All-Wave Radio

25 CENTS

DECEMBER 1937

Converting Supers
For Amateur Use

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What Tools To Use

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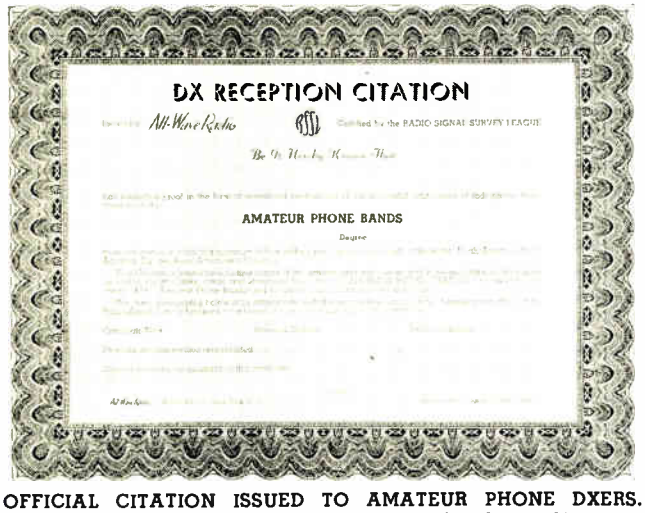

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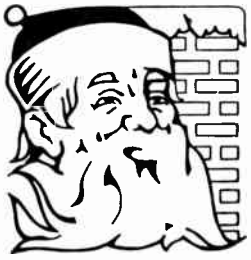

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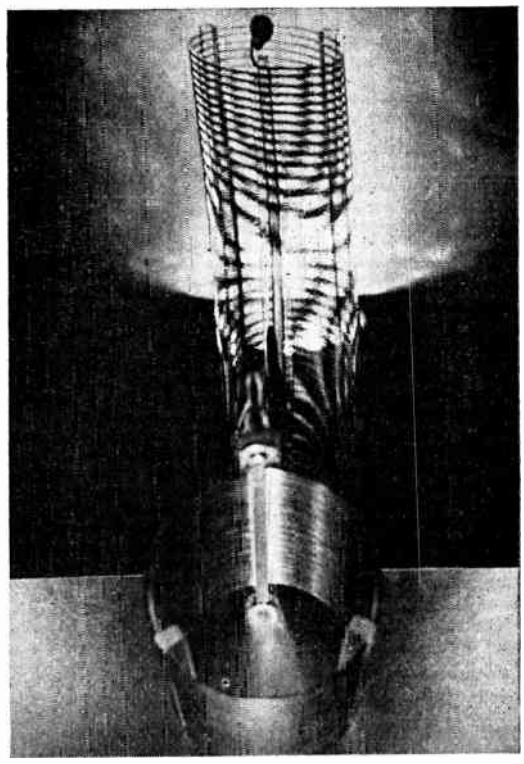
All-Wave Radio

EDITED BY M. L. MUHLEMAN

VOL. 3, NO. 12 DECEMBER, 1937

COVER ILLUSTRATION

ACTION ON THE AIR WITH ONE OF THE LATEST WESTERN ELECTRIC 22A ULTRA-HIGH-FREQUENCY POLICE RADIO TRANSMITTERS. (PHOTO COURTESY WESTERN ELECTRIC CO.)



OSCILLATION A PHOTOGRAPHIC CONCEPTION OF A COIL IN AN OSCILLATING CIRCUIT, TAKEN BY KENNETH BOHLEN. THE "SHOT" IS OF A PARTIALLY COMPLETED AMATEUR TRANSMITTER AND WAS MADE UNDER ORDINARY CONDITIONS CAN YOU FIGURE HOW THE EFFECT WAS OBTAINED?

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CONVERTING B. C. SUPERHETERODYNES

By R. M. ELLIS • W9YSA

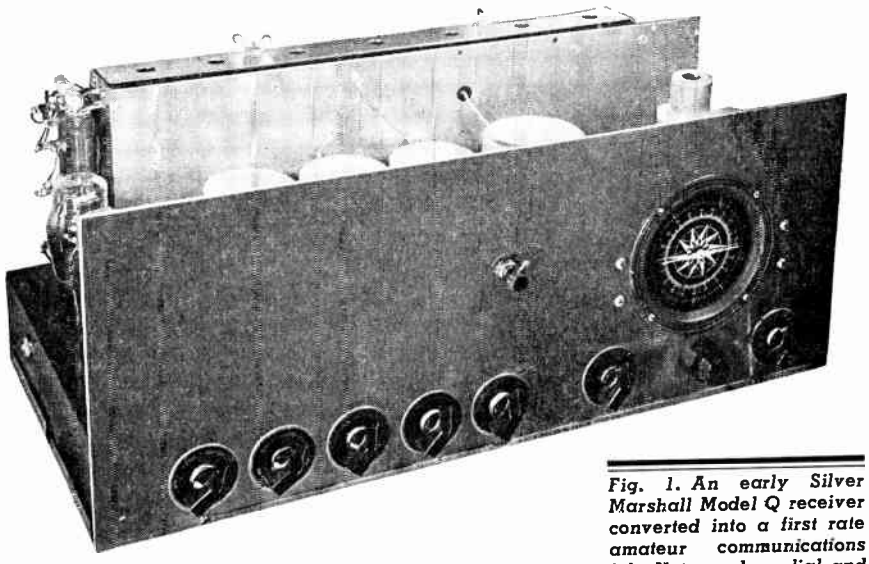


Fig. 1. An early Silver Marshall Model Q receiver converted into a first rate amateur communications job. Note modern dial and bank of controls.

OF course it is nice to build a new receiver from "scratch." It is grand to be able to select each component, then to plan the physical layout so that the best results will be secured.

