JULY 18 1925
15 CENTS

ANDERSON'S 6-TUBE SUPER-HETERODYNE

RADIO WORLD
Title Reg. U.S. Pat. Off
Vol. 7. No. 17. ILLUSTRATED Every Week

THE 3-TUBE MARCONI BROADCAST RECEIVER

HOW TO MAKE A GOOD BATTERY CONNECTOR

FIG. 1, the breaking of the glass envelope. This is followed by the soldering of lamp cord to the base tips of the tube. (Fig. 2). Sealing wax fills up the shell. (Fig. 3). Next (Fig. 4) the four wires are braided.

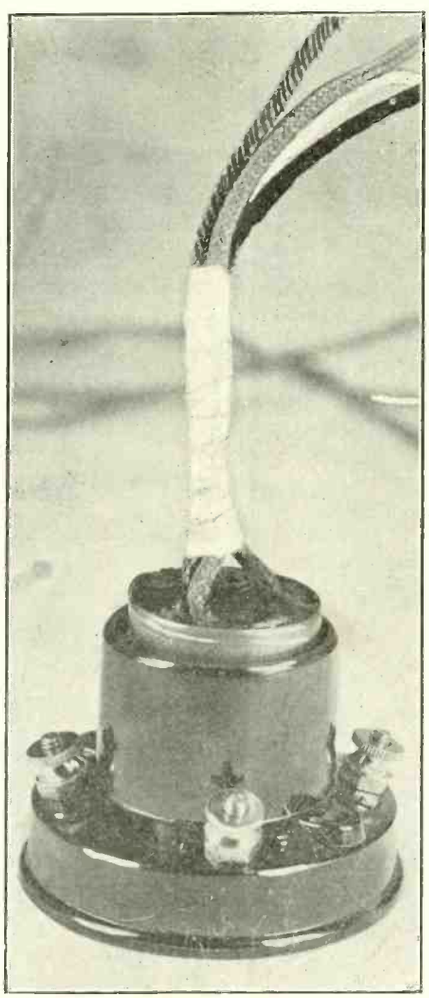
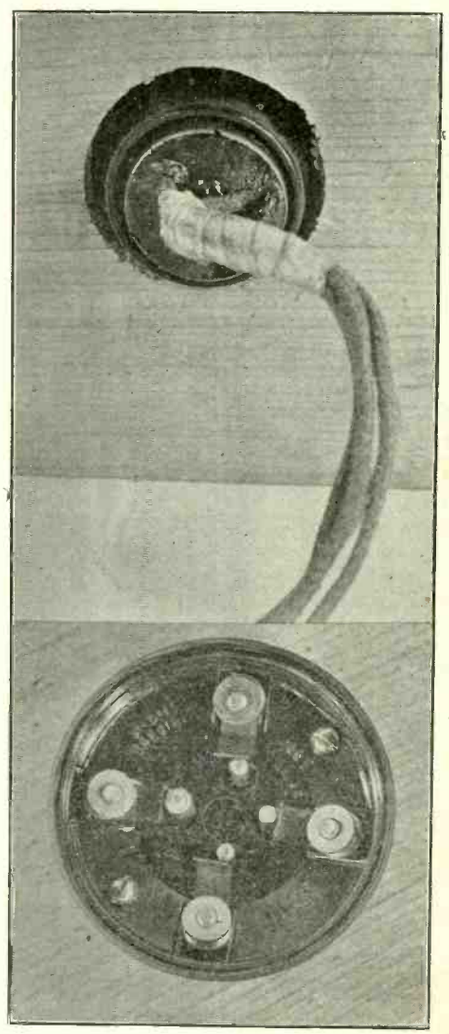


FIG. 5, the finished product, a servicceable battery connector. Vari-colored battery cable may be used to advantage for easier distinction of the leads.



FIGS. 6 and 7 show the connector in use.

WHAT good is a burnt-out radio tube? Well, the base may be converted into an excellenf battery connector. Break the glass (Fig. 1), solder to the base tips four vari-colored leads of a battery cable, fill up the "shell hole" with sealing wax, then tape the four leads where they emerge. (Figs. 2, 3, and 4). The cable leads go to the battery connections, A plus, A minus, B plus detector and B plus amplifier. The B minus and A plus are connected direct, battery to battery. Connect the set battery leads to the socket posts. Thus the insertion of the battery connector establishes the contacts between the batteries and the set. The device may be inserted in the rear wall of the cabinet of your set, the leads emerging as shown in Fig. 6, leading to batteries. Fig. 7 reveals the base tips making contact with the socket prongs and represents the inside view of the cabinet wall. (Hayden Photos).

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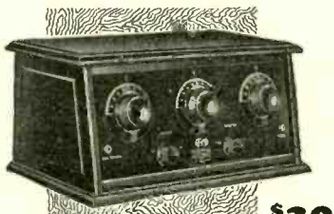

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RADIO WORLD

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The 6-Tube Baby "Super"

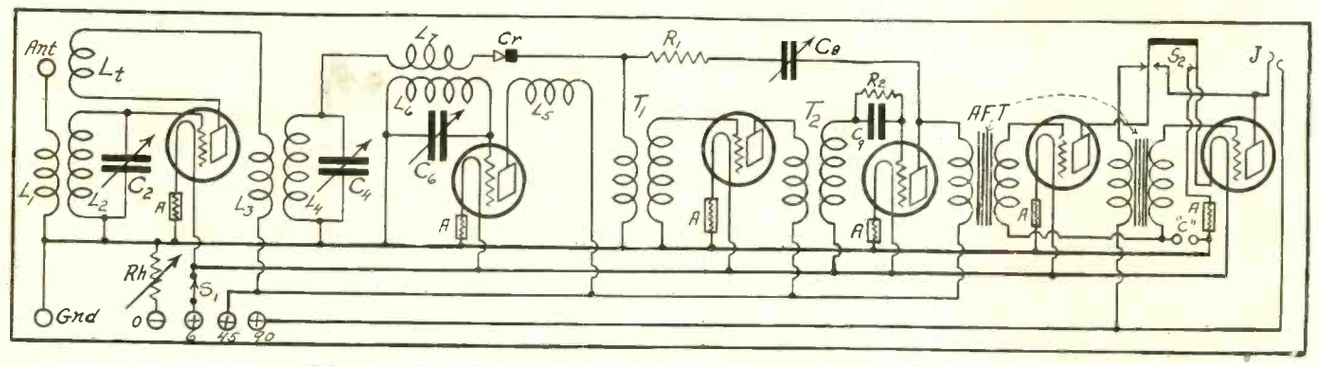


FIG. 1, the circuit diagram of the Baby Super-Heterodyne, using two audio stages.

Fundamental Circuit of the 4-Tube Model Used, But Without Reflexing; Second Audio Stage Added for Enormous Volume.

By J. E. Anderson

IN the preceding issue of RADIO WORLD (July 11) appeared the Baby Super-Heterodyne, a sensitive circuit employing only four tubes. The first tube in that receiver served the double purpose of regenerative radio-frequency amplifier and audio-frequency amplifier, the second tube was the oscillator, the third and fourth were intermediate frequency tubes, while a crystal was used in the frequency changer instead of the customary tube detector. That circuit is both sensitive and selective and is suitable for compact assembly in portable form. However, the double use of the first tube is not particularly desirable except where extreme compactness and economy of operation are prime considerations, and, therefore, the receiver has been altered for those who do not object to adding a tube or two to obtain the added advantages.

Same Fundamental Circuit

The changed Baby Super-Heterodyne employs fundamentally the same hook-up as the original circuit except that two straight stages of audio-frequency amplification have been added instead of the single reflex stage of audio. The new circuit, therefore, employs six tubes. In this form the receiver is very selective and sensitive and is capable of greater loud speaker volume.

The first tuning unit, comprising the primary winding, L1, the secondary L2 and the tickler Lt, may be any 3-circuit tuner on the market which tunes with a .0005 mfd. condenser. The "low loss" variety is preferred. The primary L1 should be loosely coupled to the secondary, that is, if the coupling is fixed L1 should consist of no more than ten turns, and these should be separated from the secondary by at least a quarter of an inch. If this tuner is constructed at home, the primary and secondary may be wound on 3" bakelite tubing with No. 22 double silk covered wire using ten (or fewer) and 43 turns respectively. The tickler may be wound on a 2" bakelite tubing using about 40 turns of fine gauge wire, say No. 36 double cotton covered.

Uses a Double Condenser

The tuning condenser C2, connected across the secondary L2, is one-half of a double National condenser and is of .0005 mfd. capacity. The other half of this condenser is connected across the secondary winding L4 of the modulator input transformer L3L4. Since this transformer is tuned together with the first tuner it is necessary to adjust it to have approximately the same inductance value as the first. This is done by adjusting the number of turns in L4 until the signal is loudest. It is desirable that the tuning of transformer L3L4 be not too critical, and for that reason it is wound with very fine wire on a small diameter. I used a wooden spool 1" in diameter and 1" long for this transformer. The primary was wound next to the core and had 20 turns of No. 36 double cotton covered wire. Over the primary were wound two layers of heavy wrapping paper to separate the two windings. The secondary contained 33 turns of the same size wire after final adjustment. The wire used winds about 73 turns to the inch so that part of a second layer was required. The two layers in the secondary were also separated by two layers of heavy wrapping paper to reduce distributed capacity. Of course the wooden spool may be made long enough so that all the secondary turns may be wound in a single layer. The set will, of course, be much more sensitive if a low loss transformer with heavy wire be used in the L3L4 position, but in that case it will be necessary to use a compensating condenser across either L2 or L4, or the set may be much less sensitive for certain wavelengths.

Coil Data

The three windings L5L6L7, which are associated with the oscillator tube may be made similar in size and number of turns to the first tuner, or they may be wound with fine wire on a smaller diameter. The writer used 43 turns of No. 24 double silk covered wire on 3" bakelite tubing for L6 and 35 turns of the same size wire on the same piece of tubing for L5. The pick-up coil L7 was wound with 50 turns of No. 36 double cotton covered wire on tubing 1½" in diameter, and it was so mounted that it could be turned through 180 degrees. The coupling between L6 and L7 may then be varied to obtain best operation. If the coupling is too close the oscillator will not operate independently of L4C4, and the result may be no response; but the closer the coupling is with independent operation the louder the signals. There are several makes of oscillator coils on the market any one of which may be used. The tuning condenser C6 of course should fit the tuning coil and the desired wave band. For the coil described above the capacity should be .0005 mfd. A vernier adjustment on this condenser is highly desirable.

The modulator crystal used in this circuit is a fixed type carborundum detector made by the Carborundum Co. It is stable in operation, rugged in construction, and sensitive, provided a good one is obtained. Before purchasing it be sure that it conducts in only one direction or that it is sensitive in a crystal receiver.

For the intermediate frequency transformers T1 and T2 I prefer home-made air core transformers. The two must be made exactly alike. Aside from this condition a wide latitude is allowable in the size of spool and wire and the number of turns. The two transformers I used are wound on spools 2" in diameter and 1" long, with a winding space ¼" deep. The primary contains 180 turns of No. 36 double cotton covered wire and the secondary 760 turns of the same size wire. The two windings are in the same direction and they are separated by two layers of heavy wrapping paper. The primary is next to the core. No condensers are used across either the primaries or the secondaries. They should be connected as follows: The inside terminal to the plate of the amplifier or to the "G" binding post of the crystal, the second terminal of the

Six Tubes Work Like Eight

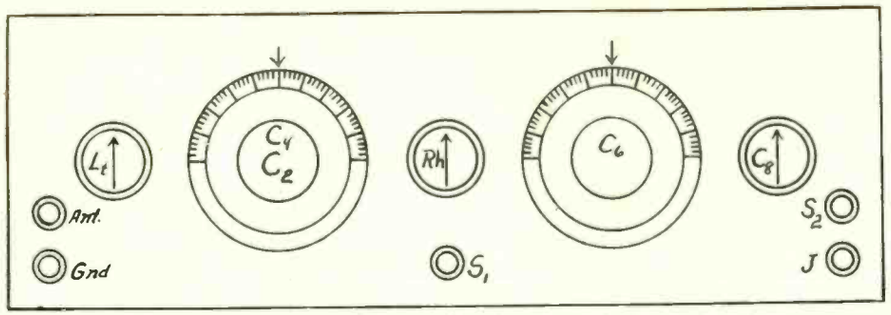


FIG. 2, the suggested panel layout of Anderson's 6-tube Super-Heterodyne.

primary to ground in one case and to the "B" in the other, the first terminal of the secondary to the filament, and the outside terminal to the grids. This connection makes regeneration possible.

Other Parts

The grid condenser C9 should have the customary value of .00025 mfd., or somewhat less. The grid leak should preferably be variable so that the detector may be adjusted for greatest sensitivity consistent with volume. Two megohms should be about right.

The intermediate frequency amplifier is made regenerative, and this feature makes the set much more sensitive than if another intermediate amplifier were used without regeneration. The feedback is through condenser C8 and resistance R1. The resistance had a value of 100,000 ohms, but a somewhat lower value may be used if the minimum capacity of the condenser is small. The regeneration is adjusted by means of a midget condenser C8, which should have a maximum capacity of about 100 micro-microfarads. On the suggested panel layout this condenser has been mounted on the panel so that the regeneration may be varied in accordance with volume requirements.

Two good audio-frequency transformers should be selected for the set. Two combinations which I used with good results are Federal 65 and 65A, and General Radio 285 with the new G. R. 2-to-1 ratio transformers. There are other good combinations, of course.

A single output jack J is used in the circuit. A switch S2 is used for switching this jack into the first or second stage of audio amplification. This switch automatically controls the filament of the last tube. This arrangement is preferable to the use of two jacks, since it is easier to turn a switch than to pull out and insert the telephone plug whenever a change is desired. The cost is only slightly greater.

An Amperite or small ballast resistance A is used in each of the filament circuits. This is for the purpose of obtaining a small negative bias on the tubes and to protect the filaments against excessive currents. The rheostat Rh is common to all the tubes, and it should have a resistance not greater than 6 ohms. If Amperites are used throughout it is not absolutely necessary, but is desirable.

A filament switch S1 has been provided for turning on and off the set. Two small binding posts have also been provided at "C" for connecting the proper size grid battery in the audio amplifier. A plate voltage of 90 or more should be used for the two audio stages and 45 volts for the remaining tubes. The A battery voltage should be either 6 or 4.5, according to the type of tubes used.

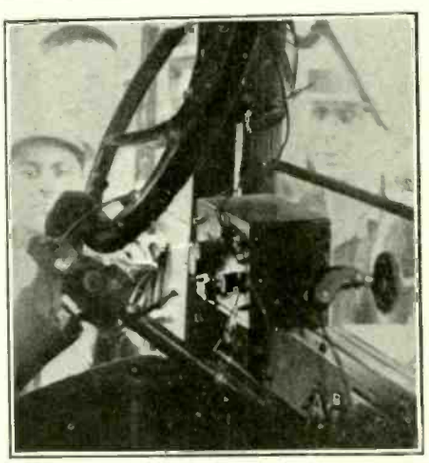
In the accompanying panel layout, which is merely suggested, the legends correspond with those on the circuit diagram.

The results obtained with this 6-tube set have been especially good when compared with Super-Heterodynes having two or more extra tubes.

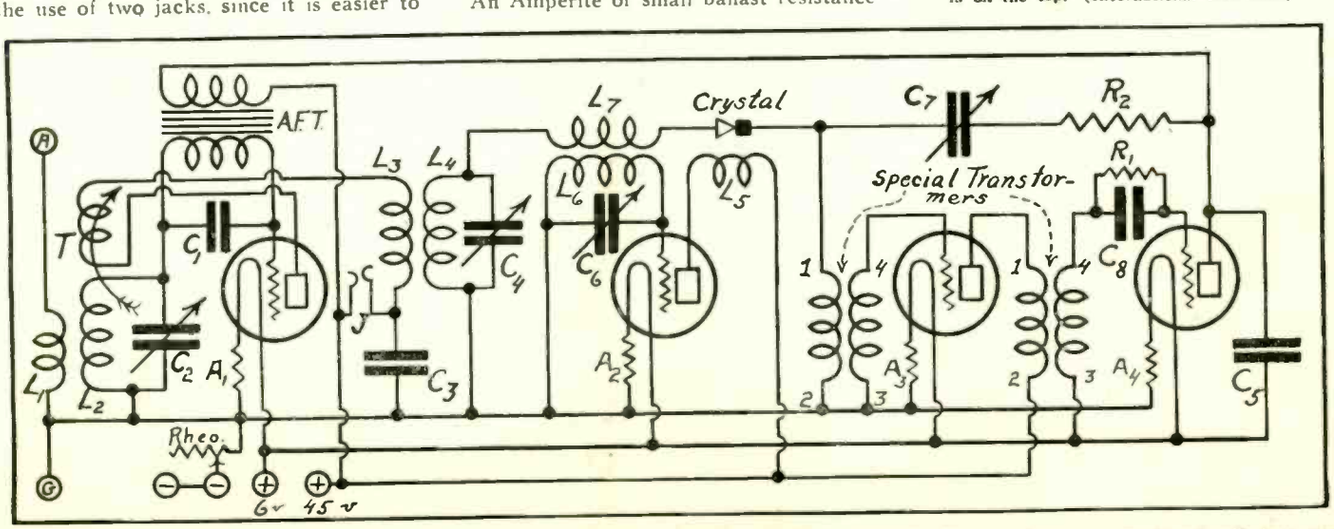
[The Baby Super-Heterodyne„ four tubes, was described last week, issue of June 11. Only one audio stage was used. It was reflexed, but for greater simplicity in construction a free audio stage may be used. If enormous volume is desired, then use two audio stages, as described in the foregoing article in the present issue. All three types are very successful.—Ed.]

LIST OF PARTS

One 3-circuit tuning coil (43 turn secondary on 3" tubing), L1L2Lt.
One inter-tube transformer as described, L3L4.
One oscillating coil as described, L5L6L7.
One National DX double condenser, each section .0005 mfd., C4C6.
Two intermediate-frequency transformers as described, IT1, IT2, or two Remler input transformers.
Six Amperites, or fixed resistances, of suitable value, depending on type of tubes used, R1, R2, 3, 4.
One grid leak, two megohms.
One grid condenser, .0002 mfd., C8.
One by-pass condenser, .0005 mfd., C1.
One by-pass condenser, .001 mfd., C3.
One by-pass condenser, about .0005 mfd., C9.
One midget condenser, C7.
One ressitance, 100,000 ohms, Daven.
One carborundum crystal detector, made by the Carborundum Co.
Six sockets and tubes.
One 6-ohm rheostat.
Two audio transformers.
One panel 7x18" and a baseboard about 9x17".
Binding post strip.
One single-circuit jack.
One 4" dial (other dial that comes with double condenser).
One small knob for tickler control.
One Yaxley 5-spring DPDT switch (for audio stages).



A RADIO SET, attached to the windshield of an automobile is very simple to tune. It even brings in some locals while the car is going. The antenna is on the top. (International Newsreel.)



THE WIRING of the 4-tube Baby Super-Heterodyne. For simplicity the reflex stage should be avoided, although the more experienced will fare very handsomely on the 4-tube basis.

The 3-Tube Marconi Receiver

By Percy Warren

ALTHOUGH designed primarily for code reception, the Marconi Type 105D receiver proved itself to be a wonder when put to the test of DX broadcast reception. The only folk who have any knowledge of this receiver at all are the commercial operators and that is because they have to draw the diagram of this set when they apply for their license. The only reason that this set has not been generally described is difficulty of building. The Type 106D is an adaptation of the old 106 type tuner, the only difference being that the old set has a crystal for a detector and the new model has a vacuum tube for detection, the Armstrong regenerative method being employed.

PERCY WARREN

This set is used exclusively by the Radio Corporation of America and the English Marconi Company on the ships for constant listening-in by the operators. If this set were for sale to the public the price would be in the neighborhood of $700, but a glance at the set would convince the most dubious. The cabinet of the commercial type is 16" long, 10" in height and 8" wide. But all these discouraging data were laid aside and the broadcast receiver designed. There is essentially no difference between the commercial type and this type, except that the broadcast model is smaller and costs little, giving all the volume and distance that anyone could expect from a 3-tube set.

Fig. 1 shows the electrical diagram of this receiver.

Material Needed

The coils are constructed at home. L1L2 and L3L4 are specially constructed coupling coils. C1 is a .00025 mfd. grid condenser. C2 is a .0005 mfd. variable condenser and C3 is a .001 mfd. variable condenser to be used for tuning in the shorter waves, in the case that the receiver does not respond to them so well. The diagram does not show a switch across this condenser to cut it in or out, but one may be easily inserted if so desired. R1 is a grid leak having a resistance of 2 megohms, or may be variable. R2 is a 6-ohm rheostat. with a vernier attachment. P is a 400-ohm potentiometer. C4, the by-pass condenser is .001 mfd. fixed. The two-step amplifier is of the standard make. R3 and R4 are Amperites for the UV201A tubes. J1, J2 are both double-circuit jacks. J3 is a single-circuit jack. A 7x18" cabinet with panel to fit will house all the above instruments very well.

