 AM to 10; 12 M to 2; 6:25 PM to 7.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (EST)—11:59 AM to 2 PM; 7:59 to 9:55.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 9.
WWJ, Detroit, Mich., 352.7 (EST)—6 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 6 to 7; 8 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:15 PM; 2:30 to 3:20; 5:30 to 11.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30 AM.
KFMQ, Fayettville, Ark., 299.8 (CST)—7:30 PM to 9.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (PST)—11:30 AM to 1 PM; 1:30 to 2:30; 3 to 6:45.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 10.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 715; 12 M to 1:30 PM; 5:30 to 12.
KJR, Seattle, Wash., 484.4 (PST)—9 AM to 1 AM.
KNX, Hollywood, Cal., 337 (PST)—1 PM to 2; 7 to 12.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9; 11 to 12 M.
KPO, San Francisco, Cal., 429 (PST)—7 AM to 7:45; 10 to 12 M; 1 PM to 2; 3:30 to 11.
KSD, St. Louis, Mo., 541.1 (CST)—6 PM to 7.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10:30.
KYW, Chicago, Ill., 536 (CST)—6:30 AM to 7:30; 10:30 to 1 PM; 2:15 to 4; 6:02 to 11:30.
CNRA, Moncton, New Brunswick, Canada, 313 (EST)—9:30 PM to 11.
CNRR, Regina, Saskatchewan, Canada—8 PM to 11.
CNRO, Ottawa, Ontario, Canada, 435 (EST)—7 PM to 11.
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CNRR, Regina, Saskatchewan, Canada—8 PM to 11.
CNRO, Ottawa, Ontario, Canada, 435 (EST)—7 PM to 11.

THURSDAY, OCTOBER 8

WAAM, Newark, N. J., 263 (EST)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill N. Y., 316 (EST)—12:30 PM to 1:05.
WAMB, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12 M.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 10.
WBOQ, Richmond Hill, N. Y., 236 (EST)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (EST)—6 PM to 11:45.

(Continued on page 28)

A THOUGHT FOR THE WEEK

HOW about the chap in Dryville, Maine, who kicks because he cannot get San Francisco on a one-tuber? There are none so deaf as those who will not hear!

RADIO WORLD

Radio World's Slogan: "A radio set for ever yhome."

TELEPHONES: LACKAWANNA 6976 and 2063
PUBLISHED EVERY WEDNESDAY
(Dated Saturday of same week)
FROM PUBLICATION OFFICE
HENNESSY RADIO PUBLICATIONS CORPORATION
ROLAND BURKE HENNESSY, President
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
145 WEST 45th STREET, NEW YORK, N. Y.
(Between Broadway and Sixth Ave.)
European Representatives: The International News Co. Breams Bldgs., Chancery Lane, London, Eng.
Paris, France Brentano's, 38 Avenue de l'Opera.
San Francisco, Lloyd B. Chappell, 656 O'Farrell St.

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, 7¾"x11"	462 lines	$300.00
½ Page, 7¾"x5½"	231 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 Discount

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, N. Y., under the act of March 3, 1870.

OCTOBER 3, 1925

JOIN THE A. B. C.

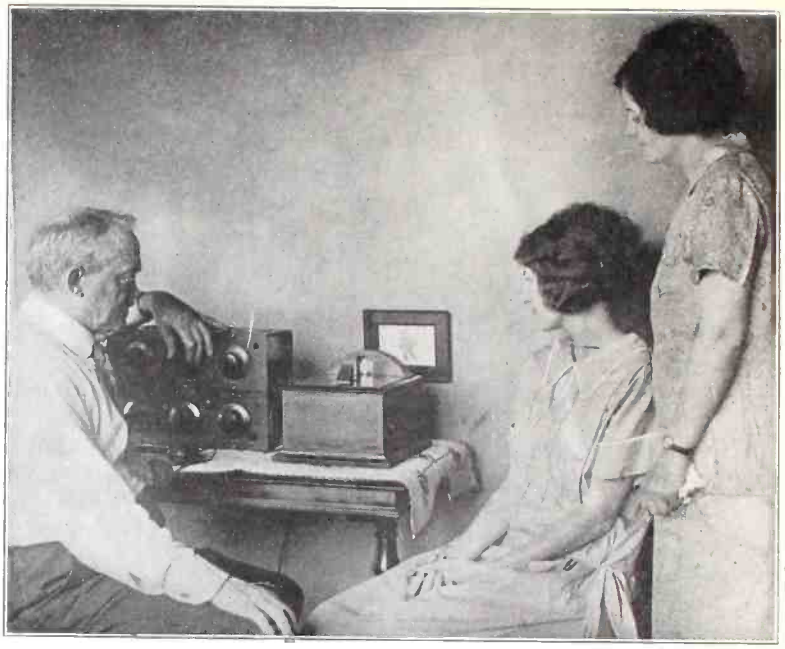
A. B. C. stands for American Broadcast Club, an organization of fans banded together to promote the welfare of radio. There are no dues, no obligations. Address A. B. C. Editor, RADIO WORLD, 145 West 45th St., N. Y. City. The names and addresses of new members follow:

D. Gilbert Libbey, Box 13, U. S. S. Nevada, San Francisco, Cal.
John B. Jones, Ridgeway, Va.
E. C. Doehne, Star Route, New Braunfels, Tex.
Gustav Nicha, 72 South 10th St., Brooklyn, N.Y.
W. C. Everhardt, 1080 Anna St., Elizabeth, N.J.
Fred Nagel, 4247 Armitage Ave., Chicago, Ill.
James Norton, 935 Willow Ave., Hoboken, N. J.
Edward W. Pratt, 746 Cumberland St., Lebanon, Pa.
Leonard B. Napora, 16 Concord St., Buffalo, N. Y.
John J. Kowalski, 508 Brownsville Ave., Pittsburgh, Pa.
H. W. Firdtbrook, Jr., 302 N. 2nd St., Temple, Texas.

REMOVAL NOTICE!
Radio World

has moved to more spacious offices at
No. 145 W. 45th St., near Broadway, New York City.