But unfortunately the financial aspect of the constructor enters into the situation. Most amateurs are long on ideas and short on cash. One solution to the difficulty is to convert a broadcast superheterodyne for short-wave work. The older types of superheterodynes can be purchased for almost a song and have very acceptable components in the way of the power transformer, i.f. transformers, choke, heavy chassis, etc. Many amateurs and SWL's will have such a receiver on hand.

Consequently this article will treat the problem of converting broadcast receivers for communication work and will start with the assumption that such a receiver is available.

The Victim

Figs. 1, 2 and 3 show a converted Silver Marshall Model Q, the receiver on which is based the constructional data given herein. The choice of this particular set was dictated by the fact that it was in the writer's possession—any other receiver would probably have been just as satisfactory.

Fig. 4 shows the circuit employed. No claim is made for the originality of any part of the circuit. On the contrary it is the result of a very careful survey that was made of a large number of commercial and home-built superheterodynes. Amateur handbooks were consulted and radio magazines were reviewed. Acknowledgment, too, must be given the engineering departments of Sylvania and Kenrad for their co-operation in supplying special data and graphs on suppressor-grid modulation.

It will be noticed that the receiver described in this article makes use of the older type glass tubes, rather than the newer types of octal based glass or metal tubes. This fact should not in any way be considered as a condemnation of the newer types of tubes. This is a receiver conversion, and for obvious reasons it was desired to use tube types which duplicated the original tube complement as closely as possible. In building a brand new receiver we would suggest the use of the now standard octal base types.

The performance of the finished receiver was very satisfactory in every respect. It is hoped that the data given in this article will be of practical assistance to amateurs and SWL's who are contemplating the construction or conversion of a receiver by eliminating the necessity of wading through reams of sometimes conflicting data on the subject.

The practical problems to be solved in making conversions are—

1. *Tuning method for ample bandspread.*
2. *Pre-selection or image suppression.*
3. *Addition of b.f.o. (beat-frequency oscillator)*
4. *Noise suppression.*
5. *Voltage distribution and filtering.*
6. *Voltage stabilization to prevent oscillator drift.*

Input Circuit Considerations

In effecting the conversion of a broadcast superheterodyne one of the first things to be decided is the type of input circuit to be used. Where there are no restrictions as to cost or space it is desirable that one or two r.f. stages precede the first detector to suppress images and lower hiss level. However, such construction makes plug-in coils somewhat impractical. With two r.f. stages a total of 20 plug-in coils would be required to cover the five principal amateur bands—a drawer full indeed!

However, by applying regeneration to the first detector the gain and selectivity of the detector stage can be increased tremendously, so that satisfactory performance can be obtained without the use of additional tuned circuits. Furthermore, this improvement is greatest at the higher frequencies where turned r.f. stages lose much of their selectivity and amplification. The price paid for this simplification of construction is the addition of one comparatively non-critical regeneration control, the screen-grid potentiometer P5.

Selection of 1st Detector Tube

The selection of the proper first detector tube was a matter of concern since in addition to providing satisfactory gain, the detector should respond smoothly to feed-back and should approach the oscillation point without having any tendency to spill over or become unstable. Low input and output capacity is desirable, particularly at the higher frequencies. Also the construction of the tube should be such as to provide for convenient injection of oscillator voltage without introducing capacity coupling to the control grid. Capacity or inductive coupling between the oscillator and detector circuits must be avoided, otherwise an annoying interlocking effect of the tuning controls will occur at the higher frequencies. A type 57 tube with a form-fitting shield was finally selected as being the most satisfactory. If your receiver employs 6.3-volt tubes a 6C6 will give exactly equivalent results. Oscillator injection is through the suppressor grid and is accomplished simply by connecting the grid of the oscillator to the suppressor. According to tube data, maximum suppressor transconductance occurs when the suppressor is approximately 30 volts negative. In this circuit the suppressor grid is biased mainly by the grid current of the oscillator tube, and partially by the grid bias resistor, R1, in the detector cathode circuit.

Control of detector regeneration is accomplished by means of the 50,000-

ohm linear taper control, P5, which varies the screen voltage of the detector tube. The cathode tap of the detector coil should be placed so that oscillation occurs with 65 to 90 volts on the screen. If oscillation occurs at a lower voltage the full gain of the first detector will not be realized. The oscillation point of the first detector also depends on the setting of the antenna coupling condenser. This condenser should be set for as little capacity as possible consistent with satisfactory gain.

In service, the screen voltage should be adjusted so that the first detector operates near the point of oscillation in order that maximum pre-selection will be obtained. Receiver volume should be adjusted by means of the sensitivity or audio gain control. The first detector should never be allowed to actually oscillate.

Band-Spread Requirements

For c. w. work on the crowded 40-meter band it might be said that it is almost impossible to have too much band-spread. Many amateurs use X- or Y-cut crystals that are heavily loaded and the frequency creep in the received signal sometimes calls for rather constant retuning. When QRM is bad, and you are copying an S5 signal against S9 interference it is easy to tune past the desired signal and lose it for a moment or two or perhaps for good. To overcome this it is desirable to build sufficient electrical band-spread in the tuning unit to give as great as possible rotation of the condenser plates in covering the amateur bands and then to supplement this with a two-speed dial which will give further mechanical reduction.

Electrical Band-Spread

There are a number of ways of achieving electrical band-spread, such as the use of tapped coils, series condensers, etc. The method adopted for the conversion was to use a low capacity two-gang tuning condenser (30 mmfd. maximum capacity) shunted by two 100 mmfd. midget condensers — these being provided with knobs so that adjustment can be made from the front of the panel. The degree of band-spread is regulated by the proportion of shunt fixed pad capacity to the capacity of the tuning condenser. Table I gives suggested coil specifications. If more band-spread is desired, simply reduce the number of turns so that more padding capacity is required. If less band-spread is desired increase the number of coil turns.