How to Wind the Coils

Procure two 3" forms, which are to be employed as the stators, and two 2" forms which are to be used as rotors, and a pound of No. 22 DCC wire for winding the coils.

L1 is wound on one of the 3" forms, which is also 3" in height, and has 9 turns, Leave the two terminals out, the beginning and the end of the winding. L2 is the rotor, and is wound on a 2" form, 2¼" in height. This has 36 turns. The beginning and the end of this coil are also left out to be used later as the terminals for connecting purposes. L3 is wound on the same type of form as was L1, except that it has 22 turns. Leave two leads extending. L4 is wound on a 2" form, 2¼" in height and has 45 turns. This is the rotor. L1L2 is placed at right angles to L3L4. No holding material of any type whatsoever should be used on these coils.

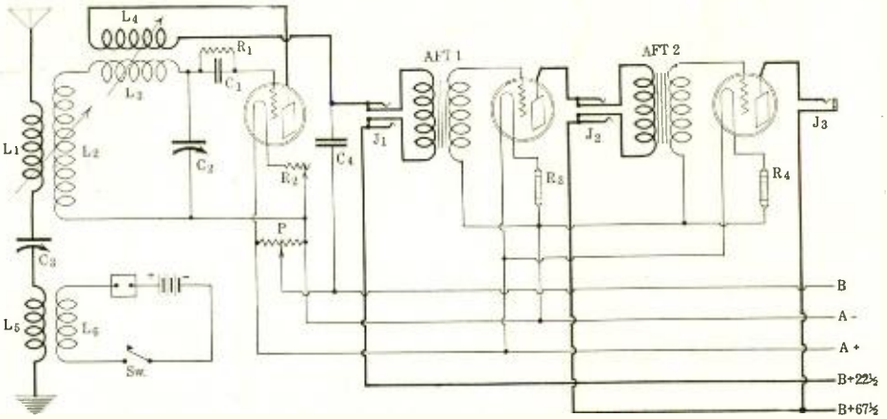


FIG. 1, showing the electrical diagram of the Marconi Receiver. Note the buzzer tester in the extreme left of the diagram. This part of the set is optional.

LIST OF PARTS

One pair of home-made couplers, L1, L2 and L3, L4.
One .0005 mfd. variable condenser.
One .00025 mfd. grid condenser.
One grid leak.
One .001 mfd. fixed condenser.
Two double-circuit jacks.
One single-circuit jack.
Two audio-frequency transformers.
Two Amperites.
One 6-ohm vernier rheostat.
One 400-ohm potentiometer.
Three 4" dials.
Accessories: Antenna wire, ground wire, connecting wire, winding wire, terminal strip, panel, cabinet, baseboard, nuts, screws, phones, speaker, A battery, B battery.

How to Drill the Panel

Five inches from the left-hand side of the panel and 3½" from the top and the bottom drill a hole for the rotor of the first coupler, L2. Five and one half inches from this hole and 3½" from the top and the bottom drill another hole, this one being for the variable condenser, the diameter of the hole depending upon the diameter of the shaft of the condenser that you employ. Five and one-half inches from this hole and 3½" from the top and the bottom drill a hole for the rotor of the second coupler, L4. Use 4" dials. 2⅛" from the bottom and 2¾" from the center of the two large holes (beginning from the left hand side) drill a hole for one rheostat. In the same line and 2¾" from the center and from the right hand dial drill a hole for the potentiometer. For the jacks, ⅞" from the bottom and in the same line as the hole for the extreme left-hand dial, drill a hole for the double-circuit jack, which is usually about ¾" in diameter. The other two jack holes are drilled in the same line, except that the holes are drilled underneath the other two dials, viz., the double-circuit jack, under dial 2 (Condenser). and single-circuit jack under dial 3 (coupler). The condenser C3 is placed in a separate little box (5x6) and can be hooked up to the set whenever necessary. The reason we use such a small panel is that the AFT used are of the small type. They can be conveniently placed in this set without the least amount of jamming. The condensers are also of the small type.

Before any wiring of set is done the material should be carefully laid out on the baseboard. As was stated before the two couplers are placed at right angles to each other, the variable condenser being in between the two. The grid condenser and leak (R1C1) are placed near the grid post of the socket, the closer the better. As for the buzzer tester, of which nothing has been said at all (L5L6), this is used to find out if the primary and the secondary are in resonance, viz., L5L6 each have 5 turns of No. 14 insulated wire, each wound on a separate 3" tubing and are inductively coupled. Set the buzzer going and adjust the two circuits until the high-pitched note is heard in the phones. When this point is reached, resonance is at hand. This method is used almost exclusively with crystal detectors. When the most sensitive point on the crystal is reached and both the circuits are in resonance, then the buzz will be heard in the phones, in other words, the buzzer is used to test the sensitiveness of the crystal, of course the BCL may omit L5L6, Sw., etc., entirely. Now for the wiring: bring the beginning of L1 to the antenna and the end to the ground, or if you are going to use the short-wave condenser, the end of the lead is brought to one terminal of the condenser (the stationary plates), and the rotary plates to the ground. If the buzzer is to be inserted, bring this lead to one terminal or the beginning of the small coil and the end to the ground. There are a great many complications here, but if the diagram is carefully followed out, there should be no difficulty encountered in wiring up this part of the set. The beginning of L2 is connected to the end of L3, and the end of L3 connected to one terminal of the grid condenser and leak, the other leads being brought to the grid post of the socket. The end of L3 also goes to the stationary plates of the condenser, while the rotary plates of the condenser go to the end of L2, this lead going to the arm of the rheostat and also to the negative lead of the A battery. The resistance wire goes to the negative F post of the socket. The beginning of L4 goes to the plate post of the socket and the end of this same coil goes to the top terminal of the double circuit jack and also to one terminal of the by-pass condenser C4, the end of this condenser going to B minus and to the potentiometer arm. The resistance of the potentiometer is shunted across the A plus and minus. The last terminal of the jack goes to the B plus 22½ volts. The two inner terminals of this same jack go to the P and B plus post respectively. The grid post of the AFT goes to the grid post of the socket, and the F post goes to the

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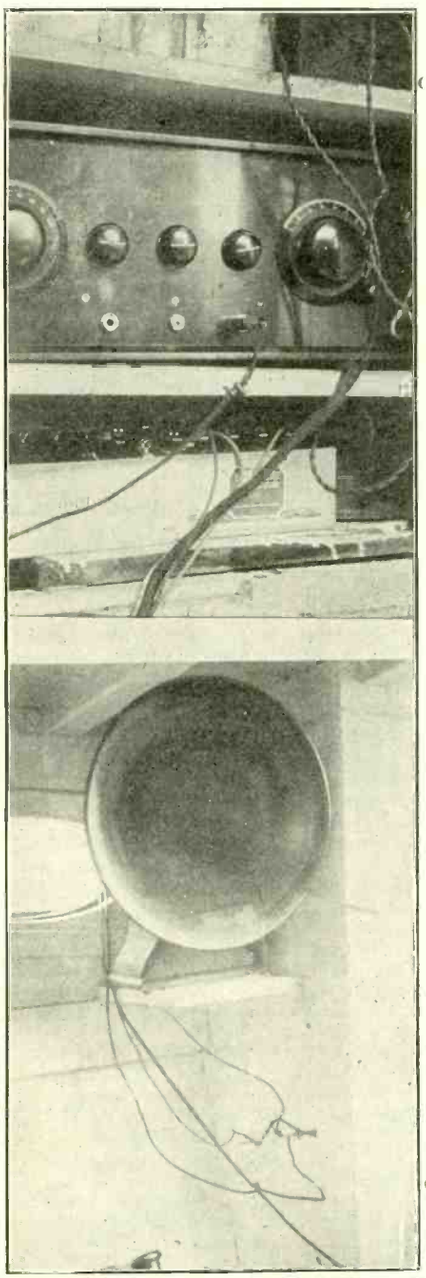
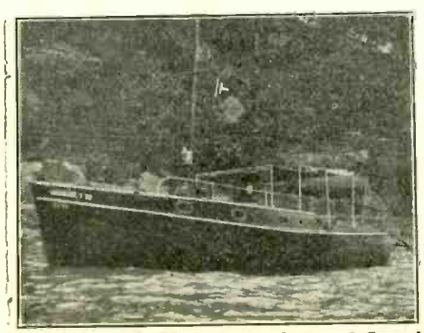
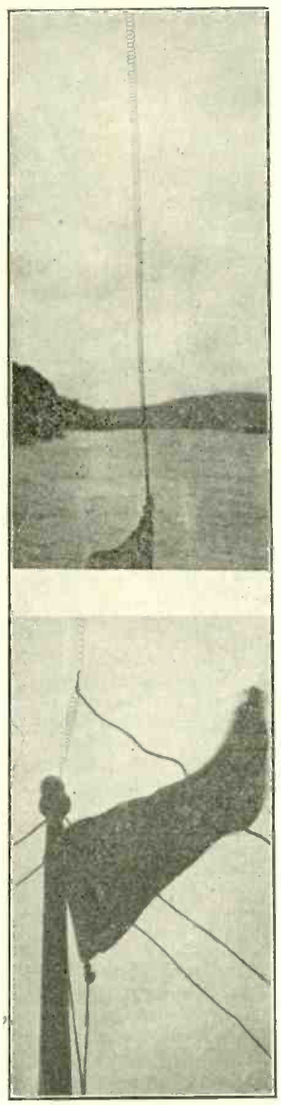
O'Rourke Tests Diamond Aboard a Motorboat



THE SET as it looks in its nook opposite the galley is shown in top photo. The B batteries are below the set, the 6-volt storage A battery above it. The lower photo shows the speaker next to a starboard porthole. The closet in which the set is located is at right.



THE Harriet S. III is 38 feet long and flies the Tarrytown Yacht Club banner. The owner is Howard Parker, 114 Montague Street, the pilot, Ben Downing, 88 Crystal Street, both of Brooklyn, N. Y.



THE AERIAL stretches from the stern masthead (top photo) to the mainmast, where the lead-in is taken. The other lines show the flagsheets and the guy wires.

By Capt. P. V. O'Rourke

ON one of my recent trips up the Hudson River to my summer cottage at Lake Popolopen I tested the Diamond of the Air under varying conditions. After one passes Tarrytown reception conditions are uncertain. This I knew from previous experience. The shielding effect of the mountains that rise as barriers between the receiver and the New York City stations is often very considerable. With some sets, using more than four tubes, no reception was possible in previous tests, under like conditions. But the Diamond brought in stations, which proves the efficiency of this receiver. The circuit I used on the Harriet S III. was the 2-control Diamond as described by Herman Bernard in the May 23 and 30 issues of RADIO WORLD. This employs a double condenser, one motion tuning two stages (the radio-frequency step and the detector input). The 3-control model (July 11, April 11 and April 18) will do just as much and is just as selective. The only difference is in the number of controls.

CAPT. PETER V. O'ROURKE

Where the Set Was Put

Space conservation and a desire for a little more simplicity in tuning prompted the choice of the 2-control model. This was constructed on a 7x21" panel and the set placed in a locker opposite the galley of the 38-foot craft. The location was on the starboard side nearly amidships, and immediately forward of the steering wheel. The flywheel on the engine was about eight feet abaft the set.

In a motorboat it is idle to assume that reception is possible when one is under way. Hence location of the set as far from engine and wheel as is possible, sometimes recomended for minimum vibratory effects, serves no practical purpose. The motor was a powerful one for such a boat—a converted 6-cylinder Continental automobile motor, which replaced a previous 3-cylinder marine engine. In any event the combustion will be entirely too noisy to permit any reception. This is a form of noise level with which radioists usually do not have to contend.

The Antenna System

The aerial was a spiral No. 18 hard-drawn copper wire about 80 feet straight length but stretching only 26 feet in a straight line from the peak of the mainmast to the top of the flagstaff at the taffrail.

This kind of wire was used because it presented the greatest surface exposure, but ordinarily it is not the most efficient type of antenna. The low potential was derived from the water itself, an end-weighted bare wire being cast overboard. As reception is possible only when the craft is lying to, this is very convenient.

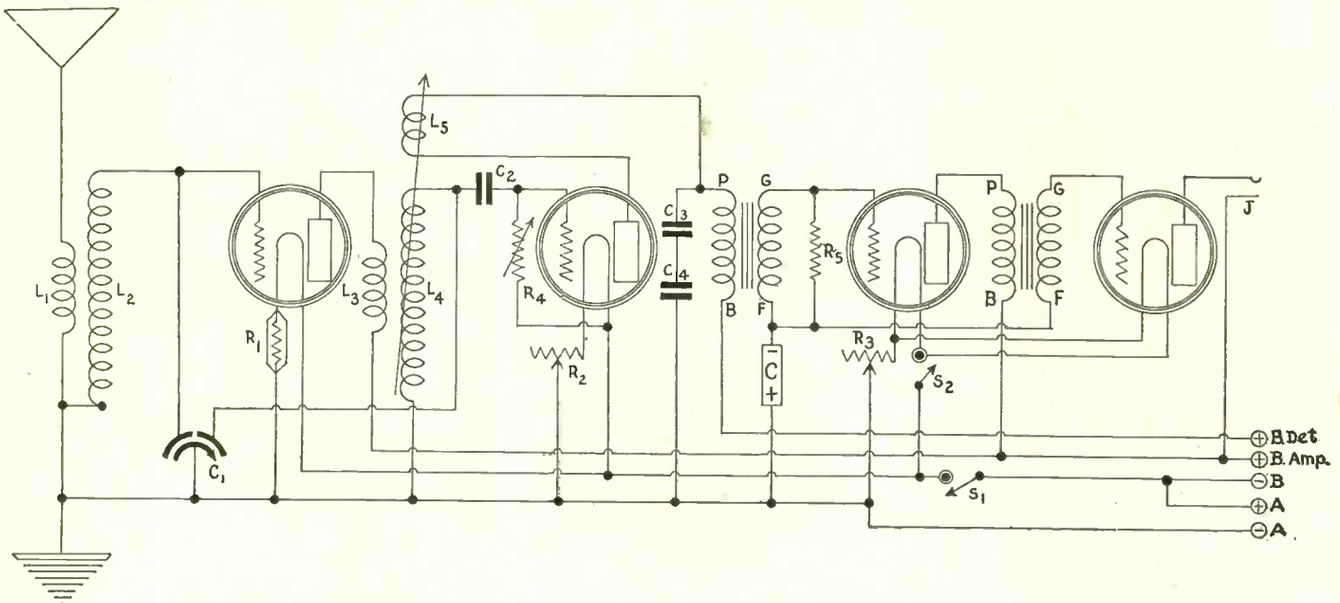
The lead-ins for both the aerial and the ground leads were brought through a porthole. The actual location of a receiver aboard a motorboat is to be determined on the basis of conditions aboard the craft, ready facility for lead-in being one factor. No. 14 insulated wire was used for both lead-ins and they ran close together. Another wire, running around the combing, a total of about 85 feet, was available, being surplus from previous experiments. But this did not improve reception either, when used as additional aerial or ground or as an attempted counterpoise.

The Plate Voltages

The set comprised four tubes, all UV-201A. A storage battery was shelved just above the set, the B batteries being on a lower shelf. On the detector plate, 51 volts were used and on the amplifiers (one RF and two audio) 96 volts. The unaccustomed voltages are accounted for as follows:

On the detector there is considerably less volume on 22½ volts B potential than on the 40 cited by the tube manufacturers. There is no 40-volt tap where two 45-volt B batteries are used. Hence one uses the 45-volt tap. Because B minus

"Diamond Is Better Than Superdyne," Says Captain



THE circuit diagram of the 2-control Diamond of the Air as used by Capt. O'Rourke on a motorboat. C1 is the double condenser. The construction was described by Herman Bernard in the May 23 issue. C3 and C4 are helpful, but not vital. Try them in both positions shown in diagrams

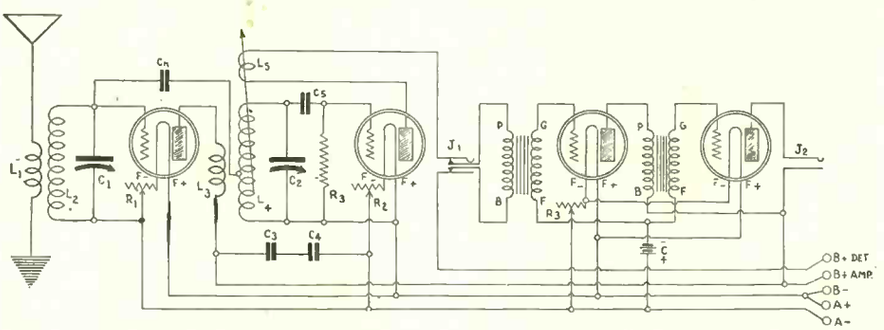
is connected to A plus, the voltage of the A battery is really part of the B battery voltage. All reckoning of voltages is made from A minus. Thus B minus is really B plus 6 volts. The 45-volt tap is 51 and the 90-volt tap is 96. If B minus and A minus were used as the common battery lead the voltages would be 45 and 90 respectively. One must choose either method and can hardly compromise, hence experience should be consulted. The main test is the regenerative effect on the detector. If the regenerative whistle, produced in tests only, is rather squawky, accompanied by a sudden plop and spilling over when the oscillatory point is exceeded, then use 45 volts on the detector, i. e., the 45-volt tap with B minus and A minus connected. If the same trouble persists, then use the 22½-volt tap, restoring B minus to A plus, i. e., 28½ effective volts. While higher plate voltage means more volume, up to a certain point, in no case will benefit accru from higher voltage when amplification constant is too high. The whistle should be of musical pitch, like the wind racing through the tree-tops, and never should degenerate into an imitation of someone grinding coffee.

The plate voltage on the RF amplifier need not be the same as that on the audio amplifiers. About 45 volts will do for the RF tube and the voltage should be varied until that point is reached, where a decrease in efficiency is noted. Then restore the lead to the next highest post.

It is interesting to note that the B voltage of a detector tube in a regenerative set should not be higher than that point where the inclusion of a C battery becomes desirable if the tube is an audio stage. This is around 40 or 50 volts for the UV201A and C 301A.

Large Tubes Needed

A storage battery was used because of the charging facilities afforded by the motor. It was not the same battery used for starting the motor. Of course the same battery could be used, only 6 volts being employed (three cells) if the motor battery has 12 volts. This is true of such batteries used on automobiles, too. If no charging facilities were aboard, the choice still might be a storage battery (even aboard sailboats), for professional battery-chargers are nearly always accessible to yacht clubs. The 5-volt type tubes should be used, because the volume is needed, especially in poor locations. No. 6 dry cells could supply the A current.



THE DIAMOND OF THE AIR, with neutalizing condenser Cn inserted. L1L2 is a radio-frequency transformer. L3L4 is of the same design, except for the neutralization tap. L1 and L3 may be 12 to 15 turns, the secondaries L2 and L4 having 45 turns of No. 22 SCC wire of No. 24 silk over cotton. The diameters are 3½", except that the tickler L5 is on a 2" diameter 2½" high, 30 turns being applied. C1 and C2 are .0005 mfd. each. If .00035 are used, put on 58-turn secondaries. C3 is .001, C4 is .002. The C voltage is 4½ on 90 on the plate, UV201A. This augments and corrects a diagram published in the July 4 issue, where A minus was joined to L3. The above diagram is in all respects correct.

Variations in Reception

Some stations were received in badly shielded areas only with enough volume to be heard and not with enough to be heard comfortably. Peculiarly enough, offshore at Highland Falls, 45 miles north of New York City, just below West Point. KDKA, Pittsburgh, came in better thna any of the New York stations although WJZ, WEAF and WNYC, all New York City, were heard well on the speaker, and WGY, Schenectady, likewise. The spot was a bad one because of the shielding by Anthony's Nose or Bear Mountain, depending on where one lay to in the Hudson, and of course the denseness and extensiveness of the foliage, trees being quite adept at conductivity along a river.

The set was transported to the cottage, five miles inland. This is a notoriously shielded area. The general native comment is: "Radio sets don't work up here." I knew from experience that a 1-tube regenerative set, a very sensitive instrument, was next to worthless in that locality. The lake is in a valley. Bear Mountain lies eight miles in a southerly direction (intervening between the reception point and the New York City stations) and tall pines and birches surround the house, the lake and teem in verdant glory in the hills and mountains. Besides, a mile away, is one of the richest iron mines in the county, in point of ore quality, and there must be much iron all about the locality. The Diamond, however, managed to bring in some stations —doing almost as well as a Super-Heterodyne had done on previous occasions. Neither set gave what one could fairly call good reception. Obviously it is not to be had in this locality.

In both tests an outside aerial was used, then a loop was tried. The Super-Heterodyne outclassed the Diamond on loop work, but both did better on an outside aerial than on a loop.