Set Used for Radio Movies



C. FRANCIS JENKINS (left) has designed this small Radio-Vision Receiving set for use in the home. It is only a few inches square and is attached to the regular radio receiving set. A miniature motion picture screen is placed on the wall of your home, as shown in this photo. The first of this machine to be made. The photo was taken in Mr. Jenkins' laboratory at Washington, D. C. (Harris & Ewing—Wide World)

A Great Thing for Radio

The enterprise of A. Atwater Kent in supplying the funds to make possible the appearance of some of the world's greatest artists before the microphone bestows a great benefit on radio. Not only will the possessors of sets reap extensive enjoyment from the high character of musical entertainment to be offered both by voice and instrument, but the army of set owners will be swelled considerably. The more radio is made worthwhile, the greater will be its success.

The action taken by Mr. Kent establishes him at once as one of the leading contributors to radio's advance. He had, of course, earned his engineering and manufacturing reputation long before radio became popular, and he added to that reputation by the manufacture of a fine radio set. But now he has dwarfed even his greatest previous efforts by endowing radio with an enduring source of great delight. To hear the magic voices of the greatest singers is a charm which will cause Mr. Kent to be permanently endeared in the hearts of radio listeners.

There are those who will look for some selfish motive on his part, but the undertaking is so vast and is made at such great expense and in so fine a public spirit that the impartial mind will look upon his deed rather in its true light as a form of philanthropy, a noble act.

The first of the series of Sunday night programs begins tomorrow and all possessors of radio receiving sets should be sure to tune in WEAF and the allied stations that will emit the program. Reinald Werrenrath, great baritone, will be the principal artist. Those who have no set should get one at once, or at least contrive to be invited to some suitably equipped home.

Wide Choice Afforded in Panel Selection

Personal taste may be consulted to a great extent in the choice of a panel. The type most popular is the plain black hard rubber kind. A variation of this type of black panel is afforded by a frieze effect, whereby the panel is made to look frosted. This is accomplished by a light drilling, a machine process.

Mahoganite panels are popular, too. They look like mahogany, but may be hard rubber, Bakelite, insuline, etc. In such a case dials would be procured to match. But with the frieze type panel plain black dials are used.

Besides these rubber panels and synthetic products there is the metal panel, which may be aluminum, brass, etc. Often this type bears a fancy engraved design.

Thus panels may be chosen, especially by the home constructor, to blend with the furniture effects in the room where the set is to be used.

HOW TO BUILD THE POWERTONE, 1 dial, 5 tubes, described in RADIO WORLD, issues of Aug. 29 and Sept. 5. Powertone Trouble-shooting, Sept. 12. Send 15c for all three. Special diagrams and "blueprint in black" included among the many illustrations. RADIO WORLD, 145 West 45th St., N. Y. City.

Greatest Artists to Broadcast

Most Gifted Singers and Musicians Sign Up, at Atwater Kent's Expense —Program Every Sunday, Beginning Tomorrow.

FOR the first time in the history of radio broadcasting, Metropolitan Opera stars and other leading artists of the musical world will broadcast regularly over the radio. Announcement was made by A. Atwater Kent, radio manufacturer of Philadelphia, that he had closed arrangements under which a group of well-known concert artists of the United States and Europe will broadcast from station WEAF, of the American Telephone & Telegraph Company, of New York, and through other stations with which WEAF is inter-connected.

Werrenrath To-morrow

The programs will begin at 9:15 o'clock each Sunday evening and will continue for one hour, with one leading artist featured, and being properly assisted. The first program will be broadcast October 4. Reinald Werrenrath, the baritone, will be the principal artist.

Others definitely announced for the series are:

Louise Homer, contralto
Mabel Garrison, soprano.
Anna Case, soprano of the Metropolitan Opera Company.
Frieda Hempel, soprano.
Maria Kurenko, soprano, of Russia.
Florence Austral, soprano, of Covent Garden, London.
Hulda Lashanska, soprano.
Reinald Werrenrath, baritone.
Edward Johnson, tenor of the Metropolitan Opera Company.
Albert Spalding, violinist.
Alexander Brailowsky, pianist.
Paul Althouse and Arthur Middleton, of the Metropolitan Opera Company.
The London String Quartet, of London.
The State Symphony Orchestra of New York.

Mr. Kent's Statement

Mr. Kent, a member of Secretary Hoover's committee on broadcasting problems, said he made the arrangement in the interest of better radio programs and as a contribution to the "listening-in" radio world.

"There has been much discussion of the improvement of broadcasting programs," he said. "I have given considerable thought to how that might be done and decided that if it were possible to bring it about the American radio audience should be permitted to hear the best artists the world affords. We had considerable difficulty in obtaining the services of these artists owing to a variety of obstacles. These, however, have been overcome and I am glad to be able to announce definitely that contracts have been signed under which a large group of the leading artists of the world will be heard on the air each week during the radio season. The broadcasting may be extended if other stations over the country ask permission to join in on the programs. It is also possible that later on we shall arrange for the artists to broadcast directly from stations in different sections of the country.

An Historic Step

"Practically every one of the artists has made phonograph records," said Mr. Kent, but only three of them have sung over the radio. I feel that the contracts signed under which they will be heard mark a step in the history of radio broacasting programs. I believe the millions of listeners who make up the great American radio audience are entitled to the best entertainment the world affords and I have endeavored to give it to them. I hope this may be the opening wedge that will lead to the best in everything being heard over the air."

It was said the contracts involve a total payment of $250,000.

Other artists will be heard on the air provided permission for broadcasting can be obtained.

Subject to permission from the Victor Talking Machine Company are:

Mme. Ernestine Schumann-Heink.
Cecilia Hansen.
Margaret Matzenauer.
Olga Samaroff.
Emilo de Gorgoza.
Kathryn Meisle, of the Chicago Civic Opera Company.
Giannini.

Subject to the Brunswick Company are:

Joseph Hofman, pianist.
Allen McQuhae and Mario Chamlee, of the Metropolitan Opera Company.

Subject to permission of the Metropolitan Opera Company are:

Lucrezia Bor.
Merle Alcock.
Joan Ruth and Marion Telva.