In operation the oscillator pad condenser is set so that the center of the amateur band tunes at one-half rotation of the two-gang tuning condenser. Then the antenna pad condenser is tuned to resonance. Except when tuning the lower frequency bands, very little readjustment will be required of the antenna pad condenser. On the 160-meter band a slight amount of adjustment of the antenna pad may be required when tuning from one extreme of the band to the other. It is suggested that the dial settings of the pads be marked on the respective coil forms so that the receiver can be instantly adjusted to any amateur band.

Mechanical Band-Spread

Since the receiver we are describing was to be used principally on the crowded 40-meter band we desired to add as much mechanical band-spread as practical. To this end we selected a Crowe 401 Micromaster Dial. This dial has a two-ratio drive with a fast ratio of 18-to-1 and a slow-speed ratio of 100-to-1 in 360 degrees. The dial also is provided with two pointers which permits the close logging of stations, especially desirable for round-table QSO's, or for keeping schedules.

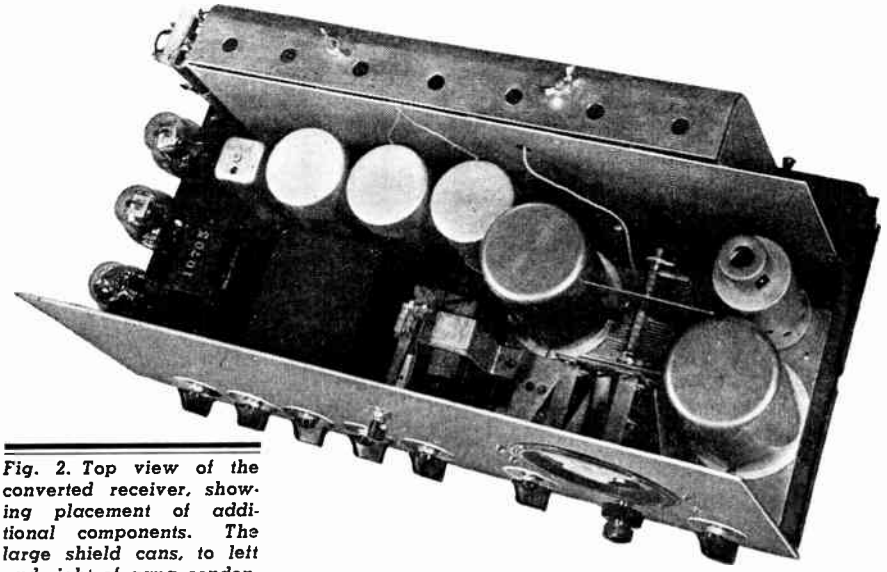


Fig. 2. Top view of the converted receiver, showing placement of additional components. The large shield cans, to left and right of gang condenser, house the r.f. coils.

High Frequency Oscillator Considerations

The present wide-spread use of electrical refrigeration and other devices which place an intermittent load on the lighting circuit has created a real problem in communication receiver design. Unless special care is used in the design of the high-frequency oscillator, fading and detuning of signals will result from frequency change in the oscillator arising from variations in the plate supply voltage.

Another effect which may be noted in some receivers results from common coupling between the power tube and the high-frequency oscillator; plate voltage varying in step with the audio signal causes oscillator variation so that a received c.w. signal rises and falls in pitch like the signal from a poorly adjusted self-excited transmitter.

There are two ways of meeting these difficulties. It is possible to use a screen-grid tube for the oscillator and balance the components so that a certain compensation occurs. When used as an oscillator, changes in plate and screen voltage have a tendency to affect the frequency in any opposite manner.

However, the writer has desired to eliminate the trouble by going to its source and providing a simple neon tube regulator which will hold the oscillator voltage substantially constant regardless of fluctuations in the supply. An 874 voltage regulator tube is ideal, but rather expensive. Satisfactory results may be obtained by using two standard 2-watt neon lamps from which the series resistors have been removed. These lamps will maintain an almost constant voltage of 70 volts across their elements unless their maximum wattage rating is greatly exceeded, or unless the supply voltage falls below the ignition point. The two lamps in series provide

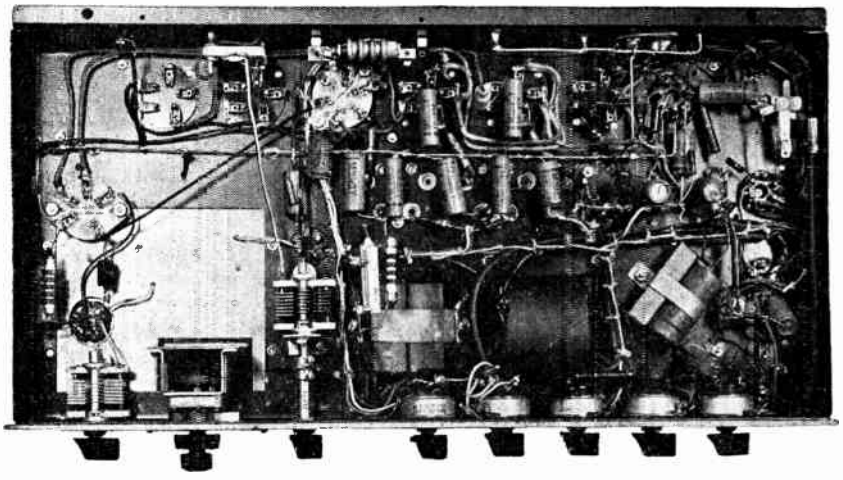


Fig. 3. Under-chassis view of the converted receiver. This clearly shows the location of each control, and such components as are mounted below deck.

a substantially constant 140-volt source of potential for the high-frequency oscillator.

Preparing the Neon Lamps

To use common neon lamps for voltage-regulating purposes it is necessary that the limiting resistors be removed from the base. This can easily be accomplished by the following procedure:

First unsolder the lead in the center of the base bottom so that this wire is free. It is not necessary to unsolder the wire attached to the top of the screw base. Then hold the metal shell of the lamp in boiling water for a few minutes. This will soften the cement so that a firm steady pull will separate the brass shell from the glass bulb. Do not twist the shell—to do so may break the glass seal and spoil the lamp. The limiting resistor will be found attached to the short lead wire at the base of the bulb. Remove this resistor, solder extensions on the lamp leads, then remount the lamp either in the old brass base or in the base from a discarded radio tube; the latter mounting being preferred so that standard radio tube sockets can be used throughout the receiver.