The Diamond, therefore, did very well

(*Concluded on page* 25)

Wiring the Transmitter

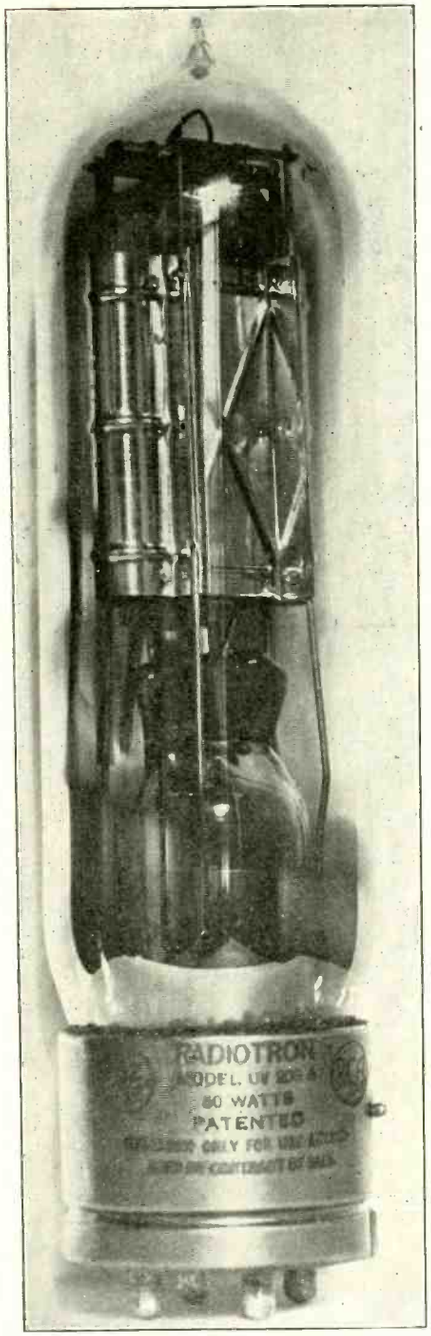


FIG. 1, showing the new UV203A, which only takes 3.25 amperes on the filament, although a 50-watt tube.

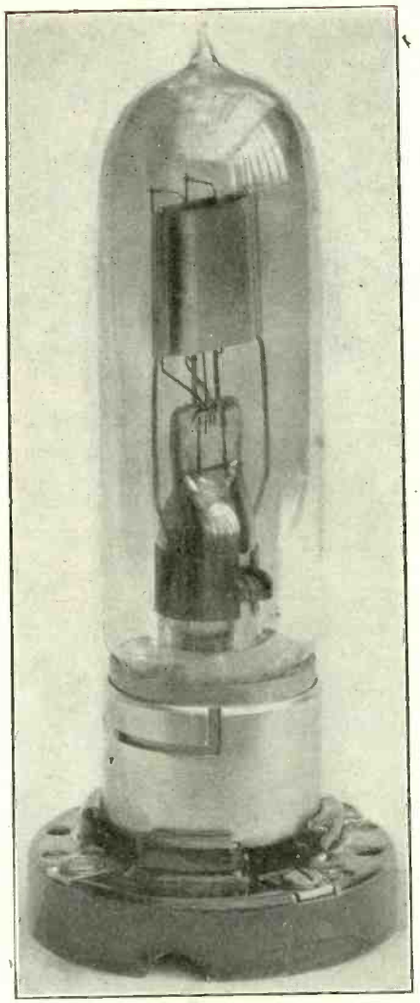


FIG. 2, the UV127 Kenotron (150-watt) rectifier tube. Note the porcelain base socket.

By Lewis Winner

PART IV

SOME tubes require grid resistances lower than 10,000 ohms, usually about 5,000 ohms. All that is necessary in such a case after you have constructed the larger resistance is to saw the glass tubing in half (2⅛") or make a special resistance which is of that length and contains a metal cap on each end.

Types of Meters

For the 5-watt tube, an antenna ammeter from 0-2 amperes is required, a filament voltmeter of from 0-10 and a plate milliammeter of from 0-75. For the 50-watt tube, an antenna ammeter of from 0-4 amperes is necessary, a filament voltmeter of from 0-12 and a plate milliammeter of from 0-200. For the 250-watt tube, an antenna ammeter reading from 0-8 amperes, a voltmeter of from 0-12 volts and a plate milliammeter reading from 0-400 milliammeters.

Types of Rheostats

For those who are desirous of having a rheostate to control the filament temperative, the following data are given:— The rheostate is placed in the positive filament lead. For a 5-watt tube a rheostat with a carrying capacity of 2 amperes is necessary. For the 50-watt tube, a rheostat that will carry 8 amperes is required, and for the 250-watt tube rheostat that will carry 16 amperes, without a burnout is needed. These rheostats are very large, on account of the heavy resistance wire employed.

Drilling the Panel

We have now to drill the panel, which by the way is 7x28". This is an unusual size, but there should be lots of space between the materials. Four inches from left hand edge of panel and 3½" from top and bottom, drill a hole for shaft of condenser, the size of hole being dependable upon type of condenser used. For transmitting purposes a condenser which will break down at high voltages is desirable (a good dielectric medium, and heavy plate). The Allan D. Cardwell Co., and General Radio Co., make such an instrument. Six inches away from hole just drilled and 3½" from top and bottom drill another hole for a second variable condenser. The rest of the drilling of the panel is left to the discretion of the builder, as there are so many different types of meters which you may be desirous of using, each one of which has different dimensions. The Weston Co., and the Jewel Electric Co., gives templates with their meters, which may be pasted on the panel and thereby easily drilled. The dials may be 3" or even 4". The latter diameter of the dial may hit the outside of the meter, so that a 3" dial may be required. See Fig. 2 (Part III) for panel layout.

Types of Antennae

There are three types of antennae that are beneficial to the radio transmitter. Of the three the vertical is the best, since it is the only one that radiates most of the electromagnetic energy, which is being transferred from the closed oscillatory circuit to the open oscillatory circuit or antennae circuit. The vertical type though, is very inconvenient to erect, as it takes up a great deal of room and cannot easily be installed either aboard ship or on housetop, etc. We then have the flat top, which is divided into two classes, the inverted L, and the T type. The inverted L antenna has a much longer wavelength than a T type of the same dimension. The inverted L antenna is somewhat directional and radiates most of the energy in the direction or field which is opposite to the free end, while the type T radiates energy with equal strength from both ends. Getting back to the vertical aerial, this radiates with equal strength in all directions. However, such an antenna is expensive to build because to obtain the proper inductance and capacity we need a very high mast and a great many guy wires, also a large span of land. This is not true of the flat top antenna, as both have low masts. Four wires used and being very long will equal the capacity and the inductance that you are desirous of obtaining.

In Fig. 3 (Part III) we have an excellent view of how a flat top L type antenna looks when properly installed. This antenna has a total fundamental wavelength of from 200 to 300 meters, taking into consideration the antenna resistance, which is about 15 ohms in this antenna, using No. 14 hard drawn wire and either mica or very heavy porcelain insulators.

A single-wire heavy cable, 7 strands, and an inside hollow diameter of 3-16", is very good for use as a transmitting antenna. The masts should be about 20 feet above the roof or 80 foot above the ground and each wire is 75 feet in length (for the 4 wire antenna). The single wire antenna is 100 feet in length.

The Vacuum Tube As A Rectifier

The tube used here is for the rectification of alternating current, and consists of only a plate and a filament. When the filament is heated up electrons are emitted. In this tube a peculiar process takes place. The current flows from the plate to the filament and not in the opposite way at all. The only place where a rectifier of this type can be used to a great advantage is where a portable set is used, or in the large commercial stations, either broadcasting or pure CW. The tubes are manufactured in various sizes, viz., for the 5, 50. 250-watt tubes, etc. The same transformer that was used for the chemical rectifier may be employed here. The filament current is supplied by a separate filament transformer, which should be bought. The General Electric Co., makes a rectifier tube, the trade name being "Kenotron." The American Radio and Research Corp., at Medford Hill, Mass., makes a tube known as the "S" tube.

How to Wire the Set

We have all the apparatus now constructed and the next thing to do is to wire the transmitter. Use No. 14 bare wire for making connections. Do not use tinned

How to Finish the Circuit

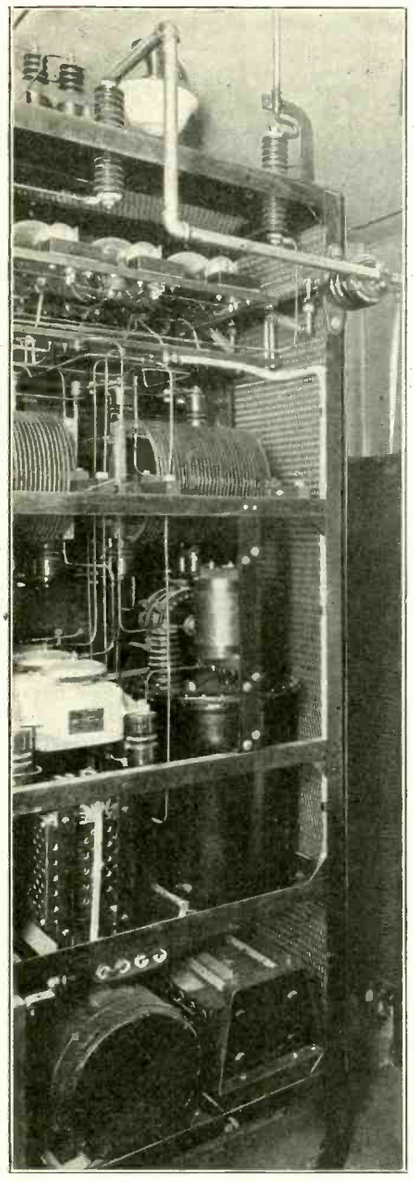


FIG. 4, the back of the 500-watt phone transmitter at WRC. Note the inductances in the fourth rack and heavy insulators on the top of the transmitter, also the large condensers in the third rack.

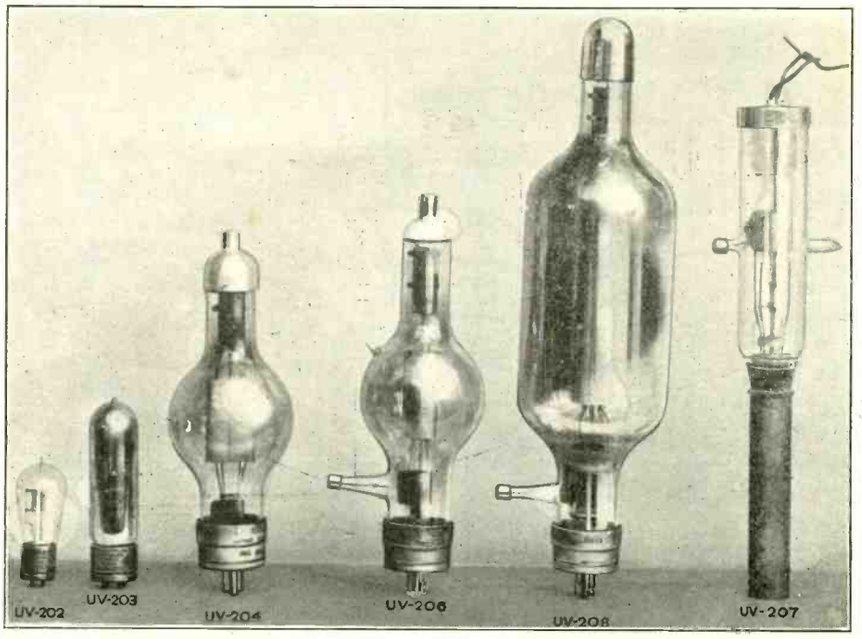


FIG. 3, showing the six different sizes of tubes used in commercial and amateur circles. The UV202 is the 5-watter, UV203 is a 50-watter (old style, filament ampeers, 6.50); UV204, a 250-watter; UV206, a 1,000-watt tube; UV208, a 5,000-watt tube. The UV207 is a water-cooled tube, with an output of 20 kilowatts.

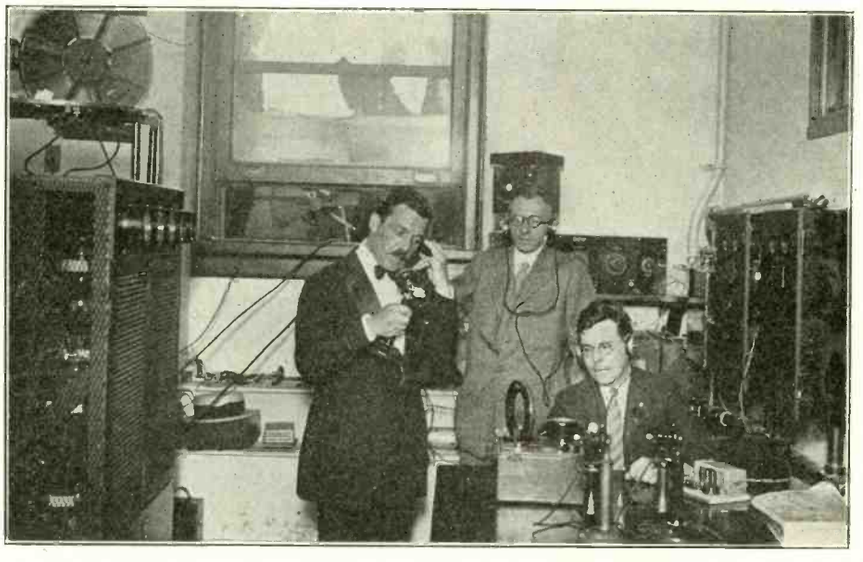


FIG. 5, what the inside works of WNYC, the New York City Municipal Broadcasting Station, looks like. To the extreme upper left is the antenna inductance. The man seated is operating a wavemeter. To his left is a key and a buzzer.

wire, known to the broadcast listener as bus bar. When using bare wire keep it bright at all times by sandpapering. Do not make sharp bends. Some transmitting sets use No. 12 wire for wiring, but this is difficult to bend. However, the larger the wire, the more power the set will put out, because all the radio-frequency current can travel more freely, through a larger wire than through a wire with narrow diameter. This is illustrated by the water pipe system, viz., the larger the pipe the more easily the water will flow. This can be applied to the receiver as well, but there neatness and compactness are especially desired, and energy lost can be made up by the simple addition of a radio-frequency or an audio-frequency tube, as receiving tubes are not expensive. But see list price of the transmitting tubes: UV202, $7; UV203. $25: UV204. $90.

We shall start the wiring from the antenna lead-in. Bring one terminal of the antenna ammeter to the antenna proper, the other terminal going to the antenna switch arm which is connected to the antenna inductance. The ground switch arm goes to the ground, and the end of the coil may go to the counterpoise if so desired. Now for the plate coil, the end of the plate coil goes to the rotary plates of the variable condenser and also to the plate post of the socket; this same post also goes to extreme left-hand terminal of the double-throw double-pole switch. The second terminal on the same side goes to the plate post of the other tube (modulator tube). The third terminal on the same side of the switch goes to the beginning of the plate coil and to the stator plates of the variable condenser. Bring the beginning of the grid coil to one terminal of the key, this being outside and having flexible leads.

The condenser which shunts the key has a capacity of 1 mfd. and should be of a very strong make, as it is inserted here to prevent any voltage surge which takes place when the key is pushed up and down. The other end of the key or the condenser goes to one terminal of the grid leak, at the same time going to the condenser C1, the end terminal going to the grid post of the socket and also to the left off post of the grid leak. From the end of the grid connection to the negative side of the filament place a small protection gap, about 1/16" in length. This is not necessary when using a 5-watt tube. Bring the end of the key connection to the grid leak and condenser, the ends of which are connected to the extreme upper right hand terminals of the switch. The second terminal on the same side, goes to the grid post of the socket, and also to the safety gap. The end of this gap goes to the negative side of the filament lead. The third terminal on this side of the switch goes to one end of the Heising choke coil, the other end going to the one lead of the secondary winding of the modulation transformer, the other secondary lead going to the minus of the C battery. This same terminal goes to the end of the primary winding and the beginning of

Summer Operation of Sets

By
Dr. Alfred N. Goldsmith
Chief Broadcast Engineer, Radio Corporation of America

THE hand that twirls the receiver knob is the final link in broadcasting. No matter what may be the power of the broadcasting station; no matter what the atmospheric conditions; no matter how good the radio programs; no matter how excellent the receiving set itself, the final factor—and the one that counts for perhaps as much as all the others combined—is the care exercised by the person at the receiving end. Not that there is anything complicated about the usual receiving set, but like a musical instrument, radio will deliver more or less in proportion to how it is played. That is why a little care in operating the receiver goes a long way in radio satisfaction.

Especially does all this become evident with the warm days of summer, when admittedly conditions are not just as favorable for radio as during the cold, crisp days of fall and winter. And just as the automobile requires a little more care during freezing weather as compared with its care-free operation in mild weather, so does the radio receiver require just a wee bit more attention in its operation if the best results are desired.

Shaving Radio Signals

Warm weather announces its presence in radio circles by the bewhiskered makeup of signals. There are on some summer days various disturbing noises coming through head-set or loud speaker, as compared with crystal-like clarity of radio reproduction so common in cool and cold weather. Such is static. Fortunately, there are ways and means of shaving static whiskers, so that we go on enjoying radio programs in summer as well as during the rest of the year.

Nearby signals, wherein we have the advantage of a relatively high signal level as compared with the static level, are fairly free from static whiskers. Hence good reception is always assured from nearby broadcasting stations, especially today when many of the broadcasters have gone to higher power so as to ensure proper reception of their programs under any and all conditions.

When it comes to distant programs from moderate-power broadcasting stations, the broadcast listener must expect static. On occasion there will be a source of static disturbance, such as a thunderstorm, much nearer to the receiver than the distant broadcasting station. With the loop type of wave interceptor the directional effect serves as an added measure of selectivity. Often a signal may be picked up from a broadcasting station several hundred miles away, while a thunderstorm, less than a hundred miles but in a different direction, will cause comparatively slight static interference. This matter of directional reception accounts for the noticeable advantage of the loop type receiver in summer-time operation.

Quality Rather Than Distance

Of course it is largely a question for the radio listener to decide: if he desires to continue his radio globe-trotting in summer as well as in winter, he must expect to encounter a great deal of static for the reasons already mentioned. If, on the other hand, he is interested primarily in good radio entertainment, then he should stand by local stations during the warm weather. The summertime recipe for radio calls for quality rather than distance.

No matter what the type of receiver, the most effective way of reducing static is to select a powerful radio signal, which usually means a local station. Ordinarily, there will be no static interference in the first place; but if the background is scratchy and blurred as the result of intense static, the output volume of the set can be somewhat cut down until the background noises are reduced to the vanishing point. Obviously, the signal volume is also reduced, but if it is sufficiently powerful to begin with, there is ample opportunity for reducing it and still have left sufficient volume at the end.

In this connection it may be well to reduce the audio amplification. Thus the average radio listener operates his radio set at its fullest capacity, summer and winter alike; whereas, with local stations at least, the usual receiver will provide plenty of volume for loud-speaker operation on but one stage of audio frequency amplification. When static interference is excessively troublesome, the amplification should be cut down to one stage. In the event that static interference is overwhelmingly troublesome, such as with an approaching thunderstorm, it is still possible to listen to sufficiently powerful signals by means of the head-set, without amplification of any kind. The writer of these lines recently listened to an important program without interruption of any kind, using a headset but no audio frequency amplification, while a nearby thunderstorm was flashing and banging away. Obviously, no one is going to such lengths to listen to a radio program unless some extraordinary feature, such as a thrilling sporting event, is in progress at the time.

Up to You to Choose

It must follow that with the reduction of the output of the receiver, in the effort to drop the static background, the loud-speaker volume will also be reduced. In this connection it is often advisable to use one of the higher quality types of loud-speakers for summer-time operation. Or again, when static conditions are exceptionally severe, the head-set method of reception with much reduced amplification is always available.

The loud-speaker has much to do with static interference. Some loud-speakers, because of the sharp, "tinny" characteristics of their horns, sound much worse on static disturbances than others. However, the trend in loud-speaker development has been more and more away from the sharp-pitched metallic-type of horn, and towards the soft, mellow, deep horn which does not amplify the sharp, whip-like cracks of static, but rather loses them partly by a blending of sounds. Furthermore, loud-speakers are being made more and more sensitive so that they may be operated with a remarkably small output from the receiver. The high quality loud speaker will not "ring" with a clanging note when a burst of static is received.

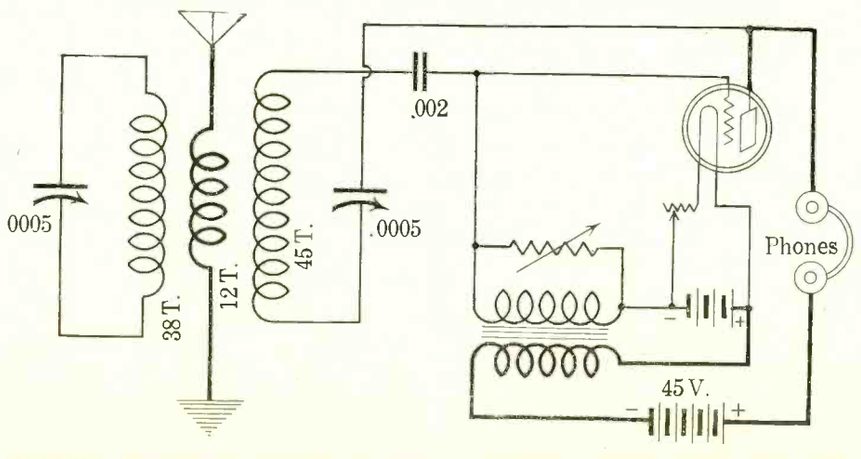
An Overlooked Phase

One phase of radio reception which is generally overlooked and yet has a most important bearing on results, is the location of the loud-speaker. It is astonishing how considerably radio music can be modified by changing the location of the loud-speaker. A little experimentation along this line will generally produce worth-while results. Especially is this true in summer-time, when the static background stands out boldly unless the sound volume is reduced as already outlined. Thus the loud speaker, located indoors, will give more volume but it will also focus attention on every little detail, static background included, no matter how faint it may be. On the other hand, if the loud speaker is brought out on the porch or on the lawn, the little details of its voice are no longer discernible and only the main theme—music or speech—remains to attract the attention of the listeners. Indeed, delightful results may be obtained with the usual loud-speaker used outdoors. The receiving set will take a brand new lease of life when heard amid new surroundings of any kind, especially in the transition from indoors to outdoors. Of course the entire receiving set need not be moved outdoors. If the receiver is of the antenna type it may be left in its accustomed place, while wires are run outdoors to the loud-speaker. The loop receiver, on the other hand, may be carried and used anywhere, so as to have the tuning controls readily available.