Soldering a Feat; How to Do the Job

Soldering is a more difficult job than many will admit. It is easy just to solder, but the trick lies in doing it well. The flux should be entirely absent after the joint is made. A good plan is to apply some solder to one section of the joint and some to the other section, fluxing each. Then when the two are held together the soldering iron is applied until the flux is evaporated. The joint should be clean. An extra precaution may be taken by wiping the completed joint with a brush or rag soaked in alcohol.

BY HERBERT HOOVER

Secretary of Commerce and Radio Chief of the United States

Tax on Radio Sets Would Be an Unnecessary Annoyance—Problem of Accommodating Applicants for Place in Air Must Be Solved

EVERY radio activity exists finally and lastly to serve the listening public. The keystone of the industry is to maintain their interest by service. That is the motive of the broadcaster who gives us better programs and better quality of transmission, and is the object of the manufacturers of receiving sets that they should give more reliable and more perfect reception. It is the object of the Department of Commerce, which has the very difficult job to keep the traffic lanes clear so that the voice over the radio may reach the listener. It is, therefore, the listener in whom we are primarily interested, not only as an industry but as a public service.

Opposes Tax

Now it is often said that the listener in the United States receives an extraordinary service without paying for it. This is not entirely true, for he pays indirectly for some of it. But in the fashion we have developed the organization of radio in the United States the listener is free from any direct charge for programs. And in this we differ from the methods of foreign countries who seek to support broadcasting by tax on the listener. A few years ago much anxiety was expressed that we could not maintain good programs of entertainment and the delivery of public information without devising some system of tax upon the listeners.

It has been my aspiration that we should keep the home free from constant annoyance of any attempt to assess the cost of broadcasting upon each receiving instrument. And I have believed that the industry would develop far more rapidly in this matter than if we pursued the European plan. But beyond this, support by taxation means a limited number of government controlled broadcasting stations, and therefore much less variety of program, much less competitive endeavor to please the listener and, above all, constant dangers of censorship.

Open to All If Room

I am today confident in the announcement that our policy that there shall be on the air every broadcasting station for which there is available channel and that the cost shall be borne indirectly by public service institutions, has proved far and away the most successful and has finally settled our policies for all time.

But whether the listener pays directly or indirectly or not at all, it is the listener in the American home who is the foundation and furnishes the support for the whole industry. For if he relaxes or his interest fails, the whole radio structure will fall as quickly as it has grown.

Problems Unsolved

We still have plenty of unsolved problems. The number of radio channels is limited. They are already so overcrowded that there is little room for the new comers. They jostle each other a good deal. More legislation for solution of our difficulties is being frequently suggested and we must sooner or later determine the major issue whether we will continue to allow every new broadcasting station access to radio paths or whether every applicant entering must first show a legitimate and a valuable purpose to the listener before we allow him to further congest the overcrowded lanes.

THE RADIO TRADE

Rebuke for Battery Maker Issued by Standards Bureau

WASHINGTON.

The Bureau of Standards again warned dealers and factory representatives not to use its name in connection with the sale of dry batteries for radio receiving sets.

"The attention of the Bureau has again been called to the frequent misuse of its name in connection with the sale of dry batteries for radio receiving sets," says the announcement.

"Claims have been made by some dealers and factory representatives that the superiority of their particular brands of batteries has been shown by tests made at the Bureau of Standards.

"Tests of batteries, including dry cell A and B batteries for radio use, are made at the Bureau in accordance with government specifications. These tests are made to aid the departments of the government in the purchase of batteries and to help each manufacturer to improve his product. The Bureau does not publish the results of its tests, nor does it inform any manufacturer of the results of its tests. Therefore, statements that any make or brand of battery is superior as shown by tests at the Bureau of Standards are unwarranted."

Radio and Electrical Business Opportunities

Rates: 50c. a line; Minimum, $1.00

RADIO HORN PLANT, fully equipped, going business, A1 accounts; on account death, partner wanted. Box A1, Radio World.

BATTERY, RADIO ESTABLISHED STORE, main thoroughfare, in Bronx; must sacrifice; no agents. Box B2, Radio World.

RADIO "A AND B" BATTERY ELIMINATOR approved by authorities; orders ready; to start production need working capital. Box C3 Radio World.

MANUFACTURER RADIO SETS, PARTS, nationally advertised, 4 years in business, wants $25,000 to $50,000 factory expansion; splendid opportunity for individual or group; known all over world. Box D4, Radio World.

MANUFACTURERS of electrical, mechanical, radio. Are your production costs, rejects and waste running high? There is available a high-class factory manager of unusual ability and initiative who can correct these conditions. The salary may be moderate if the future possibilities are not limited. E5, Radio World.

HOOK-UPS!—A lot of them, some of which are sure to suit your purpose, appeared in RADIO WORLD dated Aug. 15. 15c. a copy, or start your subscription with that number. RADIO WORLD

New 5-in-1 Connector

A novel phone connector has been brought out by Albert E. Snow, maker of radio parts for manufacturers. It allows the use of from one to five pairs of phones, is easily attached. It is solid, durable and can be adjusted to receive any size phone tip. It is being marketed by Snow & Company, 149 Church Street, New York City.

Tested and Approved by Radio World Laboratories

RADIO WORLD'S FAIR, 1926, TO BE OPENED SEPT. 13

The Third Annual Radio World's Fair will be held in the new Madison Square Garden, New York City. It will occupy the entire two exhibition floors of the new building and the tentative date approved for the opening of the show is September 13, 1926.

The Chicago Show will open October 11, 1926. It will be held in the Coliseum.

MUSICONE PRICE LOWERED

Following shortly the announcement of price reductions in several of the Crosley sets comes the news of a lower price on the Crosley Musicone. This instrument, which formerly sold for $17.50, is now priced at $14.75.

Literature Wanted

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

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

I desire to receive radio literature.

Name .....

City or town.....

State .....

Are you a dealer?.....

If not who is your dealer?

His Name .....

His Address .....