Standard 2 or 3 watt, 115-volt neon lamps, with pear-shaped bulb and semicircular electrodes are to be preferred for the service. Since in the circuit shown, the neon lamps are operated at about half the rated wattage, long life should be secured.

The voltage drop across the lamp will remain at approximately 70 volts regardless of wide fluctuations of line voltage.

Stabilized voltage for the high-frequency oscillator is taken from the junction of the 10,000-ohm dropping resistor, R4, and the two neon lamps. The value of this resistor should be adjusted so that the neon lamps do not cease to glow with any adjustment of the receiver. About 10 milliamperes bleed through the lamps under conditions of normal line voltage will be satisfactory.

If the constructor does not wish to employ the neon lamp stabilizing scheme, oscillator voltage can be obtained directly from a tap on the voltage divider—though it is recommended that the lamps be used since the improvement in receiver performance is decidedly noticeable.

Controls

The first control of the receiver is the tone control located at the left-hand side of the chassis. This control is of the conventional type consisting of a 50,000-ohm right-hand taper potentiometer, P1, and a .05 mfd., 600-volt condenser, C23, connected between the power tube plates and the chassis. If a single power tube is used the tone control condenser may have a capacity of .03 mfd. Since the Yaxley K12 used is a left-hand tapered control, the center and left-hand terminals (when the control is viewed from the shaft end with terminals down) are used, and maximum bass will be with the control knob turned to the extreme left-hand position. The tone control also carries the off-on switch for the entire receiver.

The second control is the volume or audio gain control, P2, which functions as a potentiometer to vary the output of the diode second detector. This circuit is familiar to every radio amateur and experimenter so that it will suffice to say that a 500,000-ohm left-hand taper potentiometer works very satisfactorily in this application.

The third control, P3, is the manual squelch or Class C audio control which functions to vary the bias on the first audio stage. A more complete description of the functions of this control is given elsewhere in this article. The control itself is a 50,000 ohm linear control. On the back of the control is an off-on switch which controls the beat-frequency

COIL SPECIFICATIONS

160-METER BAND COILS
(1½" diameter forms)

Antenna Coil

L1—1⅜" winding of No. 27 single cotton enamel wire, close wound, tapped at 1¼ turns.

Oscillator Coil

L2—1" winding of No. 27 single cotton enamel wire, close wound
L3—14 turns No. 27 single cotton enamel wire.

80-METER BAND COILS
(1½" diameter forms)

Antenna Coil

L1—30 turns No. 22 enamel wire, space wound to cover 1¼", tapped at 1¼ turns

Oscillator Coil

L1—25 turns No. 22 enamel wire, space wound to cover 1"
L3—9 turns No. 27 single cotton enamel wire

40-METER BAND COILS
(1½" diameter forms)

Antenna Coil

L1—12 turns No. 18 enamel wire, space wound to cover 1⅜", tapped at 1 turn

Oscillator Coil

L2—11 turns No. 18 enamel wire, space wound to cover 1⅜"
L3—6 turns No. 22 enamel wire

20-METER BAND COILS
(1½" diameter forms)

Antenna Coil

L1—12 turns No. 18 enamel wire, space wound to cover ¾", tapped at ¾ turn

Oscillator Coil

L2—5 turns No. 18 enamel wire, space wound to cover ¾"
L3—3 turns No. 22 enamel wire

20-METER BAND COILS
(1" diameter forms)

Antenna Coil

L1—8 turns No. 18 enamel wire, spaced the diameter of the wire, tapped at ½ turn

Oscillator Coil

L2—7 turns No. 18 enamel wire, spaced the diameter of the wire

L3—3¼ turns No. 27 cotton enamel wire

10-METER BAND COILS
(1" diameter forms)

Antenna Coil

L1—4 turns No. 18 enamel wire, spaced the diameter of the wire, tapped at ⅓ turn

Oscillator Coil

L2—3½ turns No. 18 enamel wire, spaced the diameter of the wire
L3—1¾ turns No. 27 cotton enamel wire

Note: Inductances are mounted in National B30 coil shields with the socket flush with the base.
Top of L2 is the ground end—bottom is the grid end.
L3. On all coils close wound, and spaced ⅛" from ground end of L2.

oscillator. Combining these controls is satisfactory since neither the manual squelch nor the beat-frequency oscillator will be used for phone reception.

The fourth control, P4, is the sensitivity control which regulates the gain of the i. f. stages, and functions by varying the control-grid bias. This control is ordinarily used only for c. w. reception —for phone reception the knob is turned to the extreme left so that the single pole, double throw switch, SW3, connects the grid returns to the diode detector so that complete a. v. c. action is secured. A 50,000-ohm linear control is used in this position.

It was found necessary in the laboratory model to use shielded wire for the a. v. c. lead between the switch, SW3, and the diode detector. Without this a slight hum was experienced, probably caused by the electrostatic pick up on the a.v.c. lead which parallels the filament and B plus leads.

The fifth control, SW4, is the stand-by switch which simply breaks the B plus voltage to the screens of the i. f. tubes so that the receiver will be inoperative during transmission. The sixth control, P5, is the first detector regeneration control and functions by varying the screen voltage on the first detector. Again a 50,000-ohm linear control is used for the application. The remaining controls are for tuning the receiver.

While at first glance it may seem that there is an alarming number of controls to this receiver, analysis will show that each control has a special function and in actual use the operation of the receiver is very simple indeed.