Loud-speaker reproduction often may be improved in summertime reception by bridging a small fixed condenser across the loud-speaker terminals. The capacity of such a condenser obviously must vary from one type of loud-speaker to another; but a little experimentation with several

(*Concluded on page 25*)

An Ultra-Audion Reflex



AN ULTRA-Audion Reflex, the design of which was submitted by Seeley Hopkins, 2416 Madison Avenue, Ogden, Utah. A variable resistance is used across the transformer secondary. This is a leak. The three coils are on a 3½" diameter tubing, 6" long, in the order shown in diagram, or the absorption coil may be on a separate tubing, inductively coupled to the other coils. No. 22 SCC wire may be used.

THE KEY TO THE AIR

KEY

Abbreviations: EST, Eastern Standard Time; CST, Central Standard Time; MST, Mountain Standard Time; PST, Pacific Standard Time; DS, Daylight Saving Time.

How to tune in a desired distant station at just the right time—Choose your station from the list published herewith. See what time division the station is under (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.	..

If you are under DST and the station you want is under that time, too, or if both are under ST, he above table will hold.

If you are under DST, and the station operates under ST, add one hour to the table result.

If the station uses DST, and you are under ST, subtract one hour from the table result.

FRIDAY, JULY 17

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12 to 1:05 PM; 8 to 12 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 (ESTDS)—8 PM to 10.
WBOQ, Richmond Hill, N. Y., 236 (ESTDS)—7:30 PM to 11:30.
WBZ, Springfield, Mass., 333.1 (ESTDS)—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 (ESTDS)—12:30 to 1:30 PM; 4:30 to 5:30; 6:30 to 11.
WDAF, Kansas City, Kansas, 365.6 (CST)—3:30 to 7 PM; 8 to 10; 11:45 to 1 AM.
WEAF, New York City, 492 (ESTDS)—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 (ESTDS)—6:45 AM to 7:45; 2 PM to 3:15; 5:30 to 10.
WEMC, Berrien Springs, Mich., 286 (CST)—7 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 (ESTDS)—2 PM to 6.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 PM to 4; 6 to 11.
WGCP, New York City, 252 (ESTDS)—8 PM to 11.
WGES, Chicago, Ill., 250 (CSTDS)—5 PM to 7; 10:30 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 (ESTDS)—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 11:30; 6 PM to 8.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—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 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 8:45 to 10:05; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—7 AM to 8; 1 PM to 2; 3 to 4:50; 6 to 7.
WJY, New York City, 405 (ESTDS)—7:30 PM to 11:30.
WJZ, New York City, 455 (ESTDS)—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 PM to 2:30.
WMCA, New York City, 341 (ESTDS)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—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 (ESTDS)—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 (ESTDS)—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)—4:30 PM to 5; 6:45 to 12.
WRNY, New York City, 258.5 (ESTDS)—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.
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., 361.2 (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.
KNX, Hollywood, Cal., 337 (PST)—11:30 AM to 12:30 PM; 1 to 2; 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 Blufs, 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, JULY 18

WAAM, Newark, N. J., 263 (EST)—7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—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 (ESTDS)—8 PM to 9.
WBOQ, Richmond Hill, N. Y., 236 (ESTDS)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (ESTDS)—11 AM to 12:30 PM; 7 to 9.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—10:45 AM to 12M; 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 (ESTDS)—6:45 AM to 7:45; 4 PM to 5; 6 to 12.
WEEI, Boston, Mass., 476 (ESTDS)—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 (ESTDS)—2 PM to 7:30; 11:30 to 12:30 AM.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 PM to 3; 6 to 12.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 2:30 PM; 3 to 5:57; 6 to 11:30.
WGR, Buffalo, N. Y., 319 (ESTDS)—8:45 to 10:15 PM, U. S. Army Band.
WGY, Schenectady, N. Y., 379.5 (EST)—7:30 PM to 10.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 11:30; 6 PM to 8.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—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 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—7 AM to 8; 10:20 to 11; 1 PM to 2; 3 to 4; 6 to 11:30.
WJY, New York City, 405 (ESTDS)—2:30 PM to 5; 8 to 10:30.
WJZ, New York City, 455 (ESTDS)—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 (ESTDS)—3 PM to 5; 6:30 to 12
WNYC, New York City, 526 (ESTDS)—1 PM to 3; 7 to 11.
WOAW, Omaha, Neb., 526 (CST)—9 AM to 11; 2:15 PM 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 (ESTDS)—11 AM to 1 PM; 4:40 to 5; 10:55 to 11:02.
WOR, Newark, N. J., 405 (ESTDS)—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)—4:30 to 5:30 PM; 6:45 to 12.
WRNY, New York City, 258.5 (ESTDS)—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 (ESTDS)—7 AM to 7:30; 10 to 1:30 PM; 2:30 to 3:30; 5:30 to 2 AM.
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 (CSTDS)—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, Canada, 435 (EST)—7:30 PM to 10.
PWX, Havana, Cuba, 400 (EST)—8:30 PM to 11:30.

SUNDAY, JULY 19

WBBM, Chicago, Ill., 226 (CST)—4 PM to 6; 8 to 10.
WBBR, New York City, 272.6 (ESTDS)—10 AM to 12 M; 9 PM to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—11 AM to 12:30 PM; 4:10 to 5:10; 7:20 to 10.
WDAF, Kansas City, Kansas, 365.6 (CST)—4 PM to 5:30.
WEAF, New York City, 492 (ESTDS)—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 (ESTDS)—5 PM to 7.
WGBS, New York City, 316 (ESTDS)—3:30 PM to 4:30; 9:30 to 10:30.
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.
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)—2 PM to 3.
WHN, New York City, 360 (ESTDS—1 PM to 1:30; 3 to 6; 10 to 12.
WHT, Chicago, Ill., 238 (CSTDS)—9:30 AM to 1:15 PM; 5 to 9.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—10:45 AM to 12:30 PM; 4:15 to 5:30.
WKRC, Cincinnati, O., 326 (EST)—6:45 PM to 11.
WMCA, New York City, 341 (ESTDS)—11 AM to 12:15 PM; 7 to 7:30.
WNYC, New York City, 526 (ESTDS)—9 PM to 11.
WOCL, Jamestown, N. Y., 275.1 (EST)—9 PM to 11.
WOO, Philadelphia, Pa., 508.2 (ESTDS)—10:45 AM to 12:30 PM; 2:30 to 4.
WPG, Atlantic City, N. J., 299.8 (CSTDS)—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.
WRNY, New York City, 258.5 (ESTDS)—3 PM to 5; 7:59 to 10.
WSB, Atlanta, Ga., 428.3 (CST)—11 AM to 12:30 PM; 5 to 6; 7:30 to 9.
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 12 M; 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 (ESTDS)—10 AM to 12:30 PM; 6 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, JULY 20

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12 M to 1:05 PM; 8 to 2 AM.
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 (ESTDS)—6 PM to 11:30.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—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., 416.4 (CST)—9:30 AM to 12 M; 1:30 PM to 6:15; 8 to 10.
WDAF, Kansas City, Kansas, 365.6 (CST)—3:30 PM to 7; 8 to 10; 11:45 to 1 AM.
WEAF, New York City, 492 (ESTDS)—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 (ESTDS)—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 (ESTDS)—2 PM to 6:30.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 to 3:10; 6 to 7:30.
WGES, Chicago, Ill., 250 (CSTDS)—5 PM to 8.
WGCP, New York City, 252 (ESTDS)—8 PM to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 3:30 to 5:57.
WGR, Buffalo, N. Y., 319 (ESTDS)—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 12:30 PM; 2 to 10:30.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—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 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—7 AM to 8; 1 PM to 2; 3 to 8.
WJZ, New York City, 455 (ESTDS)—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 (ESTDS)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—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 (ESTDS)—11 AM to 1 PM; 4:40 to 6; 7:30 to 11.
WOR, Newark, N. J., 405 (ESTDS)—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 (ESTDS)—7 PM to 11.
WQJ, Chicago, Ill., 488 (CST)—11 AM to 12 M; 3 PM to 4.
WRC, Washington, D. C., 469 (EST)—1 PM to 2; 4 to 6.
WRNY, New York City, 258.5 (ESTDS)—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
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)—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 P. M. 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.
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., 429 (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, JULY 21

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—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 (ESTDS)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (ESTDS)—6 PM to 11.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—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, Kansas, 365.6 (CST)—3:30 PM to 7; 11:45 to 1 AM.

PROGRAM FEATURES

SUNDAY, JULY 19

WEAF, New York City, 492 (ESTDS)—9:15 PM to 10:15, Goldman Band Concert.

MONDAY, JULY 20

WWJ, Detroit, Mich., 352. (EST)—8 PM to 9, Goldman Band Concert from N. Y.
WEAF, New York City, 492 (ESTDS)—9:15 PM to 10:15, Goldman Band concert; 11 to 12, Jack Alben and his Hotel Bossert orchestra.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—3 PM to 4. "Son of the Surf,"—surf sounds of Atlantic Ocean, picked up by special microphone, underneath the breakers of Steel Pier at Atlantic City, N. J.
WOO, Philadelphia, Pa., 508.2 (ESTDS)—7:30 PM to 8:30, dinner music by the Hotel Adelphia Roof Garden orch.

TUESDAY, JULY 21

WIP, Philadelphia, Pa., 508.2 (ESTDS)—3 PM to 4. "Song of the Surf,"—surf sounds of Atlantic Ocean, picked up by special microphone, underneath the breakers of Steel Pier at Atlantic City, N. J.
KGO, Oakland, Cal., 361.2 (PST)—"Ye Old Time Concert."
WEAF, New York City, 492 (ESTDS)—9 PM to 10. "Everday Hour,'; 11 to 12 PM Vincent Lopez Hotel Pennsylvania orchestra.
WOO, Philadelphia, Pa., 508.2 (ESTDS)—7:30 PM to 8:30, dinner music by the Hotel Adelphia Roof Garden orch.

WEDNESDAY, JULY 22

WIP, Philadelphia, Pa., 508.2 (ESTDS)—3 PM to 4. "Song of the Surf,"—surf sounds of Atlantic Ocean, picked up by special microphone, underneath the breakers of Steel Pier at Atlantic City, N. J.

THURSDAY, JULY 23

WEAF, New York City, 492 (ESTDS)—11 PM to 12 PM. Vincent Lopez Hotel Pennsylvania orch.
KGO, Oakland, Cal., 361.2 (PST)—Oscar Wilde play, "A Woman of No Importance."
WIP, Philadelphia, Pa., 508.2 (ESTDS)—3 PM to 4. "Song of the Surf,"—surf sounds of Atlantic Ocean, picked up by special microphone, underneath the breakers of Steel Pier at Atlantic City, N. J.
WOO, Philadelphia, Pa., 508.2 (ESTDS)—7:30 PM to 8:30, dinner music by the Hotel Adelphia Roof Garden orch.

FRIDAY, JULY 24

WWJ, Detroit, Mich., 352.7 (EST)—8 PM to 9 PM, Goldman's Band concert from N. Y.
WEAF, New York City, 492 (ESTDS)—9:15 to 10:15, Goldman Band Concert.
WHT, Chicago, Ill., 400 (CSTDS)—8:45 to 10:15 PM, Elmer Kaiser's Review Park Ballroom orch.
WGBS, New York City, 315.6 (ESTDS)—7 PM to 7:10, Herman Bernard, "Your Radio Problem."
WIP, Philadelphia, Pa., 508.2 (ESTDS)—3 PM to 4. "Song of the Surf,"—surf sounds of Atlantic Ocean, picked up by special microphone, underneath the breakers of Steel Pier at Atlantic City, N. J.
WOO, Philadelphia, Pa., 508.2 (ESTDS)—7:30 PM to 8:30, dinner music by the Hotel Adelphia Roof Garden orch.

SATURDAY, JULY 25

WEAF, New York City, 492 (ESTDS)—11 PM to 12 PM. Vincent Lopez orch.
KGO, Oakland, Cal., 361.2 (PST)—Music from "Taviata," "Caliph of Bagdad," "Rigoletto" and "The Chocolate Soldier" will be sung and played. "When We Forget," by Lella Grant, is the playlet on the bill.
KGW, Portland, Ore., 491.5 (PST)—10 PM to 12 PM. dance music from Portland Hotel by Jackie Souders' orch.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—3 PM to 4. "Song of the Surf,"—surf sounds of Atlantic Ocean, picked up by special microphone, underneath the breakers of Steel Pier at Atlantic City, N. J.

WEAF, New York City, 492 (ESTDS)—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 (ESTDS)—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 (ESTDS)—2 PM to 6:30; 11:30 to 12:30 AM.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 PM to 3; 6 to 11:30.
WGES, Chicago, Ill., 250 (CSTDS)—5 PM to 8; 10:30 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 P.M; 5:30 to 11:30.
WGR, Buffalo N. Y., 319 (ESTDS)—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 11:30; 6 PM to 8.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—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 to 12.
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—7 AM to 8; 1 PM to 2; 3 to 4:30; 6 to 11.
WJY, New York City, 405 (ESTDS)—7:30 PM to 1:30.
WJZ, New York City, 455 (ESTDS)—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 (ESTDS)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—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 (ESTDS)—11 AM to 1 PM; 4:40 to 5; 10:55 to 11:02.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7:30.
WPG, Atlantic City, N. J., 299.8 (ESTDS)—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)—4:30 PM to 5:30; 6:45 to 11.
WRNY, New York City, 258:5 (ESTDS)—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.
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.
KNX, Hollywood, Cal., 337 (PST)—9 AM to 10; 1 PM to 2; 4 to 5; 6:30 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 (CSTDS)—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, Saskatachewan, Canada—8 PM to 11.

WEDNESDAY, JULY 22

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—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 (ESTDS)—6 PM to 11.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—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 to 4; 5:30 to 11.
WDAF, Kansas City, Kansas, 365.6 (CST)—3:30 PM to 7; 8 to 9:15; 11:45 to 1 AM.
WEAF, New York City, 492 (ESTDS)—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 (ESTDS)—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, 272.6 (ESTDS)—2 PM to 7:30; 12 M to 1 AM.
WGGP, New York City, 252 (ESTDS)—8 PM to 11.
WGES, Chicago, Ill., 250 (CSTDS)—5 PM to 7; 10:30 to 1 AM.
WGBS, New York City, 316 (ESTDS)—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 (ESTDS)—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 11.30; 4 PM to 5; 6 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 (ESTDS)—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., 238 and 400 (CSTDS)—11 AM to 1 PM (238 meters); 7 to 8:30 (400 meters); 8:45 to 10:05 (238 meters); 10:30 to 1 AM (400 meters).
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 568 (ESTDS)—7 AM to 8; 10:20 to 11; 1 PM to 2; 3 to 4; 6 to 8.
WJZ, New York City, 455 (ESTDS)—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 (ESTDS)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—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 (ESTDS)—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 4; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—1 PM to 2; 4 to 6:30.
WRNY, New York City, 258.5 (ESTDS)—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.
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 A. M.
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 7:15; 12 M to 1:30 PM; 5:30 to 12.
KNX, Hollywood, Cal., 337 (PST)—1 PM to 2; 7 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 9.
KPO, San Francisco, Cal., 429 (PST)—7 AM to 8; 10:30 to 12 M; 1 PM to 2; 4:30 to 11.
KSD, St. Louis, Mo., 545.1 (CST—7 PM to 10.
KTHS, Hot Springs, Ark., 374.8 (CST)—8:30 PM to 10.
KYW, Chicago, Ill., 536 (CSTDS)—6:30 AM to 7:30; 10:55 to 1 PM; 2:15 to 4; 6:02 to 11:30.
PWX, Havana, Cuba, 400 (EST)—8.30 PM to 11:30
CNRM, Montreal, Quebec, Canada, 411 (ESTDS)—9 PM to 11.
CNRO, Ottawa, Ontario, Canada, 435 (EST)—7 PM to 11.

THURSDAY, JULY 23

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (EST)—12 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 (ESTDS)—3:30 PM to 6:30.
WBZ. Springfield, Mass., 333.1 (ESTDS)—6 PM to 11:45.
WCAE, Pittsburgh, Pa., 461.3 (CSTDS)—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 (ESTDS)—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 (ESTDS)—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 (ESTDS)—2 PM to 7:30.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 PM to 4; 6 to 7:30.
WGES, Chicago, Ill., 250 (CSTDS)—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 (ESTDS)—12 M to 12:45 PM; 2 to 4; 7:30 to 11.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 11:30; 6 PM to 7:15; 8:30 to 11.
WHAS, Louisville, Ky., 399.6 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 ESTDS)—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 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WJY, New York City, 405 (ESTDS)—7:30 PM to 11:30.
WJZ, New York City, 455 (ESTDS)—10 AM to 11 PM; 1 to 2; 4 to 6; 7 to 12 M.

With
IRVING HOFFMAN
at

KDKA

East Pittsburgh, Pa.

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 (ESTDS)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—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.

World Battery One of 4 New Stations Named

Two licenses were issued for new stations in Chicago. The World Battery Co., 1219 South Wabash Avenue, Chicago, will operate WSBC, while the Lane Technical High School will run WLTS. Both are examples of "significant" call letters. WSBC stands for World Storage Battery Co., the "W" being just the thing. But usually the divisional classification ("W" or "K") takes on no meaning. The rest of the letters being initials, e. g., LTS for Lane Technical School.

The World Battery Co. is one of the most prominent ones in the radio industry and its business has assumed very great proportions.

NEW CLASS A LICENSES

Station	Owner	Meters	Watts
WLTS	Lane Technical High School, Chicago	258	100
WIBS	N. J. Nat'l Guard, Elizabeth, N. J.	202.6	20
KFWI	Radio Entertainments, Inc., South San Francisco, Cal.	220	500
WSBC	World Battery Co., Chicago..	209.7	200

CLASS A STATIONS DELETED

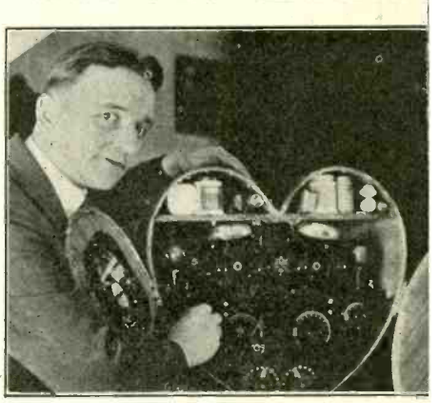
KFKB—Brinkley-Jones Hospital Association, Milford, Kansas.
KFNJ—Central Missouri State Teachers College, Warrensburg, Mo.
WHBI—Chesaning Electric Co., Chesaning, Mich.
WSAX—Chicago Radio Laboratory, Chicago.
WDBW—The Radio Den, Columbia, Tennessee.
WMU—Doubleday-Hill Electric Co., Washington, D. C.
WFBB—Eureka College, Eureka, Illinois.
KFCC—The First Congregational Church, Helena, Montana.
WSAD—J. A. Foster Co., Providence, Rhode Island.
WCBJ—J. C. Mans, Jennings, Louisiana.
KFNL—Paso Robles Broadcasting Association, Paso Robles, Cal.
KFRQ—Radio Market Service Co., Portland, Oregon.
KFNY—V. Kemp Roberts, Helena, Montana.
WTAU—Ruegg Battery & Electric Co., Tecumseh, Neb.
WCBI—Lloyd K. Rush, Bemis, Tennessee.
KFLB—Signal Electric Mfg. Co., Menominee, Mich.
WSAB—Southeast Missouri State Teachers College, Cape Girardeau, Mo.
WDBP—Superior State Normal School, Superior, Wisconsin.
KFBU—Bishop N. S. Thomas, Laramie, Wyoming.
KFWC—L. E. Wall & C. S. Myers, Upland, Cal.
WBBZ—Noble B. Watson, Indianapolis, Indiana.
WHBT—Thomas W. Tizzard, Jr., Downers Grove, Ill.
KFWF—St. Louis Truth Center, St. Louis, Mo.

WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7.
WPG, Atlantic City, N. J., 299.8 (ESTDS)—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.
WRNY, New York City, 258.5 (ESTDS)—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.
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; 530 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.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 7.
KGO, Oakland, Cal., 361.2 (PST)—11:30 AM to 1 PM; 1:30 to 3; 4 to 6:45; 7:15 to 10.
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; 5:30 to 11:30.
KNX, Hollywood, Cal., 337 (PST)—11 AM to 12.05 PM; 4 to 5; 6 to 12.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9.
KPO, San Crancisco, Cal., 429 (PST)—7 AM to 8; 10:30 to 12 M; 1 PM to 2; 3:30 to 11.
KSD, St. Louis, Mo., 595.1 (CST)—7:30 PM to 9.
CNRA, Calgary, Alberta, Canada, 435.8 (MST)—9 PM to 11.

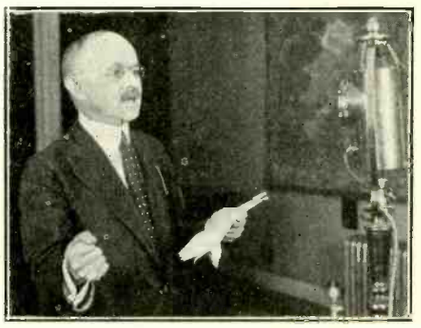
Two Phases of Air Combined

AIR is home to them, whether they are on the air or in the air. Edith Crane, of the Eagle Radio Co., is ready for a flight. At right is Eddie Squires, the globe-trotting announcer, until recently trotting around the WMCA studio, New York City. At left is Al Caperton, pilot. Scene, Curtiss Field, New York City.

Set for Ladies



A SET made by Frank Zidar, of 3171 Third Ave the powder, rouge, etc. The culvert is rather c aerial, tapped variocoupler primary, condenser-tu transf



STRANGE COMBINATION! Looks like a static personality engaging in dynamic stuff before a dark lantern. Instead the gentleman is the distinguished Ben B. Lindsay, dean of American juvenile court judges, originator of Denver's famous court, speaking on child welfare before the microphone of KOA, Denver (G. E.)

Radio Vision Is Very Practical; Mechanical Principles Known; Adaptation Is the Problem

—C. FRANCIS JENKINS, Noted Inventor

By Thomas Stevenson

WASHINGTON.

WITH amateurs all over the country helping in the development of the transmission of pictures by radio it may not be very long before the public will be able to see as well as hear with radio receiving apparatus.

Already the transmission of pictures by radio is in the same stage through which radio passed not so very long ago. Some remarkably fine examples of pictures transmitted by wire and radio have been produced in recent months. And as the transmission of images from live subjects in action differs from "still" pictures only in that they are more rapidly formed, solution of this problem may soon be expected.

C. Francis Jenkins, who for several years has been engaged in the development of transmission and reception of pictures by radio, believes the time is near when this new art will be ready for the public.

Mr. Jenkins is now providing amateurs all over the country with apparatus which will transit and receive "still" pictures. To stimulate interest and experiments among the amateurs, Mr. Jenkins has offered cash prizes for new suggestions.

Amateurs Helping Greatly

Already, Mr. Jenkins says, hundreds of amateurs have gone in for the new art and many of them are getting very good results in the transmission and reception of pictures. Likewise, many valuable suggestions have been made for improvements in apparatus.

"The rapid development of apparatus for the transmission of photographs by wire and by radio," says Mr. Jenkins, "may now be confidently expected, because the public is ready for it. At this very moment it is going through the same empirical process by which motion pictures arrived, and out of which finally the long film strip was born.

"In the motion picture development there appeared the spiral picture disc; the picture 'thumb book'; picture cards radially mounted on drums and bands, and the picture film continuously moved and intermittently illuminated.

Outcome of Experiments

"But finally the development resolved itself into a single, long, transparent picture film, intermittently moved in the exposure aparture of the projecting machine; and upon this has been built one of the large industries of the world.

"Doubtless this will be the history of the development of electrically transmitted photographs, and of radio vision, for many schemes have already been tried and more may yet be seen before the final, practical form shall have been evolved, and this new aid to business and to entertainment shall have taken its place in human affairs.

"The transmission of a photograph electrically, a portrait for example, is not so much a matter of mechanism, once the tools are perfected and their operation understood; it is more a matter of blending of line and tone, just exactly as it is with the artist. The great portrait photographer uses the same tools the amateur uses, but an acquired technique of high order enables him to produce a superior portrait, free of chalky contrasts, and soft in tone and blending. Just so in radio photography, it is a matter of simple mechanism, and an acquired skill in its use.

"I expect to see very soon the radio amateurs using flash light lamps and electric pens where they now use headphones; and halftones or potassium sells where they now use microphones, for the radio problem between the two is practically the same—if anything rather more simple with light than with sound. And new means for modulating electric current by changing light values may be expected with the American boy playing with this new toy.

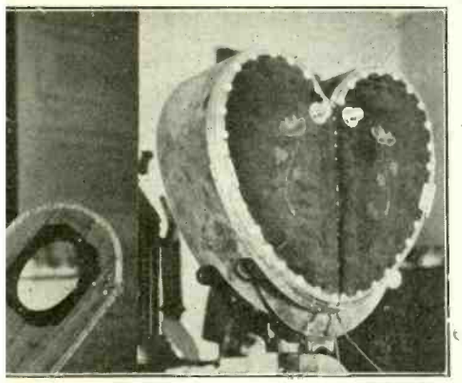
An Eye to the Eye Now

"There has been a veritable army of engineers engaged in the development of radio as a service to the ear, while relatively few engineers have been developing radio as a service to the eye.

"I believe that the distant electric modulation of light for many purposes will soon become a common phenomena and eventually of inestimable service in science, in engineering, in industry, and in the home.

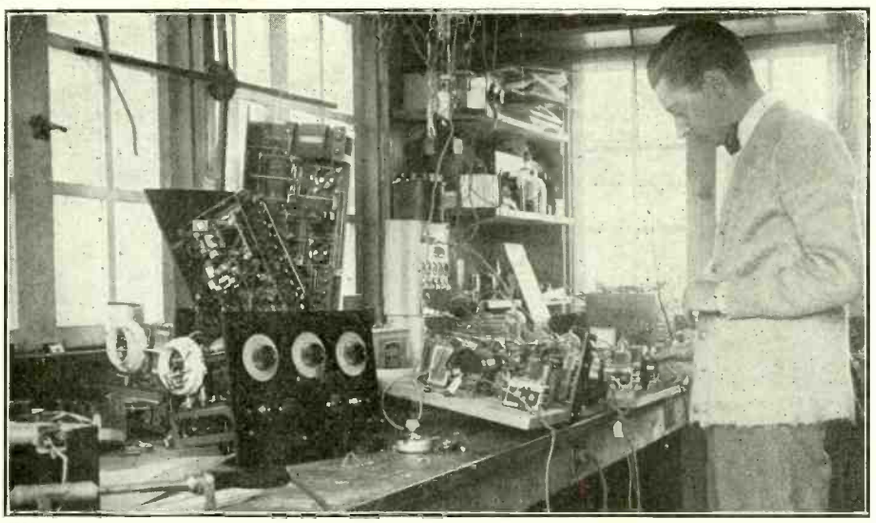
"With a radio photographic technique, the result of ten years of concentration on this subject, it may be asserted with confidence that the requirement of a particular application rather than a particular machine is the governing factor in each case; for with full working knowledge of the art, and the special application requirements known, the design of the machine best adapted to that service is a simple matter."

...s who Powder



...nue, Detroit, for ladies' use. Note the mirror and ...nfectionery. The circuit is series-condenser tuned ...ed secondary, plate variometer and two stages of ...rmer AF.

Lynch in His Famous "Lab"



THE type of a radio laboratory most fans would be tickled to have. Note the many types of receivers and testing apparatus. Arthur Lynch, Editor of "Radio Broadcast," is seen in corner manipulating the dials of a new receiver. (Kadel & Herbert)

EUROPE IN A TANGLE OF WAVES

GENEVA.

Europe has its problem of a crowded ether, too. The technical committee of the International Radiophone Union is trying to solve it. There are now about 60 stations in Europe and all must work within wavelengths between 300 and 500 meters. As wavelengths used by the various stations should have a difference of from twelve to fifteen meters, according to the distance which separates the stations, it can readily be seen that scientific distribution is ncessary to prevent confuson in broadcasting. In a number of instances the same wavelengths used by two or more stations have limited radio.

It is pointed out that the limited radius of a station is no guarantee aganst interference with mother stations. Mr. Burrows, Director of the International Union, has listened in on Edinburgh from his home in Geneva, although the Edinburgh station is supposed to have a radius of only five miles.

The committee was unable to make any headway. The stations in Europe must operate with a wave band capable of holding only forty-two. In order to continue operation of all these stations it is necessary to make experiments.

Burn Tubes Low

Keep the filament of the tubes burning well within the rating of the manufacturer. Quite frequently the filament may have a considerably lower voltage and still give very good reception. This lengthens the life of the filament and therefore the premature burnout of the tube. However, it is good policy to see if you are keeping within the rating specified, which is best done with a direct current voltmeter. This should read from zero to 8 volts, as all the present type of receiving tubes take no more than 5 volts on the filament. It is shunted across the filament leads, or in series with the rheostat arm, so that as you decrease the resistance in the circuit, the direct number of volts that pass in filament circuit can be read directly on voltmeter.

Indirect Advertising Grows; Called Solution of Programs

WASHINGTON.

WITH a big increase in the number of stations selling time to advertisers, the question "Who is to pay for broadcasting?" has been answered. Government officials in close touch with the situation predict that eventually most stations will sell time. Already a great many stations are deriving incomes from this source.

Whether selling time on the air will be in the interest of the general public will be shown by future events. The interest of the public, of course, is in the quality of the programs.

It is the belief of those in a position to know that selling time will tend to improve programs.

Called Successful Experiment

The consensus of Government officials interviewed by the writer may be summed up as follows:

"Advertising by radio, although comparatively new, has proven highly successful. Many large companies operate stations for the sole purpose of getting their name before the public, while many others buy time through stations. When time is bought, some sort of entertainment is provided which is preceded by the announcement of the company which buys the time and provides the entertainment. This is the only publicity that the purchaser of time gets out of it. Yet apparently it is worth it because there seems to be a big demand at good prices for time on the air."

Advertising by radio refers, of course, to indirect advertising, or the announcement of the company providing the entertainment through the station. It is not believed that direct advertising ever will be tolerated.

Spurs Demand for Channels

One of the reasons for the increased demand for wavelengths is the profit to be derived from selling time. Unless legislation limiting the number of stations is forthcoming within the near future, probably attempts will be made in the courts to force the Secretary of Commerce to provide wavelengths or else compel other stations to divide time with newcomers. At present practically every wavelength is in use while more than 100 applications are pending for licenses for new stations.

It is not believed the Government will ever attempt to derive an income from selling or renting wavelengths because broadcasting is classed as a public service.

Congress also probably will be asked to provide regulations in regard to advertising by radio. These regulations may take the same form as those that now apply to advertising through newspapers and magazines.

Novel Antenna Brings Great DX to Fan "6 Miles from Civilization"

In a letter to WHN, New York City, Fred L. Hutchins, Maine forest patrolman, states that he has obtained wonderful reception from this station when alone in his little shack with his dog. His success is due, he says, to a novel antenna, which he describes as follows:

"I use braided enameled stranded Belden wire, about 75 feet long. I bring it into my camp directly, then wind 25 feet on a loop I also put 100 feet on another loop similar, only the 100-foot loop is of course larger. I then place the large loop directly in front of the small loop that is a continuation of the antenna, and then by moving the large loop back and forth I get by induction just the effect in tuning that I want."

Mr. Hutchins' "beat" is in North Central Maine, "six miles from civilization."

THE RADIO UNIVERSITY

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

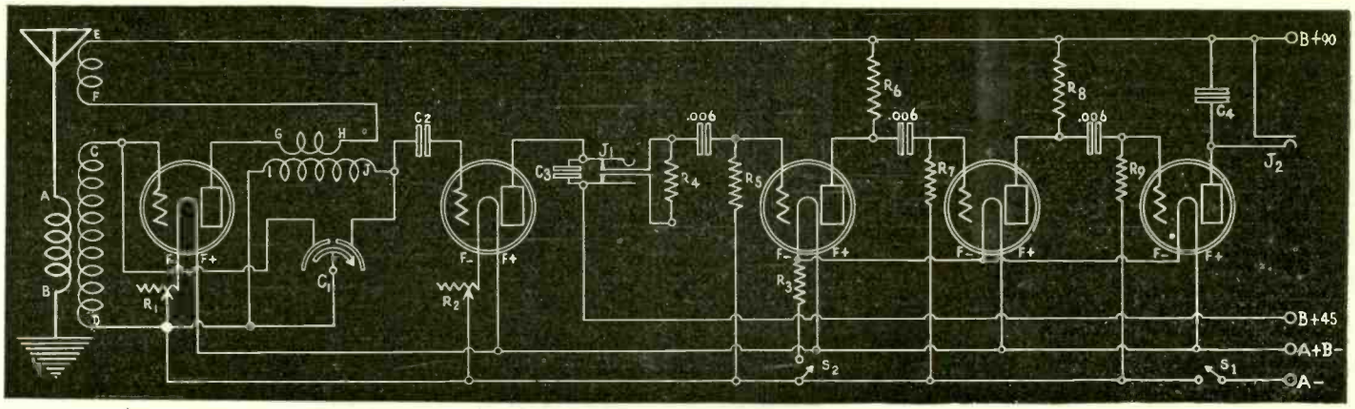


FIG. 167, showing the diagram of "1925 Model DX Wonder." The data for winding the coils are as per:—Using a 4" outside diameter tubing, 2" high, wind eight turns of No. 20 DCC for the primary of the variocoupler, AB, terminate; then, leaving the least space possible, wind 31 turns of the same kind of wire in the same direction for the secondary, CD, terminate. The tickler EF, should consist of 20 turns of No. 26 SSC on a 3" diameter, 2¼" high. The RFT, GHIJ, consists of the same kind of winding as the primary of the coupler, except that the secondary, IJ, has one turn less, or 30 turns. C1 is a .0005 mfd. double condenser. R4, R6, R8 are 1 megohm in value. R5 is 1 megohm, R7 is ½ megohm, R9 is a ¼ megohm. C4 is a .001 mfd. condenser. C3 is a .002 mfd. fixed condenser. C2 is a .001 mfd. fixed condenser. R3 is a 6-ohm Amperite resistance. R1, R2 are 6-ohm rheostats. Five UV201A tubes are used or a Sodion D21 will serve as a detector. Other detectors require a grid leak.

PLEASE PUBLISH the diagram of "1925 Model DX Wonder With Resistance AF," described by Herman Bernard in the March 28 issue of RADIO WORLD.—O. L. Beasley, City Island, N. Y.

See Fig. 167.

* * *

I HAVE read the first and second part of Lewis Winner's articles in the issues of June 27 and July 4 and the following is what I cannot get straight: (1) What is meant by modulation? (2) What is meant by oscillation? (3) What does CW mean? (4) About how much does the transmitter that was published in the June 27 issue of RADIO WORLD cost? (5) Can this transmitter receive also? (6) Can you give me a diagram of a transmitter that does not use a chemical rectifier?—I. Weiss, 608 East 9th St., New York City.

(1) The impressing of the audible notes upon the carrier wave. (2) Electrical vibrations, and not rapid to and fro physical motion. (3) Continuous wave is a wave which is not stopped or damped out in any manner. Damped waves are those where the amplitude or height of the radio-frequency wave is gradually decreased until zero or approximately thereto. (4) It depends upon what power tubes you desire to employ. (5) Yes, but it is not very practical. (6) In the near future such a diagram will be published.

* * *

IN REGARD to the article by Lewis Winner on Transmitters, in the July 4 issue of RADIO WORLD. In the ICW method of transmission, is there a key placed in the grid circuit as for CW?—L. M. Barclaye, Tension City, Ia.

Yes, but a buzzer is either inserted directly in the antenna circuit or coupled thereto, with a two-turn coupling device. When using a modulator tube, the buzzer takes the place of the microphone.

* * *

HOW MANY feet of wire are required to wind the toroid coils (4" form) for the set, which was described in the May 9 issue of RADIO WORLD? (2) What is "N," page 6, May 16 issue of RADIO WORLD?—W. E. Whelpley, Sutherland, Fla.

(1) There are 60 feet of No. 24 DSC used and there will be approximately 205 turns of wire wound on coil. (2) It is a variable neutralizing condenser.

* * *

IN REGARDS to the "Spare Parts Reflex," by Herbert E. Hayden, June 20 issue of RADIO WORLD, I find that I cannot receive the low wave stations, and that the volume is not very good.—V. D. Mauville, 233 18th St., Santa Monica, Cal.

To get the low wave stations, either reduce the number of turns on your primary coil, or insert a .001 mfd. condenser in series with the antenna. As for the volume, reverse the secondary of the second AFT, and take out the fixed condenser which is shunted across it. Reverse the secondary of the RFT.

* * *

I BUILT Wright's "Powerful 3-Tube Reflex," May 23 issue of RADIO WORLD, and on locals with only two tubes I get as much volume as I do on my Neutrodyne. I have been unable to get out-of-town stations and notice the following actions of the set: (1) The second and third condensers do not affect the tuning of the locals. Coils were wound with 24 DCC for the secondary, and primaries with 22 SSC, using same number of turns specified. The first condenser tunes real sharp. (2) The potentiometer measured 410 ohms on a Wheatstone bridge, and this does not work right, as the movable arm can be in any position. (3) The only hum I get is when I remove the catwhisker from the crystal (which is guaranteed and was tested in a crystal set). I am using 199 tubes, using my Neutrodyne detector for the first socket, and other two tubes matched in other two sockets. (4) What size panel should this be mounted on? (5) The .0005 fixed condenser across the negative A and the end of the first secondary is one that is used for a detector grid condenser from appearances. I bought it from a reliable radio store who claim it can be used in any position. Is this right?—J. M. Hubler, Western Union Telegraph Co., San Antonio, Texas.

(1) Decrease the length of your antenna. Reverse the secondaries of the second and third RFT. (2) This instrument does not play any important part. It prevents the second tube from oscillating when powerful signals are being tuned in. (3) There is an open circuit when you remove the crystal and the hum caused thereby is to be expected. (4) A 7x21" panel. (5) No.

* * *

WILL THE 8-Tube Super-Heterodyne as described in the July 4 issue of RADIO WORLD work better than the non-regenerative Ultradyne? (2) Can 3 All-American, 4,000 to 20,000 meter iron core transformers be used in this set, with an 10,000 All-American filter? (3) When tuning in, can any regenerative whistle be heard? (4) Is it advisable to use a large size condenser for tuning the oscillator coil?—Howard Everett, 3923 Second Boulevard, Detroit, Mich.

(1) They will work practically the same. (2) Yes. (3) No. (4) No.

* * *

IS THERE much difference in the intensity of volume in the Low-Loss Neutrodyne, described in June 13 issue of RADIO WORLD, if 4 rheostats are used instead of 4 Amperites? (2) Is it better to take off two turns on the secondary coils or to use a 17 plate variable condenser in place of the 23 plate condenser, as per diagram? (3) I get a very loud hum from the last stage of AF. Is this due to an open in the AFT? (4) In Percy Warren's Inductance Set for DX, in the July 4 issue of RADIO WORLD, can an ordinary variometer and variocoupler be used?—M. Skilla, 360 61st St., Brooklyn, N. Y.

(1) No. (2) Use the 23 plate condensers (.0005 mfd.). (3) Yes. (4) Yes.

* * *

IN THE 4-Tube 3-Control Set that was published in the March 21 issue of RADIO WORLD, could I use two Ambassador condensers (.0005 mfd.), an Ambassador Baby coil and a Raft coil?—John Simpson, Jr., 67 Driggs Ave., Brooklyn, N. Y.

Yes.

* * *

I WISH to build Prof. P. M. Ginnings' 2-Tube Reverse Feedback Set, described in June 27 issue of RADIO WORLD. (1) What capacity is C4 and C5. (2) What is R3?—C. J. Ripper, 36 Pittsburgh St., Emsworth, Pa.

(1) C4 is a .00025 mfd. grid condenser, C5 is a .001 mfd. condenser. (2) R3 is a grid leak (2 megohms).

* * *

I NOTE PICTURE diagram of Reflex in March 28 issue shows L2 secondary and AFT1 secondary in series, with C4 bridged across. Also fail to see how 90 volts plus connects to B of AFT2 in same diagram, though it is shown in schematic diagram. Please give correct connections for L1L2, also L3L4 basket weave coils when primary and secondary are wound together? (2) Set tunes sharply and in close step, but only get regeneration around 350 meters, and not below or above with plate condenser. (3) When I put in 201A tubes, set is absolutely dead, though filaments light fine, and tubes work all right in other sets. What is the cause

of this? (4) What is use of C5 bridged across B battery? It does not make any difference whether on or off. (5) Is Wright's 3-tube reflex, May 23, O. K.? (6) Please give me any more information on how to make the set more successful.—J. W. Crowley, 246 North Autumn Street, San Jose, Cal.