Philip H. Gimbel, Cleveland, O.
Leonard B. Napora, Buffalo, N. Y.
Melvin Melson, Mullica Hill, N. J. (Dealer).
Howard M. Steffen, P. O. Box 245, Memphis, Mo.
William Eache, Bath, S. D. (Dealer).
Alamo Camera Company, San Antonio, Tex. (Dealer).
Joe Applebaum, 34 Bristol St., Brooklyn, N. Y.
Robert W. Sulach, Kohler, Wis.
Robert M. Brick, 212 Summit St., Bethlehem, Pa.
M. Ogan, Box 17, Bellflower, Cal.
Geo. A. Gillam, McVeytown, Pa.
R. D. Currier, 3513 10th Ave., Maples, Minn.

Coming Events

OCT. 3 to 10—Radio Exposition, Arena, 46th and Market Streets, Philadelphia, Pa., G. B. Bodenhof, manager, auspices Philadelphia Public Ledger.

OCT. 5 to 10—Second Annual Northwest Radio Exposition Auditorium, St. Paul, Minn. Write 515 Tribune Annex.

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

OCT. 10 to 16—National Radio Show, City Auditorium, Denver, Colo.

OCT. 12 to 15—South Texas Radio Exposition, Post-Dispatch (KPRC), Houston, Tex.

OCT. 12 to 17—Boston Radio Show, Mechanics' Hall. Write to B. R. S., 209 Massachusetts Ave., Boston, Mass.

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

OCT. 12 to 17—Radio Show, Montreal, Can., Canadian Expos. Co.

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

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

OCT. 26 to 31—First Annual Rochester Times-Union Radio Exposition, Convention Hall, Rochester, N. Y. Write Howard H. Smith, care Times-Union.

NOV. 2 to 7—Radio Show, Toronto, Can., Canadian Expos Co.

NOV. 3 to 8—Radio Trade Association Exposition, Arena Gardens, Detroit. Write Robt. J. Kirschner, chairman.

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.

Preparing for the Conference

From present appearances it seems that the Fourth National Radio Conference will be held in Washington the middle of next month. The problems to be laid before it are many, foremost being the devising of some means of finding room on the air for all who seek to broadcast.

Unless some arbitrary plan is indorsed for curtailing the hours on the air that existing stations enjoy, the only solution seems to be to lower the minimum wavelength assignment, making the lowest wave, say, 150 meters instead of 200. Then the highest wave limit, now 600 meters, might be lowered to 450 or so, because there are ever so many more channels between 150 and 450 meters than between 200 and 600. This is due to the frequency ratio.

The solution is easy to talk about but hard to put in practice. What about the sets already in use and those being manufactured? What about the straight-line frequency condensers, now so popular, and which would not show exactly straight-line characteristics under the lowered band? The problem is inextricably woven into the woof of the trade and an important voice will be raised by the manufacturers of sets particularly.

553,000 Sets on Farms, But That's 8½% of Eligibles; Agriculturists State Views

By Thomas Stevenson

WASHINGTON.

An analysis of the survery just completed by the Department of Agriculture reveals that while the number of radio sets in use by farmers has nearly doubled during the past year, only about 8½% of the farms of the country have receiving apparatus.

The popularity and need for radio sets on all farms is undisputed by farmers possessing them, but these two obstacles stand in the way:

(1) Lack of information regarding the installation and operation of a receiver.

(2) The cost of a receiver capable of bringing in distant stations.

553,000 Sets on Farms

The survey estimated that at present there are 553,000 receivers on farms throughout the country; this is nearly twice the total for 1924 and more than four times the number of 1923. Due to greater interest and lower prices, it is considered probable that there may be even a bigger increase during the coming year.

"The increasing number of radio sets on farms," says the Bureau of Agricultural Economics which conducted the survey, "places a responsibility upon those who conduct broadcasting stations and those who have information to distribute. When half a million farmers turn a listening ear toward the broadcasting stations of the country they expect to hear something worth while."

The survey was made through a questionnaire sent to all county agents who were also invited to give their views as to the value of radio to their district. Some of the replies follow:

J. M. Eleazer, Sumter County, S. C.: "If improved a little more to eliminate static it will come to be one of the greatest educational factors in the advancement of educating the farmers that we have today."

J. A. Barton, Comanche County, Texas: "Radio fully equals the automobile in making country life more pleasant and gives the farmer who has always been

(*Concluded on next page*)

(Concluded from preceding page)

circumscribed by his circumstances infinite reach."

Harry P. Muffly, Hardy County, W. Va.: "A large percentage of the farmers do not know which are reliable sets and are afraid to buy on account of getting stuck. They also feel that if they wait sets will be simpler and cheaper.

J. A. Hearn, Huntsville, Ark.: "There is no question but that the farmers are putting in receiving sets to a greater extent than town people in my county, and I look upon it as a great educational and broadening factor for the rural folks."

H. A. Wemland, Senema County, Cal.: "The greatest value so far to my mind has been the removal of the feeling of isolation and the fact of being able to receive important news as rapidly on the farm as in the city. The real practical values outside of this in radio to my mind must come from the development of services in the nature of weather forecasts, market predictions, and pest and disease control warnings which will really apply to the farm."

L. C. Gilbert, Hugo, Col.: "The radio is doing wonders for our isolated districts in keeping them in touch with the outside world. The weather report is especially useful to the stockmen, the market conditions help in marketing, the entertainment features help to brighten the home life and in general it keeps them in touch with the outside world."

R. S. Doughty, Anniston, Ala.: "There is no question but what radio sets in farm homes are of untold value. I cannot help feeling the crying needs in our rural homes today for good clean entertainment, and because of the remoteness of some homes, radio undoubtedly is the answer."

G. W. Sidwell, Ness County, Kan.: "I think the radio for rural people is one of the greatest inventions of civilization. The big problem is to be sure the receiving sets are standardized and reliable. Cutting out all regenerative makes to prevent interference, then a thorough educational campaign to get farmers to buy them personally and save their gasoline. Good makes at reasonable prices with honest local dealers will radioize the rural sections."

B. S. Russell, Clay Center, Neb.: "On the whole I find the farmers in my county are open-minded and well posted on current events and town topics. This is largely due to the information received by radio."

W. E. Hanlen, Hebron, Neb.: "Every elevator in this county receives their market reports by radio. I look on the radio as one of the biggest factors in keeping the present generation on the farm as you are able to keep in touch with the world through them. Most of the radios in this county are operated by the young folks."