Manual Squelch

A valuable feature which can be added to any receiver is a manual squelch, or as sometimes called "Class C" audio. This is a variable bias control for the

(Continued on page 657)

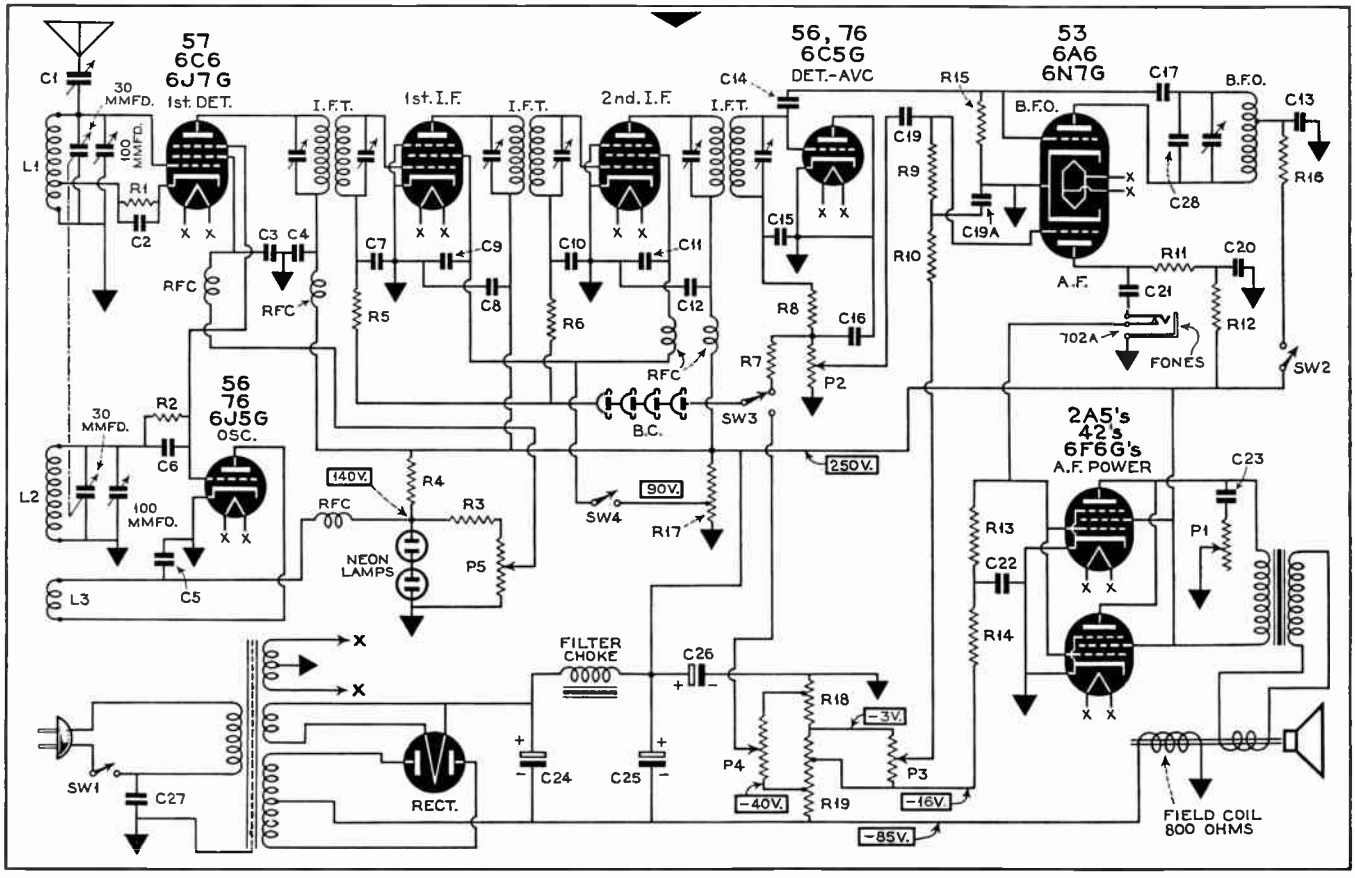


Fig. 4. Schematic diagram of the converted receiver. Values are given below. Note the bank of four grid-bias cells, "B.C."

CONDENSERS

C1 —5-35 mmfd. mica trimmer
C2 —Mallory TP436 .05 mfd. 200 volts
C3 —Mallory TP438 .1 mfd. 200 volts
C4 —Mallory TP428 .1 mfd. 400 volts
C5 —Mallory TP426 .05 mfd. 400 volts
C6 —Fixed mica .0001 mfd.
C7 —Mallory TP436 .05 mfd. 200 volts
C8 —Mallory TP428 .1 mfd. 400 volts
C9 —Mallory TP438 .1 mfd. 200 volts
C10—Mallory TP436 .05 mfd. 200 volts
C11—Mallory TP438 .1 mfd. 200 volts
C12—Mallory TP428 .1 mfd. 400 volts
C13—Mallory TP428 .1 mfd. 400 volts
C14—Gimmick—see text
C15—.0005 mfd. mica
C16—.0001 mfd. mica
C17—.0001 mfd. mica
C18—Mallory TP440 .25 mfd. 200 volts
C19—Mallory TP426 .05 mfd. 400 volts
C19A—Mallory TP428 .1 mfd. 400 volts
C20—Mallory CS131 .4 mfd. 450 volts
C21—Mallory TP428 .1 mfd. 400 volts
C22—Mallory TP441 .5 mfd. 200 volts
C23—Mallory TP415 .05 mfd. 600 volts
(or TP413 for single tube)
C24—Mallory CS136 16 mfd. 450 volts
C25—Mallory CS136 16 mfd. 450 volts
C26—Mallory CS136 16 mfd. 450 volts
C27—Mallory TP428 .1 mfd. 400 volts
C28—.0001 mica

TUNING CONDENSERS

Band Setting—2 Hammarlund MC-100-S 100 mmfd. midget variable condensers
Band Spread—Hammarlund MC-D-35-MX dual 30 mmfd. midget variable condenser