(1) Follow the schematic wiring diagram. Basket weave coils may be used. Keep like poles together (aerial, plate, batteries and ground). (2) Increase the number of turns on the plate coil. Put a .001 mfd. in series with the antenna. Reverse the secondary of the RFT. (3) Prongs don't make good contact, caused by the adapters of your UV199 tubes pushing the prongs all the way down. Add on more plate voltage and also put 4 dry cells in series to light filaments. (4) It is a by-pass condenser, which at times will work well. This method has to be tried out and no definite rule can be laid down. (5) Yes. (6) Put a fixed crystal detector or a fresh piece of galena in place of old one.

* * *

PLEASE give me a simple picture diagram of the "1-Tube DX Set for the Novice," to build, which was published in the May 23 issue of RADIO WORLD. I want data on how to build the coils.—L. K. Plipeson, Kings Road, Ia.

See Fig. 168 for diagram.

* * *

IS a double condenser more selective than two separate condensers?—James Farrell, Poughkeepsie, N. Y.

The inclusion of a double condenser in a circuit to eliminate one control accomplishes just that and nothing more. There is a mistaken impression abroad that the set is rendered more selective by the inclusion of such a condenser. The operation of the instrument is the turning of a rotor common to a pair of stators, thus causing the two condensers to be tuned with one motion. Usually the stators are one right behind the other. The reason why some persons believe that greater selectivity is achieved is that there is virtually no possibility of hearing two stations at once, if the coils being tuned are matched. That is not a test of selectivity at all. Some of the most selective sets can bring in three stations at once. The Neutrodyne is an example. This may happen when each of the three dials is set for a different local station and all three stations are strong and close at hand. If a set using a double condenser to tune two stages, having a second control for regeneration, were tuned it would be impossible to bring in these three stations at once. But set the three Neutrodyne dials for the same station and you accomplish a reduction of resistance to such a point that selectivity is very good. It is equally good in the 3-control regenerative set, for instance the one embodying a stage of tuned RF and a regenerative detector, as in The Diamond of the Air. When one motion tunes two condensers, and particularly when those two condensers are the sole wavelength control in the set, it is impossible to have any given setting for two different wavelengths. But if a test is made, no matter what circuit is used, with the receiver set for a given station only, it will be found that the double condenser can not achieve greater selectivity than two separate condensers. It may achieve as much, but not more, for it is doing no more, electrically, than two separate condensers. In fact, the device is more mechanical than electrical. It is well to include a double condenser to eliminate one control, providing a good make is used, but nobody should expect a greater selectivity on that account alone, or borrow mistaken notions concerning "increased selectivty." Indeed, a slight loss is bound to occur, due to the meeting of the electrostatic fields of condensers of two stages which it is well to keep apart both magnetically and statically. This loss is nothing to worry about and scarcely ever can be interpreted in actual missing stations one would get otherwise, or even in diminished volume or noticeably less selectivity. The use of double condensers is to be encouraged where control reduction is greatly desired, but not for other reasons. If it were not an effective instrument in this direction it would not have been pushed to its present plane of popularity by Herman Bernard and adopted also by McLaughlin in his Super-Heterodyne and by Anderson in the 4-Tube Baby Super-Heterodyne.

* * *

WHICH IS the better design, Fig. 1 or 2 for reception as low as 20 meters in the short wave article by Herbert Hayden in the June 13 issue of RADIO WORLD? (2) Is the primary L1 wound on top of the secondary L2 or are they alongside of each other on the 3" tube and separated ¼". (3) As this set is designed for phones and would appear to be elusive in tuning, is it advisable to attempt adding a stage of audio? (4) Which is a preferable tube to use, 199 or 301A? (5) I have a Heath 13 plate vernier and a Murdock 13 plate plain variable condenser; may these be used in Fig. 2 with satisfaction or is it necessary to have both with verniers? (6) Provided I use UV199 in Fig. 2 design with the variables I have an inside antenna of 35 ft. I shall want to know the number of turns of 22 DCC for L1L2L3. (7) What is meant by "avoid using tubes with metal bases"?—Robert C. Hopkins, 5205 14th Ave., Brooklyn, N. Y.

(1) Fig. 2. (2) Alongside. (3) Yes, but the wavelength of the set will be increased a bit, due to the inductance and capacity of the AFT, tube, phones, and connection wire. (4) The UV201A. (5) You may use these, the vernier as the wavelength control. (6) L1 has 6 turns, L2 has 17 turns and L3 has 17 turns. The tubing diameter for L1L2 is 3" and for the tickler 2". (7) Use bakelite, Insolantite or porcelain based tubes. The base is the lower portion of the tube, which screws in the socket.

A 1-Tube DX Set for the Novice Using a Tuned Plate Circuit

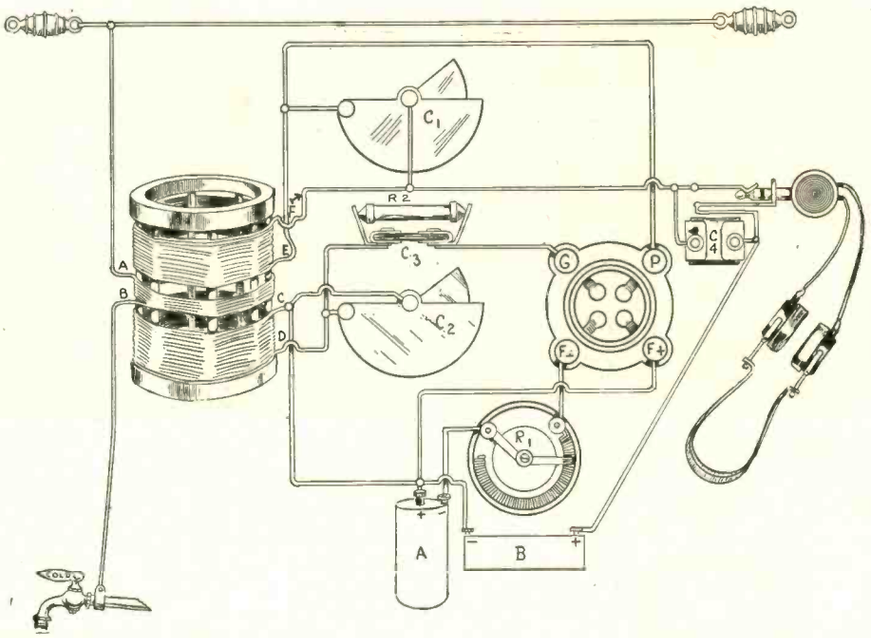


FIG. 168, showing the picture diagram of a 1-tube DX set. The tubing is 3" in diameter and 4" length. There are 50 turns on the grid coil (C and D), 10 turns for the primary coil (A and B), and 35 turns for the plate coil (E and F). Leave ¼" spacing between coils. The variable condensers (C2 and C3) have a maximum capacity of .0005 mfd. The coil wire is No. 22 SCC. Keep the polarities in the same manner that they are shown on diagram. Use a WD12 tube for the detector and a 6-ohm rheostat.

A THOUGHT FOR THE WEEK—Radio has only five letters but a million angles.

RADIO WORLD

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

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

JULY 18, 1925

The Reason

Caesar—You Carsius hath a lean and hungry look, slave.

Slave—Yea, verily. He hath lost much sleep and missed many meals trying to get Turkey on his Lictordyne.

A SIMPLE 1-TUBE DX SET FOR THE NOVICE, by Percy Warren. Send 15c for May 23 issue, RADIO WORLD.

LISTEN IN every Friday at 7 P. M. and hear Herman Bernard, managing editor of RADIO WORLD, discuss "Your Radio Problem," from WGBS, Gimbel Bros., New York City, 315.6 meters.

WHOLESALE, RETAIL ELECTRICAL SUPPLY business in part of business section; population about 1,000,000; must have between $20,000 and $25,000. Box 100, RADIO WORLD.

Where Stations Waste Money

THERE are several stations in the United States that are wasting a great deal of money. Fortunately it is their money, but it is a pity the waste should continue. Until recently the Hotel McAlpin, New York City, was one of these. But it saw the error of its ways and procured an antenna site in Hoboken, instead of the makeshift stretch of wire at Thirty-fourth Street and Broadway, New York City. That particular antenna, "where the White Way begins," represented where the possibility of "getting out" ends. And the aim of every station is, or should be, to "get out."

WMCA now continues to conduct its studio at the hotel, but the microphone is hooked up by land wire with the transmitting antenna in Hoboken, where the "getting out" is decidedly good. Some station owners would do well to inquire of WMCA what the mail proved the very day after the ether was energized from quiet Hoboken, instead of from dizzy New York.

A broadcasting station is an expensive undertaking. A fair-sized station, equipped for 500 watts output, with not everything purchased being exactly brand new, would cost about $35,000. The payroll, in addition, would be that much a year. Then count rent, insurance, power, physical upkeep of plant, and you begin to run into figures that should make station owners think of pro rata cost per listener. It costs so much to get one person to listen to the program, no matter if the owner does not know just how many are listening in, hence does not know the cost per listener. The station owner may never find out. Therefore he is not so greatly worried over the fact that his station is not "getting out." If the station costs him $100,000 per year, or about $2,000 a week, and some one tells him that his station does not cover any appreciable territory, all he needs, to make him feel comfortable, is to have some enthusiastic expert (on his payroll) assure him that 500,000 persons listen to each program. Multiply 500,000 by 365, giving 187,500,000 listeners a year, or 1,000 listeners for 53 cents. And look at the "listener interest"! That is a paraphrase of the "reader interest" slogan borrowed from the publication advertising world.

But there are several, indeed many, stations in the United States that are in very poor locations for transmitting antennas, but their studios, for good and sufficient reasons, must be where they are. Why not use a suburban antenna? It is well worth the extra cost. Indeed, the added expense represents a saving.

One station that recently opened in New York City on a very low wave for a Class B station is suffering the same trouble of being "pocketed." Tremendous areas of steel all about an antenna simply spoil the station's possibilities. Another station, not so far from the Hotel McAlpin, isn't getting out very well, Canadian reception being regarded as distance. These and other stations should mend their own ways for their own good before the weather arrives which is most propitious for distant reception. In changing over to the new and better plan they will be serving themselves first, but, what interests the listening public more, they will be disseminating their programs over so much wider territory that a great benefit will be conferred on fans in general; also the radio industry as a whole will derive an advantage.

KDKA, which, for its broadcasting technique enjoys an envious position of honor in the radio field, has been very successful with this remote control work, and other stations might profit from the master.

What About Words, Orchestras?

JAZZ orchestras become more and more frequent as radio entertainers. Few of them have any singers to inform listeners of the words of the songs. Seldom indeed is anyone heard who has a good voice and who "sings with the orchestra."

Many persons are as much interested in the words as in the music. Broadcasting orchestras seeking to lead in popularity should have three or four instances of one person "singing with the orchestra" during an hour's playing. Of course the singing should be solo. Under no circumstances must the musicians or even the maestro attempt to sing.

The Tide Turns Toward the Crystal

THE efficacy and charm of the crystal as a rectifier, when preceded by enough radio-frequency amplification, make its use worth while by fans. Although the crystal suffers fluctuations of popularity it always seems to bob up again, and its many kind but rather forgetful friends rally to its support. Thus when H. E. Wright described his Powerful 3-tube Reflex in the May 23 issue of RADIO WORLD, using crystal rectification, the storm of cheers that arose from builders of this circuit was something to make the crystal feel anything but lowly. Then J. E. Anderson used a crystal—specifying carborundum—in his Baby Super Heterodyne, which works a speaker on four tubes (July 11 issue). Once again score a point for the crystal.

Where conditions are such that a crystal may be used successfully, selectivity being afforded by tube amplification ahead of rectification, economy and excellent service are its companion virtues. Usually if the crystal is inductively coupled to the preceding part of the hookup the selectivity will be greater

The crystal rectifies with wonderful purity and clarity. There is a little less volume than with tube rectification, but the added clarity is an appreciable gain.

ROXY GAINS STILL MORE NEAR CLOSE

Popularity Contest Ends This Month—Last Coupon Will Be Published Next Week.

ROXY made a rushing gain in the popularity contest conducted by RADIO WORLD. Ben Bernie and his orchestra improved some, but Roxy has 12,166, as against Bernie's 11,105. This does not decide the contest by any means. It is true that only one more coupon will be published—that in next week's issue, dated July 25—and all the ballots have to be in RADIO WORLD,S office by July 31. After that the final counting begins. Naturally there will be a great number of ballots cast near the closing hours.

Note carefully that although the final coupon will be published in the July 25 issue, that does NOT mark the end of the contest. The end is on July 31. The result will be published in the July 15 issue.

Bonawitz in the Running

Karl Bonawitz is doing very nicely in the contest, as he has a chance to pass Ben Bernie, and even Roxy, if the balloting for him shows some sudden strength. Indeed, he has about the same chance of passing Bernie as Bernie has of passing Roxy. Bernie's followers say that Bernie will win. They would not reveal whether Bernie has anything up his sleeve.

Bonawitz has 10,069 votes, a very respectable showing. The Happiness Boys are about the only others who may be fairly rated as in the running, with 9,944. After them the drop is rather sudden. Nils T. Granlund being in fifth place with 4,514. The votes for all others may be termed scattering. But who can say with safety that a huge batch of votes is not being held back for some one far down on the list at the moment, but who will win the first prize nevertheless?

The coupon attached published herewith should be used in voting. Any and all coupons may be cast at any time prior to the closing of the contest.

The Tally

Roxy (S. A. Rothafel), WEAF, New York City	12,166
Ben Bernie & Orch., WEAF	11,105
Karl Bonawitz, WIP, Philadelphia	10,069
Happiness Boys, WEAF	9,944
Nils T. ranlund, WHN, New York City	4,514

Mrs. Rofpatkin Wants Her Little 1922 Crystal Set Back Again

By Sonia Rofpatkin

MY FAVORITE always has been the crystal set. I remember two and a half years ago what a nice little crystal set we had in the house and how I used to sit by the hour and listen to the sweet music that receiver brought in. Since then there has been an unending parade of tube sets into our home and my husband has constructed any number of sets, but it's a case of tubes, tubes, tubes all the time. Once in a while a crystal is used, but always there are plenty of tubes ahead of it. And, while I don't know so very much about radio, and never dispute my husband, Feodor, on technical matters, I do insist that any set that has tubes in it, except merely for audio amplifiers, is a tube set, and NOT a crystal set. My husband does not deny that assertion, but he always looks at me quizzically when I broach the subject.

Feodor's Reply

I know very well that my crystal set worked splendidly. I don't think that Feodor will deny that. But when I ask him when I'm going to get my little crystal set back he says:

"My dear, what is the use? A crystal set will not prove selective enough. You will hear two or more stations at once. Unless the set has about six controls you won't be able to get rid of that interference."

And then I begin to present my side of the case. As I said, I am not a radio technician, like Feodor and his friends, Capt. Peter V. O'Rourke and J. E. Anderson. But I do remember that the little crystal set, which used only a variometer for tuning—a single-control set, mind you!—tuned in WEAF elegantly and there was hardly any, I might say absolutely no interference from WOR.

What Difference Now?

That was two and a half years ago. But the sun rises at the same time in the morning now as it did then; there are just as many months in the year now as then; static isn't any worse, indeed, judging by this summer's record so far, is much less; and, all things considered, we are right now just about at the point where we were then. That little crystal set was quite a distance from the wall but nearer to the leadin than any of our sets have been since then and I am sure that must have something to do with it. The walls, I feel certain, have a deterring effect on radio signals, and if my husband woudln't have his tube sets and their accompanying heavy batteries so near the wall, and those important wires so carefully connected that if I tried to dabble with them I'd blow out another row of eight tubes, I would move the tubular nuisance and replace my crystal set. But, as I said, I have no crystal set, and my husband makes no move to supply me with one again. I am sure that the set I had must be around the house somewhere, although Feodor says that I ought to remember that he put in the variometer to tune the plate of Aunt Becky's 3-tube set that she complains he specially designed to consume so much B battery current because she was not over-enthusiastic about him when he was courting me. Aunt Becky has changed greatly, and really likes Feodor, after a fashion, especially during the past thirteen months. My baby, Nealovitch, is just thirteen months old, by coincidence.

MRS. SONIA ROFPATKIN, who pleads for the simple little crystal set, is shown with her only child, Nealovitch.

Longing is General

Many a wife, mother or grown daughter is longing to have her little crystal set back. Meanwhile the radio expert about the house is experimenting fiercely with tuned radio-frequency amplification. Super-Heterodynes, Diamonds of the Air, Sky and Sea, and trying to hear signals from Mars, while the sensible folk, who expect little and get less, wish that they had their little crystal sets back again. It may be true there are more stations on the air now than then, but, after all, maybe that impression gains favor because, since then, the newspapers have taken up the habit of printing programs. Maybe there aren't any more, or at least are only a few more stations, but the experts are being misled by the newspapers. There is nothing intentionally misleading about it. But I do know that none of these experts ever sat down to and a half years ago and counted the number of stations on the air, no more than they actually count them now. It is true there are lists of stations, as of February, 1922, and that by comparison with the lists of today, as published by the Department of Commerce, there seem to be quite a few more today than there were then.

Nothing Daunted

Anyway, even if crystal sets are not selective enough for present-day needs, they certainly must give just as pure, sweet music now as then, and everybody enjoys naturalness of voice and clarity of orchestral rendition.

Some day I'm going to try to build myself a crystal set.

RADIO WORLD'S POPULARITY CONTEST

To Determine the Gold Medal Radio Entertainer for 1925

Popularity Editor, RADIO WORLD, 1493 Broadway, N. Y. C.

I hereby cast one ballot for:

(Name of Entertainer).....

(Entertainer's Station).....

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

(Street and Number).....

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

MR. DX HOUND

A Character Created by RADIO WORLD *Artist*

By HAL SINCLAIR

Literature Wanted

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

Trade Service Editor,
RADIO WORLD,
1493 Broadway, New York City.

I desire to receive radio literature.

Name .....

City or town .....

State .....

Are you a dealer? .....

If not who is your dealer?

His Name .....

His Address .....

J. A. Triche, 3218 Magazine Ave., New Orleans, La.
E. N. Rothschild, Hamilton Garage Station, Box 21, N. Y. City.
Oman Radio Service, 156 Concord St., St. Paul, Minn. Dealer).
M. V. Gatter, 4811 Shattuck Ave., Oakland, Cal.
Ernest R. Britton, 1317 W. 3rd St., Anderson, Ind.
R. H. Norman, Fulton, Ky.
Steve Prospect, 139 3rd Ave., N. Y. City.
Ira Sines, 82 La Salle St., N. Y. City. (Dealer).
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Rates: 50c a line; Minimum, $1.00

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MUSIC BUSINESS, PIANOS, PHONOGRAPHS, radio; doing $15,000 year; retiring; will sacrifice at $2,000; low rent; long lease, New York City. Box AA, Radio World.

PATENTS PROCURED FOR MECHANICAL, electrical, chemical inventions; recording blank and book free. W. T. Criswell, Attorney. Woolworth Building, New York City.

BLUE PRINTING BUSINESS IN BEST LOCAtion in New York City, with long list of permanent customers and fine record of profits over several years, for sale account ill health of owner; sales so far this year exceed any previous year and may reach $40,000. The Engineering Business Exchange, 30 Church St., New York City.

THE ADVERTISER, A WELL KNOWN RADIO manufacturer—desirous of obtaining either an individual or advertising sales organization to invest $20,000 to $25,000 for a campaign to market our products on a larger scale; are an old established concern; do not need capital for our business but only for above purpose; there is practically no competition on products we manufacture; own our plant and building. Box BB, Radio Wld.

THE RADIO TRADE

SUPERTRON EXPANDS

The Supertron Mfg. Co. are moving into their new plant at 222-228 Washington Street, Hoboken, N. J. The entire plant and offices will occupy 20,000 square feet. New and additional machinery in these quarters will give Supertron an output of 10,000 tubes daily. The Supertron Mfg. Co. are looking ahead and preparing to meet the season's demand. Their established distributors and nine branch offices have already placed requisitions to warrant this expansion. Supertron is not only building a national demand, but also promise a startling improvement that will be a revelation to the vacuum tube art.

NEW INCORPORATIONS

Radio Testing Laboratories, Upper Montclair, N. J., supplies. $100,000; Charles Landenman, Brooklyn, N. Y.; James V. Kilpos, Alonzo L. Tyler, New York. (Attys., Spitz & Bromberger, N. Y. C.)

Strait Line Radio Corp., N. Y. C., $5,000; H. F. Berman, J. E. Berger. (Atty., W. S. Archibald, 250 Park Ave., N. Y. C.)

Triodine Radio Corp., N. Y. C., $20,000; J. H. Sternberger, J. Lalus, S. Feinstein. (Atty., H. I. Falk, 150 Broadway, N. Y. C.)

Qualitone Products Corp., N. Y. C., radio, $35,000; P. N. Anstey, R. S. Taber. (Atty. G. P. Beckenridge, 41 Park Row, N. Y. C.)

Oracle Mfg. Co., N. Y. C., radio, 1000 shares, $100 each; 1000 common, no par; I. Ward, E. Schulter, E. Vanraalte. (Attys. Olvay, Eisner & Donnelly, 292 Madison Ave., N. Y. C.)