Charles L. Doughty, Chattanooga, Tenn.: "Farmers in our county have not bought outfits very much as yet. Possibly the biggest reason is that no one has gone out on their farms to sell them and no particular advertising has been done, and no special effort has been made to sell radio outfits to farmers. Possibly another reason why farmers have not bought outfits in great numbers is that for the last few years, excluding last year, farmers have made very little money."

G. W. Vergerent, Jackson County, Wis.: "I believe that the radio is a wonderful invention and that farmers are buying them whether or not they can afford them. I also feel that it is not the duty of an agricultural agent to urge the purchase of such commodities when they are now selling far above their value."

Robert H. Zeiger, Laramie County, Wyo.: "I believe that many more of our ranchers and farmers will buy radio sets when agricultural conditions have improved and they can afford them. We can use only the expensive multi-tube sets because of distances from broadcasting stations."

TUNING a set with Streamline SLF condensers is a pleasure. Stations are delightfully separated.

No more will the political orator at one station brush shoulders with the jazz band at another, or almost collide with an operatic soprano on an adjoining channel! There is a bountiful band of silence in between.

Mechanically precise, electrically perfect, the Streamline condensers represent an achievement in low-loss straight-line frequency design.

Streamline Radio Co.
218 Fulton St., New York City

STREAMLINE SLF

.0005 mfd. (23 plates)	**$2.50**
.00035 mfd. (17 plates)	**$2.00**
.00025 mfd. (11 plates)	**$2.00**

Inquiries Invited From the Trade

STREAMLINE RADIO CO.,
Dept. W., 218 Fulton Street, N. Y. City.

Enclosed find $..... for which send me by return mail ..... Streamline SLF condensers, capacity .....

NAME .....

ADDRESS .....

CITY ..... STATE .....

STATIONS

(*Concluded from page* 15)

Station	Owner and Location	Meters
WOCL	Hotel Jamestown, Jamestown, N. Y.	275
WOCG	Triple Alliance Radio Station, Sycamore, Ill.	205
WOI	Iowa State College, Ames, Iowa	270
WOK	Neutrowound Radio Mfg. Co., Homewood, Ill.	217
WOKO	Otto Baur, N. Y. City	233
WOO	John Wanamaker, Philadelphia, Pa.	508
WOQ	Unity School of Christianity, Kansas City, Mo.	278
WOR	L. Bamberger & Co., Newark, N. J.	405
WORD	Peoples Pulpit Assn., Batavia, Ill.	275
WOS	Mo. State Marketing Bureau, Jefferson City, Mo.	441
WOWO	Main Auto Supply Co., Ft. Wayne, Ind.	227
WPAK	N. D. Agricultural College, Agricultural College, N. D.	285
WPAZ	Dr. John R. Koch, Charleston, W. Va.	268
WPG	Municipality, Atlantic City, N. J.	300
WPSC	Penn State College, State College, Pa.	261
WQAA	H. A. Beale, Jr., Parkersburg, Pa.	220
WQAC	Gish Radio Service, Amarillo, Texas	234
WQAE	Moore Radio News Station, Springfield, Vermont	246
WQAM	Electric Equipment Co., Miami, Fla.	268
WQAM	Electric Equipment Co., Miami, Fla.	263
WQAO	Calvary Baptist Church, New York, N. Y.	360
WQJ	Calumet Rainbo Broadcasting Co., Chicago, Ill.	448
WRAF	Radio Club, Inc., Laporte, Ind.	224
WRAK	Economy Light Co., Escanaba, Mich.	256
WRAM	Lombard College, Galesburg, Ill.	244
WRAV	Antioch College, Yellow Springs, O.	263
WRAW	Avenue Radio Shop, Reading, Pa.	238
WRAX	Flexon's Garage, Gloucester City, N. J.	268
WRBC	Immanuel Lutheran Church, Valpariaso, Ind.	278
WRC	Radio Corp. of Ama., Washington, D. C.	469
WREC	Wooten's Radio Shop, Coldwater, Miss.	254
WREO	Reo Motor Co., Lansing, Mich.	286
WRHF	Radio Hospital Fund, Washington, D. C.	256
WRHM	Rosedale Hospital, Minneapolis, Minn.	252
WRK	Doron Bros. Elec. Co., Hamilton, O.	270
WRNY	Experimenter Publishing Co., (Radio News) N. Y. City	258
WRM	University of Illinois, Urbana, Ill.	273
WRMU	A. H. Grebe & Co., Inc., Motor Yacht Mu-1, N. Y. City	236
WRST	Radiotel Mfg. Co., Inc., 5 First Ave., Bay Shore, N. Y.	216
WRW	Tarrytown Research Laboratory, Tarrytown, N. Y.	273
WSAC	Clemson Agricultural College, Clemson College, S. C.	337
WSAI	U. S. Playing Card Co., Cincinnati, O.	326
WSAJ	Grove City College, Grove City, Pa.	229
WSAN	Allentown Call, Allentown, Pa.	229
WSAP	City Temple, New York, N. Y.	263
WSAR	Doughty & Welch Elec. Co., Fall River, Mass.	254
WSAU	Camp Marenfeed, Chepham, N. H.	229
WSAV	C. W. Vick Radio Construction Co., Houston, Tex.	248
WSAZ	Chase Electric Shop, Pomeroy, Ohio	244
WSB	The Atlanta Journal, Atlanta, Ga.	428
WSBC	World Battery Co., Chicago, Ill.	210
WSBF	Stix Baer and Fuller, St. Louis, Mo.	273
WSDA	Seventh Day Adventist Church, N. Y. City	263
WSKC	World's Star Knitting Co., Bay City, Mich.	261
WSMB	Saenger Amuse. Co., New Orleans, La.	319
WSMH	Shathick Music House, Owosso, Mich.	240
WSMK	S. M. K. Radio Corp., Dayton, O.	275
WSOE	School of Engineering, Milwaukee, Wisc.	246
WSRF	Harden Sales & Service Co., Broadlands, Ill.	233
WSRO	Radio Co., Hamilton, Ohio	251
WSUI	State University of Iowa, Iowa City, Iowa	484
WSY	Alabama Polytechnic Institute, Auburn, Ala.	250
WTAB	Fall River Daily Herald, Fall River, Mass.	266
WTAC	Penna. Traffic Co., Johnstown, Pa.	268
WTAD	R. E. Compton, Carthage, Ill.	236
WTAL	Toledo Radio & Elc. Co., Toledo, O.	252
WTAM	Willard Storage Battery Co., Cleveland, Ohio	389
WTAP	Cambridge Radio Elec. Co., Cambridge, Ill.	242
WTAQ	S. Van Gordon & Son, Osseo, Wis.	254
WTAR	Reliance Radio & Elec. Co., Norfolk, Va.	261
WTAS	Charles E. Erbstein, Elgin, Ill.	303
WTAT	Edison Elec. Ill. Co. (Portable), Boston, Mass.	244
WTAW	Agricultural & Mech. College, College Station, Tex.	270
WTAX	Williams Hardware Mfg. Co., Streator, Ill.	231
WTAY	Oak Leaves Broadcasting Assn., Oak Park, Ill.	250
WTAZ	T. J. McGuire, Lambertville, N. J.	261
WTG	Kansas State Agricultural College, Manhattan, Kas.	273
WTHS	Flint Senior H. S., Flint, Mich.	219
WTIC	Travelers Insurance Co., Hartford, Conn.	347
WWAD	Wright & Wright, Inc., Philadelphia, Pa.	250
WWAE	Alama Ballroom, Joliet, Ill.	242
WWGL	Radio Engineering Corp., Richmond Hill, N. Y.	213
WWI	Ford Motor Co., Dearborn, Mich.	266
WWJ	Detroit News, Detroit, Mich.	517
WWL	Loyola University, New Orleans, La.	275