A.V.C. BIAS

B.C.—4 Mallory Grid Bias Cells

RESISTORS

R1 — 1,500 ohms ½ watt
R2 — 50,000 ohms ½ watt
R3 — 25,000 ohms 1 watt
R4 —Mallory Truvolt Type A-100, 10,000 ohms
R5 —100,000 ohms ½ watt
R6 —100,000 ohms ½ watt
R7 — 1 megohm ½ watt
R8 — 50,000 ohms ½ watt
R9 — 1 megohm ½ watt
R10— ½ megohm ½ watt
R11— 50,000 ohms 1 watt
R12— 10,000 ohms 1 watt
R13—100,000 ohms ½ watt
R14— 50,000 ohms ½ watt
R15— 50,000 ohms ½ watt
R16— 10,000 ohms 1 watt
R17—Mallory Variohm 5 AV 30,000 ohms
R18—Mallory Truvolt Type A-1 1,000 ohms
R19—Mallory Variohm 5 AV 10,000 ohms

Note: ½ watt and 1 watt resistors are IRC Insulated Resistors, Types BT-½ and BT-1.

CONTROLS

Tone and On-Off Switch
P1 —Yaxley K12 50,000 ohms
SW1—Yaxley No. 6-9 Switch

Volume
P2 —Yaxley N 500,000 ohms

Manual Squelch and B.F.O. Switch
P3 —Yaxley Y5OMP 50,000 ohms
SW2—Yaxley No. 6-9 Switch

Sensitivity and A.V.C. Switch
P4 —Yaxley Y5OMP 50,000 ohms
SW3—Yaxley No. 8 Switch

Standby Switch
SW4—Yaxley 20

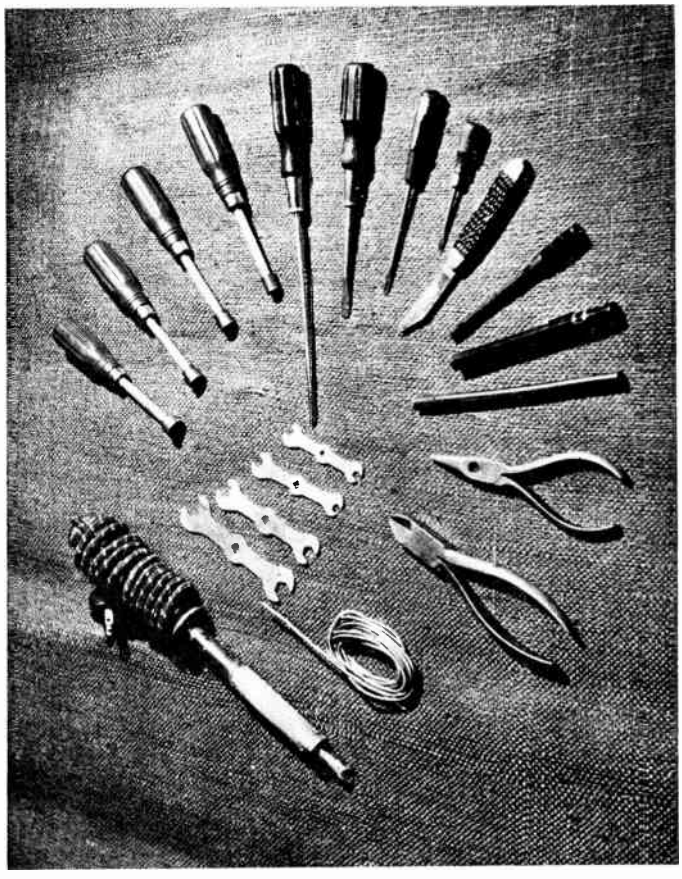
Detector Regeneration
P5 —Yaxley Y5OMP 50,000 ohms

Beat-Frequency Oscillator
Hammarlund STBO-465

Two-Speed Vernier Dial
Crowe Name Plate No. 401 Micromaster

TOOLS For The HOME WORKSHOP

By WILLARD BOHLEN and CHESTER WATZEL



The beginning of an ideal home workshop—"spintite" wrenches, screw drivers, a knife, "neutralizing" tools, a "Magic Wand", short-nose and diagonal pliers, open-end wrenches, solder, and a soldering iron.

PART I

THE construction of present-day radio equipment is largely a matter of metal working. In view of this, many constructors of limited experience seem at a loss in choosing the proper tools. Some seem to believe that power tools are necessary in order to do a satisfactory job. This, fortunately, is not the case. Metal panels and chasses may be worked easily and neatly with an inexpensive set of hand tools. We are presenting here photos and notes on a set of tools which is adequate to construct any equipment appearing in ALL-WAVE RADIO; they are, in fact, the actual tools used in the AWR laboratory.

Layout Tools

The following tools are used in layout work:—

Steel Rule: A wooden rule should never be used due to its inaccuracy. A six-inch steel rule is used here. A longer 12-inch rule would be very useful. For a 12-inch rule we use the rule out of the——

Square: This has a removable 12-inch steel rule. The square is indispensable in laying out metal chasses and panels. A small scriber, removable, is a part of the square. This is necessary for marking painted work, where a pencil line would not show. If no scriber comes with the square, or it becomes lost, as in our case, it is permissible to substitute a——

Compass: The sharp point of the compass is excellent for scribing. The main use of the compass, however, is for scribing circles on material where a pencil line will show. For scribing circles on painted material it is necessary to use a pair of——

Dividers: These are also useful for measuring the distance between two points when a ruler will not fit into the layout. The divider is laid on a ruler to determine the measurement.