W. G. C. P. Radio, N. Y. C. $100,000, H. O. Bolton, G. C. Crolious, M. L. Suhleder. (Attys., Caldwell & Pothemus, 50 Church St., N. Y. C.)

Radio Pastime Corporation, Dover, Delaware, $500,000. (United States Corporation Company, Delaware).

Community Radio & Battery Shops, N. Y. C., 5,000 shares, $10 each; 5,000 common $1 each, active capital, $55,000; V. R. & L. F. Jones, E. F. Rigney. (Atty., B. E. Kopleman, 280 Broadway, N. Y. C.)

CAPITAL INCREASES

Dalrymple-Whitney Radio Corp., N. Y. C., 500 to 2,000 shares, $50 each; 100 common, no par, same as heretofore.

Ware Radio Corp., N. Y. C., 75,000 shares to 200,000 common, no par; 5,000 shares $100 each same as heretofore.

LISTEN IN every Friday at 7 P. M. and hear Herman Bernard, managing editor of RADIO WORLD, discuss "Your Radio Problem," from WGBS, Gimbel Bros., New York City, 315.6 meters.

TESTS TO BE FEATURES AT CHICAGO RADIO EVENT

Plans for a nation wide set-building contest open to all amateur radio fans, and a window-dressing contest open to Chicago radio dealers to be held in connection with the Allied Radio Congress and National Radio Exposition, Combined scheduled for the week of Sept. 28 in the American Exposition Palace in Chicago have been formulated. McMurdo Silver, president of Silver-Marshall, Inc., is chairman of the set building contest, and R. H. Hopkins, radio advertising specialist, heads the committee for the window-dressing contest.

Coming Events

AUG. 22 to 23—3d Annual Pacific Radio Exposition, Civic Auditorium, San Francisco. Write P. R. E., 905 Mission tS., San Francisco.

SEPT. 5 to 12—Third annual National Radio Exposition, Ambassador Auditorium, Los Angeles, Cal. Address Waldo K. Tupper.

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

SEPT. 9 to 20—International Wireless Exposition, Geneva, Switzerland.

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

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

SEPT. 14 to 19—Radio Show, Winnipeg, Can., Canadian Expos. Co.

SEPT. 21 to 29—International Radio Exposition, Steel Pier, Atlantic City, N. J.

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

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.

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

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 Thos. 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.

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

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

NOV. 19 to 25—Milwankee 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.

New Shanghai Station Has Its Bedtime Jazz

WASHINGTON.

If North American fans become tired of the entertainment provided by stations in the United States and Canada they might attempt to pick up the China Press-Kellog Station at Shanghai, China, operated by an American concern. Here is a typical program:

MONDAY, JULY 20

9:45 to 10:15 AM, Shun Pac Studio (in Chinese); market, stock reports; exchange quotations; music; news. 1 to 1:30 PM, Victor records; talks on radio; 6 to 6:30, news, phonograph records; 8:30 to 9, Shun Pao Studio (in Chinese); speeches by prominent Chinese; news, music. 9 to 11, Hotel Plaza Jazz Orchestra; Melsa & Cave.

The call letters of the new station are not disclosed. The wavelength is 356 meters.

Efficient Static Reducer

Many claims are made for devices produced to combat the static evil, but one of the most efficient ever tested at these laboratories is being placed on the market by the H. & F. Radio Laboratories, 168 Washington Street, New York City. This device is a simple article, easy to install, and being a small, separate instrument does not have to be placed in the set. It is attached in the aerial circuit, in series, and grounded. Five binding posts allow two possible combinations, thus taking care of differing amounts of interference. Tested, it gave very satisfactory results, really cutting down severe static about 50 per cent. and also proved to give sharper tuning on the set attached, preventing re-radiation on a three-circuit tuner and clarifying the tone. Patents pending. The reducer is inexpensive, being sold for a dollar, and this concern guarantees satisfaction or money refunded.

What Is a Radio Set?

A radio set is a device for receiving radio waves, with means for excluding those waves not desired, and straining those waves so as to reproduce the original sounds sent forth from the studio.

At the broadcasting station is a microphone, which device has a diaphragm. Speech or music simply consists of vibrations of the air. These are picked up by the sympathetic diaphragm and electrical current supplied by a battery is made to conform to these vibrations.

AUTHORIZED DEALER PLAN GAINS GROUND

The Samson Electric Co., (C. J. Brown, 52 Vanderbilt avenue, New York City), are following the authorized dealer plan of distribution. Although it is said the Samson transformer has never been known to burn out, authorized Samson dealers will be allowed to replace immediately any parts that may prove defective. The Samson straight-line frequency condenser and the Samson kit using these condensers will shortly be available.

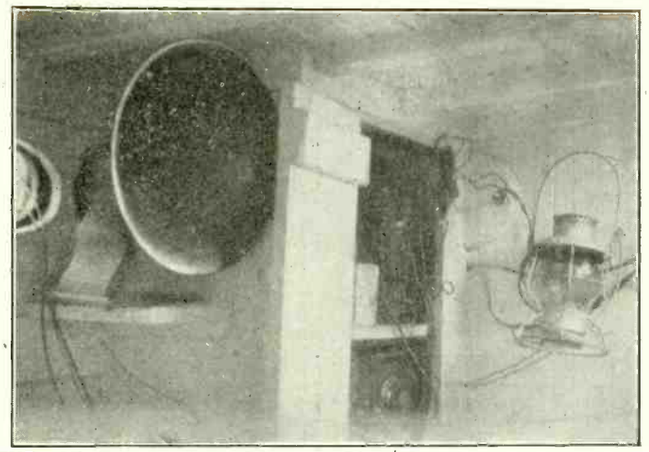
THE BABY PORTABLE, by Herbert E. Hayden. A 1-tube DX set on a 7½x5½" panel. Send 30c for May 16 and 23 issues to RADIO WORLD, 1493 Broadway, New York City.

The Dynamic RF Amplifier

A Powerful 3-Tube Set Described by P. E. Edelman in Next Week's RADIO WORLD Dated July 25

LISTEN IN every Friday at 7 P. M. and hear Herman Bernard, managing editor of RADIO WORLD, discuss "Your Radio Problem," from WGBS, Gimbel Bros., New York City, 315.6 meters.

Claims Made for Diamond Called Entirely Too Modest



THE porthole, the speaker and the open closet in which the set and batteries are contained.

(*Concluded from page 7*)

indeed, although this is nothing remarkable to those who have constructed this exceptional receiver. The fact that the circuit is loop operable, and also that it brings in stations where a 1-tube regenerator fails, confirms the advisability of having a stage of tuned RF ahead of a regenerative detector. In making the comparison, of course the Diamond is to be rated as a 2-tube set. The two audio tubes simply enable speaker operation. A station that can not be heard on earphones at the detector output can never operate a speaker in any set.

The tests also convince me that the Diamond is a better circuit than the Superdyne, largely due to the location of the regenerative feature in the detector stage, where it belongs, rather in the RF stage where it overloads that tube. Others familiar with both circuits agree with me fully, but those who have built the Superdyne and not the Diamond are hard to convince. The Diamond produces at least as much volume, is a little more selective, has a greatly reduced tendency to distort (proven by milliameter tests) and is a little easier to tune.

* * *

DX ON SPEAKER EASY, SURPRISED FAN FINDS

DIAMOND EDITOR:

I HAVE built the Diamond of the Air as described by Herman Bernard in RADIO WORLD, and it sure is a wonderful home-made coils and the tubing is not set. I am using home-made coils and the tubing is not really low-loss. With a poor aerial what do you suppose I receive? Here they are, and all on a loudspeaker with a lot of volume—WLW, KDKA, WGY, WTAS, WTAM, WEAR, WEAF. While building it, I thought I'r be lucky if I received any distant stations on my phones.

The local stations WWJ and MCX come in with too much volume. I turn down my rheostats, reduce the tickler and even have the secondary of the tuner out of tune to cut down the volume. I know I'll get marvelous results when I rebuild my set with the recommended parts. It sure is a great circuit. I will never miss a copy of RADIO WORLD. It sure prints a lot of helpful material. Will you please send me a name plate.

HAROLD S. ROCHOWIAK,
8714 W. Jefferson Ave.,
Detroit, Mich.

* * *

SCOFFS AT MERE 300 MILES; EXPECTS 2,400 ON SPEAKER

DIAMOND EDITOR:

I constructed the 3-Control Diamond of the Air, as described by Herman Bernard, and I expected about 150 to 200 miles reception. I got WCAP, WEAR and WGY on the speaker with plenty of volume for my 4-room house and with excellent quality.

For two more days from my log of both loop and aerial I could duplicate these stations, but last night I gave the Diamond her first real test and this with the static preceding a rain and thunder storm. Here is my list for 2:30 P. M. reception and on loud speaker and won-

FILL OUT AND MAIL NOW

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD 1493 *Broadway, New York Ctty*

Please send me RADIO WORLD for.....months, for which please find enclosed $.....

SUBSCRIPTION RATES:
Single Copy.....$ .15
Three Months..... 1.50
Six Months..... 3.00
One Year, 52 Issues..... 6.00
Add $1.00 a Year for Foreign Postage; 50c for Canadian Postage.

derfully clear with the incoming static considered: WEAR, WCCO, WOC, WGY, WEBH, WFAA, WQJ, WPG, WLW, WCX and WEAF. The dials were full of stations to be cleared up when I quit as I had listened a good while to each.

I thank Mr. Bernard for a wonderful circuit, but tell him to multiply his 300 miles by four, yes five. In winter I am expecting to multiply that 300 by at least eight.

ROBERT B. BARNES,
U. S. Motor Vehicle Service,
Magee and Bluff Streets,
Pittsburgh, Pa.

* * *

DIAMOND EDITOR:

I have built the Diamond of the Air. Herman Bernard certainly underrated its DX, volume and clarity qualities. I am using four UV199 tubes and my set receives as far and as loud as the Freed-Eisemann 5-tube Neutrodyne across the street and that uses 5-volt tubes. Thanking your fine magazine for its past radio favors.

JOE HEARD, JR.,
Winnfield, La.

FREE

A BEAUTIFUL colored nameplate to put on the panel of the Diamond of the Air will be furnished free to all. Send in your request now, if you haven't done so before.

RADIO WORLD'S
DIAMOND
OF THE AIR
"A Gem, A Jewel and A Joy"
1925 SPRING MODEL

A. O. Johnson, 456 53rd St., Brooklyn, N. Y.
Robert Schloss, 5127 Hunter Ave., Norwood, O.
G. Price, 436 9th Ave., N. Y. City.
John Urban, 4320 72nd St., Winfield, Queens County, N. Y.
R. A. Loftus, 4400 Superior Ave., Cleveland, O.
Oscar A. Lux, Lexington, Neb.
Joseph Noth, 973 Columbus Ave., N. Y. City.
N. Martan, Fort Crocket, Texas.
A. H. Ostrander, 16 Akien Ave., Rensselaer, N. Y.
I. Goldstein, 333 Grant Ave., San Francisco, Cal.
E. V. Norat, 50 West 112th St., New York City.
H. S. Rochourak, 8714 N. Jefferson Ave., Detroit, Mich.
C. H. Ferguson, 616 Maple Ave., Newark, O.
Arthur Wieland, 729 Jackson Ave., Elizabeth, N. J.
Joseph Ries, Elgin, Neb.
Orin Robinson, Marshall, Wash.
A. W. Lyle, San Diego, La Mesa, Cal.
R. G. Williams, 533 Melrose St., Chicago, Ill.
Casper M. Winter, 115 Steward Ave., Garden City, L. I.
Gilbert Jones, Elkland, Mo.
William Forster, 138 Smith St., Elizabeth, N. J.
Roy J. Smith, 925 8th Ave., St. Cloud, Minn.
R. F. Scheibeck, 244 Locust St., Chillicothe, O.
E. L. Hakes, 132 Fulton St., Union City, N. J.
James A. Merklein, 3226 Fulton St., Brooklyn, N. Y.
Jospeh C. Meisel, 2115 Christian St., Baltimore, Md.
C. V. Slack, 747 17th St., Niagara Falls, N. Y.

The Illusion of Static Elimination

(*Concluded from page* 12)

sizes of small fixed condensers must soon disclose the proper value for a given loud speaker. Such a condenser arrangement tends to eliminate a part of the fuzziness of static, interference and helps, particularly in listening to certain kinds of music.

The Question of Antennas

With just a little care in the operation of the receiver, as already outlined, good results should be obtained with the usual installation. It is hardly necessary to go to the trouble of installing a shorter antenna for summer-time operation, although if the radio listener is of an experimental turn of mind, he will obtain interesting results by trying out various kinds of antennas. After all, the only result of a short antenna or an indoor antenna is that the amount of energy intercepted is noticeably less than with a full-sized antenna. Hence the static level falls and with it falls the signal level. In the event that the static level is below the signal level to begin with, this matter of dropping the initial values to lower levels must perforce bring the low static down below the threshhold of audibility. At best it is an illusion, though to some it is highly pleasing. With powerful nearby signals a smaller antenna will provide ample loud-speaker volume with a clean background, but the same result can be obtained by reducing the amplification as previously mentioned.

Loop for Year Round

The loop receiver is, of course, an all-year-round outfit, requiring no change of any kind no matter what conditions may be. Remarkably flexible in operation and greatly encouraging the use of radio outdoors, the loop receiver has added summer-time enjoyments to the joys which radio has given to the radio listener. Years ago, most automobile owners put up their cars during the winter. Now this practice is the exception rather than the rule and, likewise, radio listeners are finding year-round operation possible and enjoyable.

Passengers Use Wireless Phone From One Liner to Another

A 2-way wireless telephone system was worked successfully from the liner Columbus, Bremen to New York. Passengers spoke to shore and other ships. The new system makes wireless telephone conversation possible by overcoming the interference between the receiving and sending antennae, which heretofore has prevented the simultaneous operation of the receiving and sending apparatus.

Mrs. Morris Sampter, 322 West Seventy-sixth Street, New York City, was one of the first to use the new wireless telephone when she talked from the Columbus to her sister, Mrs. Emil Berolzheimer, aboard the Deutschland. The two ships were more than 150 miles apart when the sisters held wireless conversation.

The toll charge for eight minutes' conversation, paid by Mrs. Sampter, was $2.50.

Mr. Gerstung said he had used the new invention to talk to other ships at sea. The other ships were equipped with the same device used by the Columbus. The results in most cases were very satisfactory, he said. The new system is controlled by the Telefunken Company of Germany.

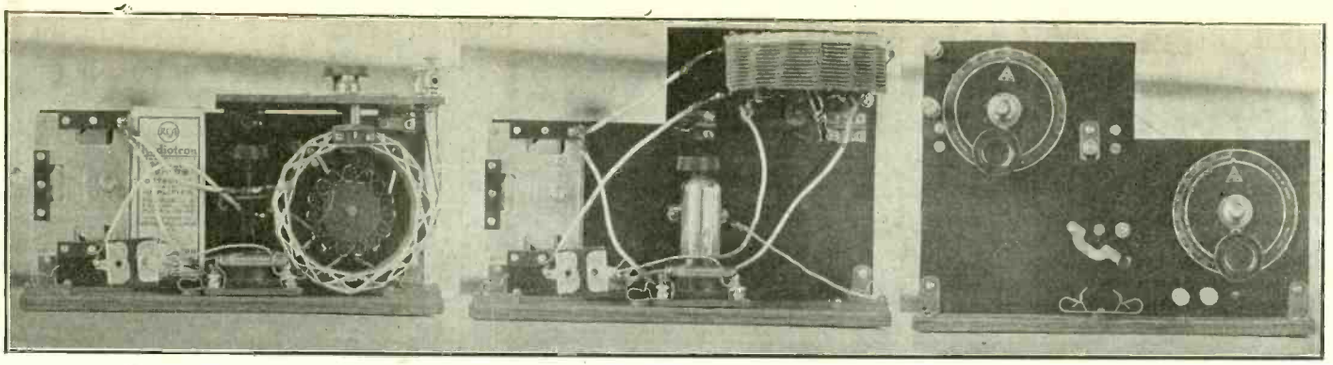
The apparatus is a duplex receiving and sending set. It operates on a wavelength of 1,800 or 1,450 meters. Experiments with the device have been under way for more than two years.

McMILLAN HAS VOCAL GOAL

Efforts will be made by the Donald B. McMillan Arctic expedition to broadcast back to civilization the voices of Eskimos singing in their native language, according to C. H. Thordarson, of Chicago, who built the broadcasting transformer equipment, the transmitting transformers and the receiving set transformers carried by the "Peary" and the "Bowdoin."

Mr. Thordarson sailed with Mr. McMillan from New York aboard the "Peary."

LISTEN IN every Friday at 7 P. M. and hear Herman Bernard, managing editor of RADIO WORLD, discuss "Your Radio Problem," from WGBS, Gimbel Bros., New York City, 315.6 meters.



PORTABLE SET built by Harold T. Brown, 2nd, who specially lauds articles by Capt. Peter V. O'Rourke.

O'ROURKE LAUDED AS MOST LUCID

RADIO GALLERY EDITOR:

I herewith enclose three photographs of a Baby Portable, recently constructed by myself, which might be of interest to some of your readers. The set folds for transportation into a space 4x10x6". Due perhaps to the wide spacing of the instruments when opened for use, it is a remarkable performer, both for distance and quality of tone. The hookup is a standard one, and was published in your issue of April 11, 1925 in "A Survey of 1-Tube DX Sets," by Capt. Peter V. O'Rourke. Capt. O'Rourke's articles, by the way, are extraordinarily lucid and valuable.

HAROLD T. BROWN, 2nd.,
2851 Bedford Ave.,
Pittsburgh, Pa.

Batteries Will Stay Says President Ogden

By Clarence E. Ogden

President, Kodel Radio Corp.

The hysteria caused by light-headed inventors who claim everything for A and B eliminators, new tubes, new aerials and new receivers has caused an actual financial loss to retailers, jobbers and manufacturers. There will be no radical change in radio this year or next year and when a change does come it will not be revolutionary in nature, but what all of us expect, which will possibly be a general improvement in everything, rather than the elimination of batteries or tubes.

The use of batteries for the most efficient reception from a radio receiver probably will always be paramount—especially among people who want true tone, with volume and without distortion or a hum of any kind.

Today there are more cellar and back attic inventors getting an inspiration and rushing into print with it, only to have their idea utterly collapse upon trial, than at any other time in history.

Like the World War, radio is filled with rumors which, if taken seriously, are sufficient to scare the life out of the small radio dealer without vision. Only by expanding and going ahead with a full knowledge that the merchandise they sell is manufactured by a reputable company, financially sound and aggressive, will the radio dealer progress to the point where he is recognized as is the musical or electrical dealer today.

RECENT BACK NUMBERS

of RADIO WORLD, 15 cents each, or any seven for $1. Address Circulation Manager, RADIO WORLD, 1493 Broadway, New York City.

THE OFFICIAL LIST OF STATIONS in the United States, Canada, Cuba, etc., with list of station slogans, was published in June 6 issue. Send 15c for copy to RADIO WORLD, 1493 Broadway, New York City.

THE DIAMOND OF THE AIR AS A 2-CONTROL SET, by Herman Bernard. This is the circuit that is sweeping the country. Four tubes; loop or aerial. Send 30c for May 23 and 30 issues of RADIO WORLD, 1493 Broadway, New York City.

THE SHORT WAVE RECEIVER REINARTZ WILL USE IN ARCTIC. Full wiring directions. Send 15c for May 16 issue, RADIO WORLD, 1493 Broadway, New York City.

A $5 HOME-MADE LOUDSPEAKER, by Herbert E. Hayden, in Feb. 7 issue. Send 15c for copy, RADIO WORLD, 1493 Broadway,

THE BABY PORTABLE, by Herbert E. Hayden. A 1-tube DX set on a 7½x5½" panel. Send 30c for May 16 and 23 issues to RADIO WORLD, 1493 Broadway, New York City.

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Completing the Transmitter

(*Continued from page* 10)

difficult at all if all the data are read carefully and followed.

Hints on Successful Operation

There are many things to be done in the transmitter that will improve the distance transmission in so far as pure CW is concerned, and quality when you are using phones.

First, adjust the inductance and capacity to the specific wavelength to which you are assigned, which is done with the aid of a wavemeter, which was described in the June 6 issue. Do not put too much voltage on the plates of the tubes, that is, not enough to make the plates overheat. Now get your circuit oscillating. This might be difficult to accomplish at first, and may be readily remedied by reversing the leads of the tickler or grid coil. As soon as the milliameter needle starts to wiggle, you can be sure that the circuit is oscillating. The tuning of this set is accomplished by the variable condensers and the tap on the antenna inductance, although the latter is used only when you are calibrating your receiver, and then usually left alone. You probably will have to vary the coupling of the grid and the plate coils and the taps, so as to obtain maximum antenna output.