Works on One Meter

HERE is a 1-meter coil, hooked up to a transmitter. Sidney E. Finkelstein is demonstrating the transmitter, made by Leon P. Adelman, distinguished radio author. (Underwood & Underwood).

Battery Voltages to Use on Thordarson-Wade

(Concluded from page 6)

battery value can not be given as standard for all cases. For the detector plate connect the 45-volt tap of the B battery block, but this voltage may be even 67½ for greater volume and richer tone. Try both and even other voltages, higher and lower. Any tendency of the set toward over-oscillation may be checked by reducing the experimental B battery voltage here. The B posts of the two remaining auto-transformers are connected to B plus 135 volts, and this may be taken as standard, although the grid bias should be varied from 6 to 12 volts. It is assumed that the 201A type tube is used throughout. The bias that is theoretically correct for minimum B battery consumption and maximum grid response can not be always accepted as best from a quality viewpoint, and one may determine the C voltage on the basis of auditory effects alone.

The set is to be operated exclusively on a speaker, hence no provision is made for a detector tube listening post.

The overloading that takes place, and which is enirely curable, is not due to the form of coupling at all, but to the limitations of tubes. Of course, much of this strain can be more simply averted by using high-Mu tubes in the first and second audio stages (tubes 3 and 4). Instead of 6 to 8, the normal Mu of the 201A, etc., you would have about 20. Such a high-Mu tube must not be used in the final audio stage, but the 201A type or a special last-stage Mu tube being employed. The regulation high-Mu tube in the final audio stage cuts down the volume and injures tone quality.

The 1.0 mfd. fixed condenser that bypasses the RF current around the batteries is optional and if a small condenser is in mind for use here it certainly should be omitted, for only a large one serves the purpose.

The Adjustable Factor

Looking over the variable factors in the set we find the following:

(1) the tuning condenser C1 regulating wavelength.

(2) the tuning condenser C2 regulating wavelength.

(3) the regeneration condenser C3 regulating feedback.

(4) the rheostat controlling the RF tube.

(5) the rheostat controlling the detector tube.

(6) the grid leak controlling the discharge of excessive negative electrons from the detector grid.

(7) the potentiometer controlling the leakage from the second AF tube's grid.

Every one of these is a volume regulator. But not every one ranks as a control. Once the detector grid leaks, the potentiometer and the two rheostats are set they may be left that way. Hence remain only the three tuning controls or radio-frequency elements.

The original set was wired for me by Bob Barbley, 135 Liberty St., N. Y. C.

LOUD CRYSTAL SET

RESULTS EDITOR:

I thank you very much for your information in the Radio University, given to me in the Sept. 26th issue of RADIO WORLD in regard to the Crystal Set described in the July 25th issue by Lewis Winner. The special hookup that I am referring to is the one employing the Carborundum crystal with the small battery. After fixing the set as you told me to, the results were remarkable. The set worked a loud speaker.

G. Claybrooke.

616 E. 25th St., Los Angeles, Cal.

THE KEY TO THE AIR

(*Concluded from page 19*)

WCAE, Pittsburgh, Pa., 461.3 (CST)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 11.
WCBD, Zion, Ill., 344.6 (CST)—8 PM to 10.
WCCO, St. Paul and Minneapolis, Minn., 416.4. (CST)—9:30 AM to 12 M; 1:30 PM to 4; 5:50 to 10.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 11 to 12 M; 4 PM to 5; 6 to 12.
WEAR, Cleveland, O., 390 (EST)—10:30 AM to 12:10 PM; 3:30 to 4:15; 7 to 11.
WEEI, Boston, Mass., 467 (EST)—6:45 AM to 7:45; 1 PM to 2; 2:30 to 10.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30; 11 to 1 AM.
WFBH, New York City, 272.6 (EST)—2 PM to 7:30.
WGBS, New York City, 316 (EST)—10 AM to 11; 1:30 PM to 4; 6 to 10:30.
WGCP, New York City, 316 (EST)—2:30 PM to 5:15.
WGES, Chicago, Ill., 250 (CST)—5 PM to 8; 10:30 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 11:30; 6 PM to 7:15; 8:30 to 11.
WGR, Buffalo, N. Y., 319 (EST)—12 M to 12:45 PM; 2 to 4; 7:30 to 11.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10.
WHAR, Atlantic City, N. J., 275 (EST)—2 PM to 3; 7:30 to 10.
WHAS, Louisville, Ky., 399.6 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (EST)—2:15 PM to 5; 7:30 to 11; 11:30 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—7:30 PM to 9; 11 to 12.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WJY, New York City, 405 (EST)—7:30 PM to 11:30.
WJZ, New York City, 455 (EST)—10 AM to 11; 1 PM to 2; 4 to 6; 7 to 12 M.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 8:30 to 9.
WLW, Cincinnati, O., 422.3 (EST)—10:40 AM to 12:15 PM; 1:30 to 5; 6 to 8; 10 to 11.
WMAK, Lockport, N. Y., 265.5 (EST)—11 PM to 1 AM.
WMCA, New York City, 341 (EST)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (EST)—3:15 PM to 4:15; 6:50 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1:30; 5:45 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 AM to 2 PM; 3 to 3:30; 4 to 7:10; 8 to 9.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7.
WPG, Atlantic City, N. J., 299.8 (EST)—7 PM to 11.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—1 PM to 2; 4 to 6:30.
WREO, Lansing, Michigan, 285.5 (EST)—8:15 PM to 9:45; 10 to 11.
WRNY, New York City, 258.5 (EST)—11:59 AM to 2 PM; 7:39 to 10.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 8 to 9.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30; 3 to 4; 6 to 7; 8 to 9.
KDKA, Pittsburgh, Pa., 309 (EST)—9:45 AM to 12:15 PM; 2:30 to 3:30; 5:30 to 10:15.
KFAE, State College of Washington, 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 to 1:15 PM; 3 to 4; 6:30 to 10.