Center Punch: After the work is laid out a center punch is used to make a small depression in the metal so as to accurately start the drills. It is almost unnecessary to state that, to make said depression, the punch must be "socked" with a——

Hammer: The use of this article is hardly necessary to describe; even the cavemen had 'em. So we go into the next class of tools which are used for——

Drilling

Hand Drill: The hand drill is used for all size drills up to about a quarter inch, depending on the particular one used. The most useful sizes of drills are as follows:

1/16"—Used for drilling wire holes in coil forms. Also very useful for starting holes in metal after they have been center punched. Starting a hole with a large drill often throws the hole off center.

5/32"—This size drills holes that will clear 6/32 bolts.

3/16"—This size drills holes that will clear 8/32 bolts.

7/32"—This size drills holes that will clear 10/32 bolts.

1/4"—This size makes the right size hole for mounting the insulating washers of binding posts. This size hole will also do as a "bushing" in panels to pass 1/4" shafts.

Carpenter's Brace: This tool may seem to be out of place in metal working but is actually very useful. It takes the larger size of drills, as well as other large tools such as the reamers, countersinks and circle cutters. The slow speed of the brace is of distinct advantage in handling these larger drills and tools. In order to prevent slippage the tools to go into the brace should be of the square shank type. Drill sizes useful with the brace are as follows:

3/8"—This is a much-used size. Most all of the single-hole mounting types of radio components, such as volume controls and midget tuning condensers. mount in this size hole.

7/16"—This takes most toggle switches, also a few of the controls and condensers of older types.

1/2"—A few toggle switches and similar components require this size of hole. We also use this drill in connection with making chassis cutouts, to be mentioned later.

Reamer: The particular reamer we find most useful is a little over three inches long, with a maximum diameter of 7/8".

This, of course, has the square shank. It is very useful for enlarging and rounding out holes. It will make holes of any diameter desired, between available drill sizes. It also fills the gap between the ½"-inch drill and the——

Circle Cutter: The circle cutter fashions holes down to ⅞" in diameter, where the reamer leaves off. The large size Pawood circle cutter illustrated will drill holes up to a maximum of 5½" in diameter. Other types of circle cutters of various sizes are available, but the particular one shown has been found the most versatile. It is well to get this size instead of a light-duty one, as the latter will not last any too long. It is cheaper in the end to start with the heavy-duty type, which will last indefinitely.

Countersink: (not illustrated). The countersink reams out holes to the proper depth and angle when it is desired to employ flat-head or french-head bolts instead of the more usual round head type.

Cutting

Four types of tools will handle all ordinary cutting operations. The most familiar is the——

Hacksaw: One disadvantage of the hacksaw is that the frame limits the length of the cut to a few inches. It is therefore most useful for work such as cutting shafts, angle and similar material. For long cuts we prefer the——

Metal-Cutting Saw: These are procurable at most hardware stores for the small sum of a quarter. They will make any length cut, even in steel. They are useful in making cutouts in chasses or panels, such as are necessary to mount many types of transformers. A half-inch hole is drilled at each corner of the proposed cutout, or at least two diagonally opposite corners. These holes will permit the insertion of the saw blade sufficiently to start the side cuts. This method of making cutouts is easier and quicker than would first be imagined. The resulting holes have straight, clean cuts which need only a little touching up with a file to smooth the edges. This method is infinitely superior to the more common method of "chopping" out the hole with a cold chisel. The latter method usually leaves a messy job unless very skillfully done.

Cold Chisel: While the chisel is not the best instrument for making cutouts it is desirable for another purpose; that of taking the burrs off drilled holes. A tap of the hammer on the chisel will remove the burrs cleanly. This is a simple trick that is not as well known as it should be.

Files: The file is a tool that is generally familiar to the constructor. Three general types, all illustrated, should be on hand. The large flat file is used mostly for trimming off rough edges on long metal cuts. The small, three-cornered file gets into places where the flat file is too large. The three-cornered file is also handy for making notches, such as for starting a cut on a volume control shaft. The round file is used for enlarging holes when they are drilled "off center" and for filing curved edges. It would be a good idea to have two sizes of round files, the smallest available for getting into small holes, with the larger size for working on large holes and curved edges.

Assembly

Three types of tools are employed for assembling component on chasses and panels. The most familiar are the——

Screw Drivers: Several sizes are shown, and should be owned by the constructor. The nature of the work being done will indicate which size is most suitable for that particular job. Get good ones that will not slip and will retain their edges indefinitely.

"Spintite" Wrenches: As a complement to the screw-drivers these wrenches are very useful. The screw should be kept from turning with the screw driver while the nut is tightened with the wrench. This will prevent damaging of the screw heads. Four sizes, which are available in sets, will take practically all standard size nuts. The 1/4" and 5/16" sizes will take 6/32 and 8/32 nuts. The ⅜" and 7/16" sizes will take the 10/32 and other large nuts such as come with various types of insulators.

Open-End Wrenches: This set of four open-end wrenches are not as expensive as one might believe. We paid the sum total of eight cents (American money, 69 cents to the dollar) for all four. This makes them rather inexpensive at 2 cents per. The local auto accessory store provided this bargain. Don't kick if you have to pay a few cents more; they are worth it. They are particularly useful for tightening panel nuts on volume controls and similar parts which are of the single-hole mounting type. They will do this without scratching the panel and nut, which is likely to happen if the tightening job is done with pliers. The eight sizes of nuts these four wrenches fit make them useful for tightening any nuts the Spintites will not reach.