The hot wire ammeter has many functions in the radio transmitter. It indicates when the highest amount of current has been put in the antenna. When you have adjusted the frequency of the secondary circuit by a wavemeter to a certain wavelength, resonance may be obtained in the antenna circuit by placing an ammeter in antenna, and coupling the oscillation transformer until the needle offers a sharp deflection, at which point resonance is indicated. It also gives the amateur radio operator a gauging ability, that is, he can see how much current is required to send certain distances (the farther away, naturally, the more current needed) and thereby adjust his set to transmit only enough energy to cover a certain distance. Of course, this is a rough unmathematical method. There are many physical obstacles, but it is of a practical use. Amateurs, please note that you cannot tell how far you are sending by simply reading your meter because your wave might be distorted, distracted or absorbed, just the night you are thinking you have sent a great distance, because your antenna meter probably reads 4 or 5 amperes.

There is only one person who can tell what the output of your set is and that is the one who is conducting field tests with a calibrated receiver.

Herewith are some facts, showing the approximate range that the transmitter will send, using good standard receiving equipment. The Diamond of the Air is a good set with which to hold these tests.

With a 5-watt tube the current output is usually about ¾ of an ampere and the range is 350 miles under normal conditions. With 10 watts the antenna current is 2/3 of an ampere and the range is 500 miles. With a 50-watt tube, the antenna current is 1.6 amperes and the mileage covered is 1,300. With a 100-watt output the antenna current is 2.2 amperes, and the mileage is 2,000 miles. With the 250-watt tube, about 3.4 amperes are used for a 3,500-mile range. With a 500-watt set, the antenna current is 5.8 amperes and the mileagecov ered is 5,000. All the above data are given on the basis of a 16-ohm resistance in the antenna and an oscillator efficiency of 62 per cent. (with an L type of antenna). When you use a high amount of power for the modulation tube, such as the 250-watter, the grid voltage has very little to do with the successful operation of the set. We therefore put a 2-megohm resistance across the secondary

LIST OF PARTS

(Names after parts are for those who desire to purchase the parts.)

One power transformer (Acme).
One microphone (Kellogg).
One modulation transformer (either Acme or General Electric).
Two tubes, size to be determined by the builder (according to output desired).
One oscillation transformer (Acme).
One key.
Two sockets to fit the tubes (porcelain bases).
Jars for the chemical rectifier.
One 50-henry choke coil.
One 6-henry choke coil.
Six or seven 1 mfd. fixed condensers.
Two variable condensers, .0005 mfd. (high voltage).
One .002 mfd. fixed condenser.
One milliameter, size determined by tubes employed. See text.
One voltmeter, size determined by tubes employed. See text.
One ammeter, size determined by type of tubes used. See text.
One large DPDT switch.
One push-pull switch.
One terminal strip.
Accessories: wire for winding of the coils as stated in the text; also antenna wire, ground wire, insulators, a receiver, posts for the antenna, connecting wire.

of the modulation transformer. The prevention of the tube remaining at a positive potential is accomplished by the above method.

This set will tune from 200 to 300 meters, and for those who desire to get a special license to use lower wavelengths the following data are stated:

Meters	Turns antenna coil	Turns on grid coil	
100-200	15	18	(5-watt)
100-200	15	16	(10-watt)
100-200	15	12	(50-watt)
100-200	15	10	(100-watt)
100-200	15	3	(250-watt)

The plate coil is reduced to 15 turns and left in the same manner for all powers.

There may be a bit of confusion as to just what the extra taps are on the diagram for the filament winding of the power transformer. The high voltage taps are provided to supply the voltage drop, when using the chemical rectifier, and the low voltage taps are to be employed when using rectifier tubes. It was stated previously, that the plates in the chemical rectifier have to be formed, before they could be used. When doing this, be sure to use a heavy resistance in series with the primary, which may be varied until the complete voltage is at hand. If you don't do this the fuses will blow and also your transformer will be damaged permanently.

(Note that the coil marked X, in the diagram, June 27 issue, is the Heising choke coil. The data on how to wind this coil was corrected in the July 4 issue, but may have escaped some readers. These data are for the radio-frequency choke and may be placed in the plate leads to prevent inter-tube oscillatory action.

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RESULTS

BOTH DX AND VOLUME ON ROFPATKIN'S REFLEX

RESULTS EDITOR:

Being a dyed-in-the-wool experimenter I have whiled away many pleasant hours testing out your hookups and other experimental writeups and have at this writing a very high regard for your staff of writers and perhaps even more regard for your editorial staff in getting the stuff in print. The slam of the "gentleman from Columbus" as published in issue of June 20 is indeed amusing. Mr. Rofpatkin took more than the usual amount of effort to guide such "lambs" into the fold of "Radio-Bug-Land" and while I am sure that he succeeded in getting the "Ninety and nine" safely tucked away, it remained for that "Columbus Boy" to fulfill the old prophecy of "there is always one who goes astray."

I built the "1-tube reflex" for a friend of mine and having none of the much touted "infinitesimal, minute, low loss" parts on hand I rifled the old junk box and scraped together enough material to complete the hookup in less than two hours, which period of time included the winding of the coils on mere mush boxes.

And now about results. Here is a copy of my log book on this set for the eight days it was hooked to my sky line:

California, KNX, KFON, KFI, KFSG, KHJ, KJS, KRE, KGO, KLX, KPO, KFRC; Oregon, KGW; Washington, KFAE, KFHR, KFOA, KJR; Idaho, KFAU; Canada, CFCN; Utah, KFPT; Colorado, KOA; Nebraska, KFKX.

All of these stations were received with the set carrying two pairs of head phones. On KFI and KGO (2,000 watts) both stations about 200 miles away, the volume was such that the head phones could be heard in any part of the room.

Verily I say unto you, it is a "sin and a shame" to make a poor little reflexed WD12 do all that labor.

Yours truly,

C. C. LARY,
Visalia, Cal.

* * *

"STRONG ROAST" UNJUST; PRAISE FROM PACIFIC

RESULTS EDITOR:

In your issue of June 20 I noticed a strong roast for the RADIO WORLD. In refutation of Mr. E. S. Hancock's claims of failure with your hookups, I will say that I did NOT have the same results. I take about all the radio magazines and class RADIO WORLD among the best. Capt. O'Rourke's hookups give great results. Also Bernard's are fine. I consider J. E. Anderson's contributions of great value to the experimenter. I have just finished Anderson's Twinplex.

FRANK A. LANZER,
Port Townsend, Wash.

* * *

TUNER THAT YOU LOG IS CALLED REAL GOOD

RESULTS EDITOR:

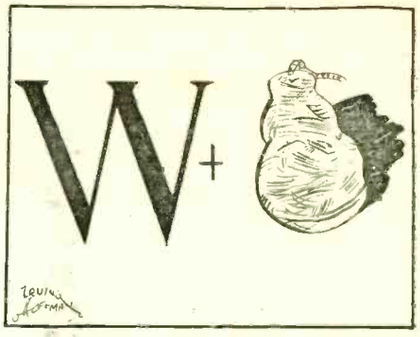
Being a dealer in radio sets and accessories I recently came into possession of a set that I converted into a 3-circuit tuner that you can log. I have constructed many sets according to your hookups and find this is a real good one. Volume is good and tone quality excellent. The range compares favorably with that of 4- and 5-tube sets.

SAMUEL O. WRIGHT,
Radio Engineer, Milford, Ill.

[See June 20 issue, "Experiments With Bernard's 3-Circuit Tuner You Log," by Capt. Peter V. O'Rourke.—Ed.]

[Those who construct any circuit or unit from data in RADIO WORLD are requested to write to Results Editor, RADIO WORLD, 1493 Broadway, New York City, and state how they fared. When possible give the trade names of the parts you use, or the manufacturers' names. Results letters will be published, including trouble-shooting letters. Readers may include questions in the same letter. The questions will be answered in the Radio University Department.]

The Weekly Rebus



RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS.

10 CENTS A WORD. 10 WORDS MINIMUM

MAKE MONEY! RADIO BUSINESS. Write Konkle, 192 Market St., Newark, N. J.

FULL LIST OF STATIONS appeared in RADIO WORLD dated JUNE 6. Sent postpaid on receipt of 15c, or start your subscription with that number. RADIO WORLD, 1493 Broadway, N. Y. C.

THE SHORT WAVE RECEIVER REINARTZ WILL USE IN ARCTIC. Full wiring directions. Send 15c for May 16 issue, RADIO WORLD, 1493 Broadway, New York City.

HOW TO BECOME AN AMATEUR OPERATOR—A comprehensive, illustrated article appeared in issue of June 27, 1925. 15c per copy, or start your subscription with this number. RADIO WORLD, 1493 Broadway, N. Y. C.

2650 MILES DISTANCE with one tube. We send complete understandable instructions with panel layout, picture diagrams, etc., for 25c. Or BIG BOOKLET FREE. VESCO RADIO CO., Box 117-RW, Oakland, California.

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.

2650 MILES DISTANCE WITH one tube. We send power amplifier, circuit with instructions, $1.00. W. G. Conger, Independence, Missouri.

AGENTS—WRITE FOR FREE SAMPLES. Sell Madison "Better-Made" Shirts for large Manufacturer direct to wearer. No capital or experience required. Many earn $100 weekly and bonus. Madison Mfrs., 501 Broadway, New York.

PATENTS—Write for free Guide Books and "Record of Invention Blank" before disclosing inventions. Send model or sketch of your invention for our Inspection and Instructions Free. Terms reasonable. Radio, Chemical, Mechanical, Electrical and Trademark experts. Victor J. Evans & Co., 924 Ninth, Washington, D. C.

SALESMAN CALLING ON RADIO DEALERS WANTED to handle Radio Tubes as a side line. Thoria Tube Company, Dept. W, Middletown, Ohio.

Recent Patents

RADIO PLAYING CARD (No. 1,539,726), invented by Gustav A. Stiffel, Jr., of Cincinnati, Ohio. This invention relates to a game of cards, in which static, squealing receivers, sending stations, and other radio factors play a part.

"HOW TO MAKE—"

The following illustrated constructional articles have appeared in recent issues of RADIO WORLD:

Sept. 6, 1924—A simplified Neutrodyne with Grid-Biased Detector, by J. E. Anderson. A Low-Loss Wave Trap, by Brewster Lee.
Nov. 15—A Sturdy Low-Loss Coil, by Lieut. P. V. O'Rourke. An Ultra 2-Tube Receiver, by Byrt C. Caldwell.
Dec. 6—A 6-Tube Super-Heterodyne Using a Variometer, by J. E. Anderson. A $1 Coil Winder, by Herbert E. Hayden.
Dec. 13—The World's Simplest Tube Set, by Lieut. P. V. O'Rourke.
Dec. 20—A 1-Tube DX Wonder, Rich in Tone, by Herman Bernard. An Interchangeable Detector, by Chas. M. White.
Dec. 27—A 2-Tube Variometer Set, by Lieut. P. V. O'Rourke
Jan. 3, 1925—A 3-Tube Portable That Needs No Outdoor Aerial, by Abner J. Gelula.
Jan. 10—A Low-Loss DX Inductance, by Herbert E. Hayden.
Jan. 17—A $25 1-Tube DX Wonder, by Abner J. Gelula.
Jan. 24—A Selective $15 Crystal Set, by Brewster Lee. A Variometer-Tuned Reflex, by Abner J. Gelula. An $18 1-Tube DX Circuit for the Beginner, by Feodor Rofpatkin.
Jan. 31—A Transcontinental 3-Tube Set, by H. E. Wright. An Experimental Reflex, by Lieut. P. V. O'Rourke.
Feb. 7—The Bluebird Reflex, by Lieut. P. V. O'Rourke. A $5 Home-Made Loudspeaker, by Herbert E. Hayden.
Feb. 14—A Super-Sensitive Receiver, by Chas. H. M. White. A Honeycomb RFT for DX, by Herbert E. Hayden.
Feb. 21—A 1-Tube Reflex for the Novice, by Feodor Rofpatkin. A Set for Professional Folk, by Lieut. P. V. O'Rourke. A Honeycomb Crystal Receiver, by Raymond B. Wailes.
Feb. 28—A Set That Does the Most Possible, With 6 Tubes, by Thomas W. Benson. Three Resistance Stages of AF on the 3-Circuit Tuner, by Albert Edwin Sonn.
March 7—Storage B Battery, by Herbert E. Hayden. Benson's Super-Heterodyne.
March 14—The Reflexed 3-Circuit Tuner That You Can Log, by Herman Bernard.
March 21—A Variable Leak, by Herbert E. Hayden. A 4-Tube, 2-Control Set That Gets the Most DX, by Lieut. P. V. O'Rourke.
March 28—The Improved DX Dandy Set, by Herbert E. Hayden. A 2-Tube Reflex for the Novice, by Feodor Rofpatkin.
April 11—Audio Hookups for Fine Volume and Quality as Well, by Brewster Lee. The Diamond of the Air (Part 2), by Herman Bernard. 1-Tube Distance-Getting Sets, by Lieut. P. V. O'Rourke.
April 18—The Diamond of the Air (Part 3), by Herman Bernard. The 7-Tube Pressley Super-Heterodyne (Part 1), by Thomas W. Benson. An Easy D Coil, by Jack Norwood.
April 25—A 3-Tube, 2-Control DX Reflex, by Brewster Lee. Trouble Shooting Article on Diamond of the Air, by Herman Bernard. Wiring the Pressley Set (Part 2), by Thomas W. Benson.
May 2—The Twinplex, by J. E. Anderson.
May 9—A Set to Cut Static, by Feodor Rofpatkin. Toroid Circuit with Resistance AF, by H. I. Sidney. A Push-Pull AF Amplifier, by Lt. Peter V. O'Rourke.
May 16—A 3-Tube Reflexed Neutrodyne, by Percy Warren. The Baby Portable by Herbert E. Hayden. One Tube More for Quality, by Brewster Lee.
May 23—Powerful 3-Tube Reflex Receiver, by H. E. Wright. The 2-Control Diamond (Part 1), by Herman Bernard.
May 30—Wiring the 2-Control Diamond (Part 2), by Herman Bernard. 1-Control Neutrodyne, by Sidney E. Finkelstein. Making Your Set Tune the Entire Wavelength Band, by J. E. Anderson.
June 6—The Smokestack Portable, by Neal Fitzsian. A and B Battery Eliminators, Using DC (Part 1), by P. E. Edelman. A Wavemeter, by Lewis Winner.
June 13—Simple Short-Wave Circuits, by Herbert E. Hayden. A Simple Push-Pull Rheostat, by A. C. G. Force. A and B Battery Eliminators, Using AC (Part 2), by P. E. Edelman. A Portable Super-Heterodyne, by Wainwright Astor.
June 20—The Diamond as a Reflex, by Herman Bernard. A 2-Tube Portable Reflex, by Herbert E. Hayden. A Reflex for 99 Type Tubes, by L. R. Barbley.
June 27—The Pocketbook Portable, by Burton Lindheim. The Power House Set, by John L. Munson. Lesson on Learning the Code.
July 4—The Handsome Portable, by Herbert E. Hayden. The Freedom Reflex, by Capt. P. V. O'Rourke. 8-Tube Super-Heterodyne, by Abner J. Gelula.
July 11—The Baby "Super," by J. E. Anderson. A 1-Dial Portable Receiver, by Capt. P. V. O'Rourke.

Any copy 15c. Any 7 copies, $1.00. All these 33 copies for $4.00, or start subscription with any issue. Radio World, 1493 Broadway, N. Y. City.

LISTEN IN every Friday at 7 P. M. and hear Herman Bernard, managing editor of RADIO WORLD, discuss "Your Radio Problem," from WGBS, Gimbel Bros., New York City, 315.6 meters.

How to Tune and Operate the Marconi Broadcast Set

(*Concluded from page* 5)

F minus of the A battery and also to one terminal of the Amperite, the other terminal going to the F minus post of the socket. The F plus post of socket goes to the plus of the A battery. The top of plate and the end to the B plus 67½ volts. The other AFT is hooked up in the same fashion as AFT1, except that there are only two terminals to the single circuit jack. The top goes to plate of the 3rd tube while the bottom terminal goes to the B plus 67½ volts. That is all there is to the wiring of this set.

Care and Operation of the Set

If after you have hooked up the set and the signals are weak, due to insufficient oscillatory action, reverse the leads to the tickler (L4) and also the secondary (L2) leads. The potentiometer is used to control the oscillations that the tubes produce or, to prevent the tubes from spilling over and thereby spoiling the entire reception. By removing the condenser C4 the spilling over may also be stopped. In that case remove the condenser and the lead. If the audio tubes howl, insert a .001 mfd. across the secondary of the first and the last AFT. If you want to insert a C battery, so as to save the B battery current, disconnect the lead which goes from the end terminal of the Amperite to the minus A, and place the negative side of the C battery here, connecting the positive side of the same to the negative side of the A battery. The C battery prevents distortion at times. The antenna should be no longer than 75 feet, including the lead-in. In case the lead-in has to be longer compensate by making a very short ground lead. All this helps in getting louder signals, although advice on antennas and grounds are usually ignored. The ground should be made to the cold water pipe. When wiring this set, use No. 14 bare copper wire, not bus bar. For the detector use a UV200 tube, and for the amplifiers use UV201A tubes. To light the filaments of the tubes, either use four No. 6 dry cells connected in series, or a storage battery of the 6-volt, 80-ampere type. Louder signals may be had sometimes by reversing the A battery leads. Try out different tubes in the different AF sockets, as some tubes will function better in the first audio stage than in the second AF stage. The tuning is very sharp on this set and a little difficulty may be experienced when operating the same at the very beginning.

This set was tested in RADIO WORLD'S laboratory for several weeks and it brought in Chicago, Springfield, Kansas, etc., without the least difficulty, and with tremendous loudspeaker volume.

Lamps in Parallel Pass More Current from DC Source

Very few persons realize that the more lamps you place in parallel, when charging your A battery from a DC source, the more current will pass. For example, the usual 16 C.P. carbon filament lamp passes ½ ampere under an electromotive force of 110 volts, the usual house supply. If you place 10 lamps of the above style in parallel, you will find that there are 5 amperes passing through. This can easily be checked by an ammeter. In other words, the more lamps in parallel, the higher the rate of charge for the battery which is on the line. To find the correct resistance required to pass the exact amount of current to charge the battery, employ the following formula: I (charging amperes of battery) equals E (voltage of the house mains) minus e (voltage of the storage battery), over R (resistance). We, therefore, will have to transpose and find that R equals $\frac{E-e}{I}$. Let us take an example of how to employ this formula: the voltage of the mains is 110, the voltage of the storage battery is 6, and the result by substraction is 104. The number of amperes at which the manufacturer states the battery should be charged is 6. The division then takes place and we find that there should be 17.1 ohms in the line to charge the battery at the required numbers of amperes.

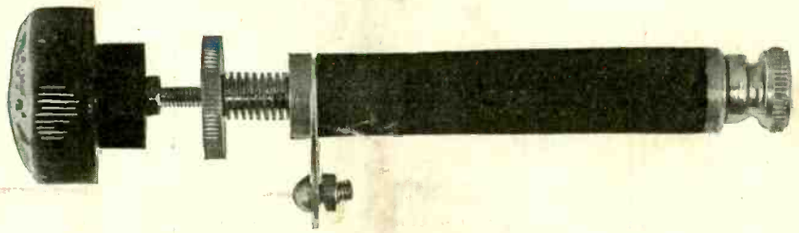
The Leak That Does The Trick!

NOW you can get it for the first time in America

Used in eighty per cent of all receiving sets in Great Britain

The "BRETWOOD"

Pulls in inaudible stations



Eliminates tube noises

Range 300,000 to 10,000,000 ohms

Variable Grid Leak

Bretwood, Ltd., London, Eng., Sole Patentees and Owners.

The Bretwood Variable Grid Leak used in a detector tube circuit, strengthens weak signals, makes DX easier, eliminates tube noises and internal howling, due to incorrect leakage from the grid of the tube.

By simply turning the knob the carrier wave may be tuned from the silent point to maximum audibility.

The Bretwood is absolutely noiseless in operation and will hold any given setting indefinitely. It is a single-hole panel mount leak.

The Bretwood Variable Grid Leak, tested in the National Physical Laboratory (the official laboratory of Great Britain) and by RADIO WORLD'S Laboratory, proved to be a scientifically accurate instrument. The total range, 9,700,000 ohms, produced by 25 turns of the knob, make a minute adjustment very simple.

The Bretwood Variable Grid Leak is constructed on a different principle and produces better results than any other grid leak. In its specially-constructed barrel is a patented plastic, non-drying resistance material, in which there is a small movable plunger which again moves freely in an absorbent cartridge which gives the setting of the instrument great stability, making it far superior to the graphite, carbon or fibre, compressed or decompressed, resistance elements. It can be used in the most critical circuits with the greatest success.

Sent You on a Money Back Absolute Satisfaction Guarantee

The Bretwood Variable Grid Leak will be immediately shipped on receipt of order to any address in the United States, prepaid for $1.50. After 10 days' trial if it is not 100% better than any grid leak you have ever had and does not in every way substantiate all claims made for it, your money will be refunded without question.

The North American Bretwood Company

Sole Distributors for United States and Canada

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Dealers and Jobbers Write for Special Trade Terms

THE NORTH AMERICAN BRETWOOD CO.
1505 Broadway, New York City
Room [illegible]

Gentlemen:

Enclosed find $1.50 for which you will please send me one Bretwood Variable Grid Leak prepaid. Satisfaction guaranteed or my money back after trial within ten days of receipt by me.

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