Field Intensity Studied By U. S. in Drive Against Avoidable Interference

WASHINGTON.

In an effort to lessen interference the Bureau of Standards is developing a portable apparatus for radio supervisors which will enable them to measure the field intensity of transmitters and regulate the power of stations so that they do not produce excessive interference.

During the past few months a study has been made of several methods hitherto used for the measurement of field intensities. It has been learned that the factor which determines the strength of signals produced in a radio receiving set by the waves from any transmitting station is the field intensity produced by the station. This field intensity is not determinable from a knowledge of the power of the transmitting station, and so the interference caused by a station at a given point is measured not by the station's power but by the field intensity which it produces.

With the advent of higher-power broadcasting this summer, the Bureau of Standards has measured the field intensities produced at Washington by a number of the higher-power stations. These measurements have shown that the effect of the higher power is to produce louder signals and to increase the radius of the small zone around the broadcasting station in which there is freedom from atmospheric disturbances and other interference. This gain is not proportional to the increase of power. The higher power does not materially nicrease the interference produced by the stations. Fading at a distance is not reduced by higher power and limits the zone of satisfactory reception. One of the greatest obstacles to good reception is fading. The Bureau, in coperation with about 40 other laboratories, has been making graphical records of fading on prearranged schedules to study the changes in fading during the sunset period. Accurate knowledge of the sunset fading phenomena should throw light on the nature and causes of fading.

How to Obtain the Best Results from the Diamond

(*Continued from page* 11)

station, then more turns must be put on the secondary, to make its inductance the same as that of the loop. However, other considerations arise, and these you must settle for yourself. For instance, if with the loop in use the RF and the detector condenser both tune in step, you may prefer to keep this advantage. Then stations may be logged, as to this pair of dials, with the same reading for both condensers. You might not desire to alter the secondary of the RFT to make is correspond to the loop readings, because then the parity of readings with the other dial would be lost. That being so, you would want to adjust the loop. If the collapsible type is employed, the inductance may be reduced by pushing the top of the loop farther down, making the loop more "squat." Also, the number of turns on the loop may be increased or reduced, depending on whether lower or higher readings are required. A tapped loop may offer ready solution of the difficulty.

In dealing with these matters one must not forget that the set must tune in the entire broadcast band of wavelengths. Thus it would be idle to readjust the inductance on loop or recondary, only to make one coil conform to another that prevents tuning in the entire band! The winding directions given in the constructional article, issue of April 11, would enable you to tune in the entire band with .00005 condensers. Therefore attention should be concentrated on the loop to make its inductive value the same as that of the secondaries of the RFT and the detector stage coupler. This inductance is about 176 microhenries.

If anybody has the misfortune of building the set without being able to obtain a peep out of it, the wiring should be checked against the schematic and picture diagrams. Look over the B batteries, using a voltmeter. If these batteries show a reading of 25 per cent. less than the rated voltage it is time to replenish. Test the A battery with ammeter or hydrometer. The next concern is the tubes. If you can try them out in some other set, that's preferable. A set that doesn't work usually means (1) a broken connection, (2) tube trouble, (3) rundown batteries.

MOST GRATIFYING RESULTS OBTAINED WITH DIAMOND

DIAMOND EDITOR:

I have built the Diamond of the Air with most gratifying results.

I believe RADIO WORLD to be of great value to the intelligent radio constructor, the man who is fair-minded enough to make allowance for the personal element, with its errors; the man who recognizes that in all constructive work, mental or physical, self-blame, or helpful self-criticism, is a greater aid than is arrogant assumption of self-superiority.

CHARLES G. MANDEVILLE,
505 West 168th St.,
N. Y. City

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS.

10 CENTS A WORD. 10 WORDS MINIMUM

DINING AND SLEEPING CAR CONDUCTORS (White). Exp. unnecessary. We train you. Send for book of Rules and application. Supt. Railway Exchange, Sta. C, Los Angeles.

RADIO HOSPITAL—Specialists in Neutrodynes and Super-Heterodynes. Dept. 4, Abilene, Kansas.

A 1-CONTROL PORTABLE, by Capt. P. V. O'Rourke; A Baby Super-Heterodyne, only 4 Tubes, by J. E. Anderson; A More Powerful Diamond, Still only 4 Tubes, by Herman Bernard. Other features in RADIO WORLD, dated July 11, 1925, 15c a copy, or start your subscription with that number. RADIO WORLD.

MAKE $100 WEEKLY in spare time. Sell what the public wants—long-distance radio receiving sets. Two sales weekly pays $100 profit. No big investment, no canvassing. Sharpe of Colorado made $955 in one month. Representatives wanted at once. This plan is sweeping the country—write today before your county is gone. Ozarka, Inc., 126-Y. West Austin Ave., Chicago, Ill.

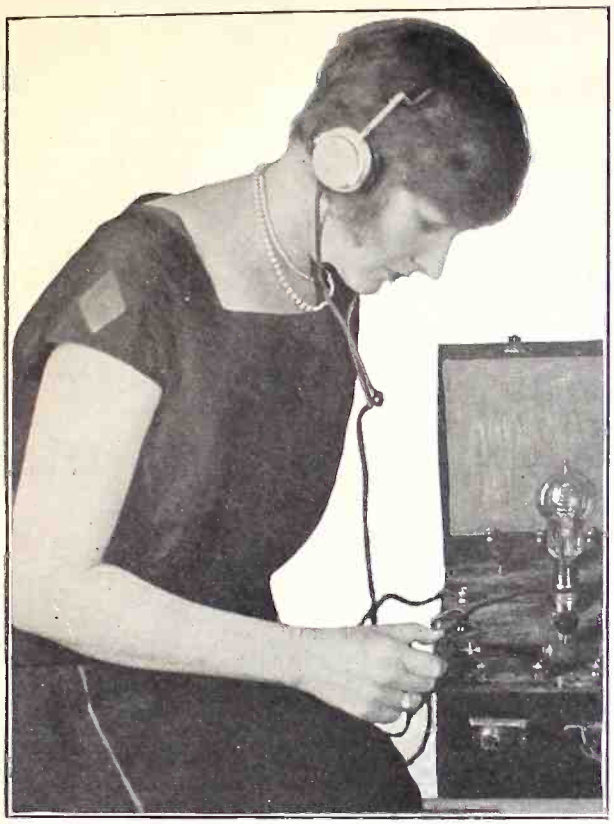
HOW TO BUILD THE POWERTONE, 1 dial, 5 tubes, described in RADIO WORLD, issues of Aug. 29 and Sept. 5. Powertone Trouble-shooting, Sept. 12. Send 15c for all three. Special diagrams and "blueprint in black" included among the many illustrations. RADIO WORLD.

AGENTS WANTED TO SELL standard radio apparatus. Write us at once if interested. Radio Development and Engineering Co., 180 Broadway. New York.

BATTERY ELIMINATORS, Radio Sets. Bargains. G. Sims, Lake, New York.

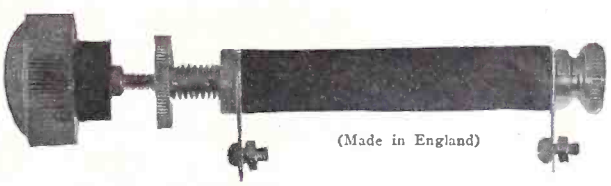
A TRIPLE TESTED SILVERED DETECTOR or Amplifier WW-201-A Tubes, with Standard Base, for $4.25, or $$1.50 each. Guaranteed. Williams Distributing Co., 4301 Third St., Louisville,

BABY PORTABLE SET. How to make it. See RADIO WORLD dated May 16. 15c per copy, or start your subscription with that number. RADIO WORLD.



EVERY LEAK is thoroughly tested by the audible beat method, with an Osglim tube (above), and again on a megometer. (Foto Topics.)

The Bretwood Variable Grid Leak



Guaranteed Precision Scale of ¼ to 10 megobms

The Bretwood is the world's most scientific variable grid leak. Noiseless, accurate, it will improve tonal quality and increase distance range.

Try one. Money back if you're not elated.

The Bretwood is the officially prescribed leak for RADIO WORLD'S 1926 Model Diamond of the Air.

When the King Wanted
A Grid Leak He Commanded
Bretwood

$1.50

North American Bretwood Co., 145 W. 45th St., New York City:—Enclosed find $1.50. Send one Bretwood Variable Grid Leak, prepaid, on 10-day money-back guarantee.

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Dealers and Jobbers
Write for
Trade Terms

North American Bretwood Co.
145 West 45th St. New York City

after all.....

"HOW WELL YOU CAN HEAR" is the only thing that really counts

FOR a few weeks after we get a new radio set we all have the "logged 57 varieties of stations last night" feeling in our blood. Then we get tired and want to sit back and have some real entertainment. For, after all, "How well you can hear" is the only thing that really counts—no matter whether the entertainment is coming from a local station or one a thousand miles away.

Acme M A-2 Audio Frequency Transformer — more amplification without distortion.

"How well you can hear"

In this "how well you can hear" proposition is where quality comes in—and so does Acme. The Acme Apparatus Company, pioneer radio and transformer engineers and manufacturers, have long made both transmitting and receiving apparatus of only the highest efficiency. Specialists in amplification, even before the days of broadcasting, this company has perfected "amplification without distortion."

Acme "Double Free-edge Cone" Loud Speaker—for reproduction without distortion.

Distortion does not mean merely squeals and howls. *Any thing which fails to give you an exact reproduction of the human voice is distortion.*

Make this test with your set

Here is how you can test your own set. Start your radio and at the same time keep up a conversation with two or three friends.

Unless you can understand the voice over the radio as easily as that of a friend several feet from you, and without any more concentration and effort than is ordinarily required in talking with him, then you have distortion.

The reason you have to concentrate when listening to a voice speaking over the ordinary radio (an action unnecessary in ordinary conversation) is simply this: the individuality of the voice is lost because distortion has blurred out the over tones which give this vitality and individuality. Monotones are always hard to understand.

Acme B — eliminator for elimination without distortion.

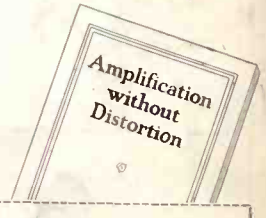
The whole story of distortion and how it can be overcome is carefully and fully explained in "Amplification Without Distortion," a book on radio reception which is invaluable because it is written by a famous radio engineer in language even the radio novice can completely understand. Over two hundred thousand radio enthusiasts can vouch for the service it will give you. Thousands have written us their thanks. The 9th edition is just off the press. Send for your copy.

Claude Harris

Pres., Acme Apparatus Co.

9th edition of this famous book just off press—send for your copy

A 40-page book—over 200,000 of which have been sold at 10c. a copy—gives the complete story of "Amplification Without Distortion." Use coupon.



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~for amplification

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