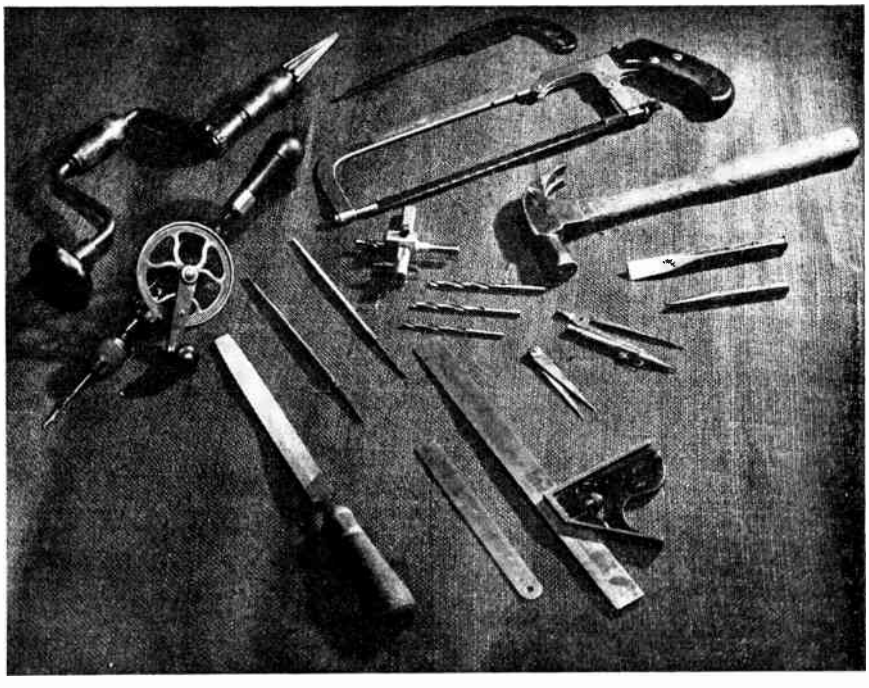
Wiring

Only four tools are necessary in order to do a satisfactory job of wiring. They are, first, the——

Soldering Iron: The soldering iron chosen should be neither too light nor too heavy. A light iron has not sufficient heat to properly solder large pieces of metal, producing a "cold" joint. A heavy iron, on the other hand, will not get into crowded places, such as are inevitable under the chassis of a receiver or a similarly complicated piece of radio equipment. A medium size iron will be satisfactory for all general radio work.

A roll of solder, which is not exactly a tool, slipped into the photograph for "local color" when our backs were turned. In order to "cover up" the photographer's artistic touch we will make a few remarks on the right kind of solder to use. For practically all radio work rosin-core solder should be em-

(Continued on page 655)



The remainder of the tools for a good workshop—carpenter's brace (with reamer in chuck), a hand drill, a hack saw, a metal cutting saw, a circle cutter, drills, hammer, compass, a scriber, a center punch and a cold chisel. Also a round, a flat and a three-cornered file, a steel ruler and a square.

IT GOES OUT... THERE!

By W. E. McNATT • W7GEZ, ex-W6FEW

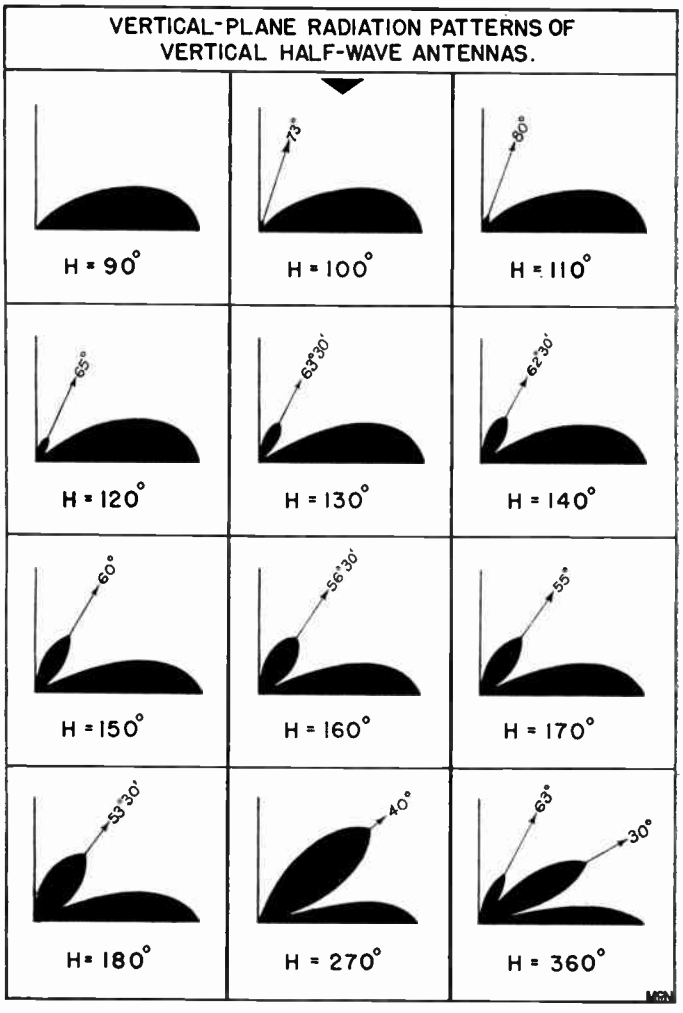


Fig. 2. Vertical-plane radiation patterns of vertical half-wave antennas. Pick your angle and let 'er squirt.

VERTICAL antennas for the high-frequency bands, 14 mc. on up, are desirable for several reasons. The advantages over a horizontal antenna are: 1—the initial cost is less; 2—the mechanical set-up is simpler; 3—less room is required, and 4—the radiation characteristics of the vertical are easier to control than is the case of the horizonal layout.

Undoubtedly there are many hams who use vertical antennas, and who just "stuck them up" at any convenient height without knowing what the effects would be. For those hams who are in the latter classification, and for those who are contemplating the erection of a vertical, it is hoped that the radiation patterns shown in Fig. 2 will give them something more definite to work from.

These patterns are the result of calculations based upon ideal conditions, and therefore represent theoretical and probably unattainable performance. Ground conductivity, electrical length of the antenna, height of same, current distribution along the antenna, frequency of transmission and guy wires (and other reflecting bodies in the immediate vicinity are some of the major factors influencing the performance.

It is not difficult to see that the only factors within the immediate control of most of us are those of antenna height, its length, and the frequency of transmission. Since most of us have our favorite band, the matters of antenna length and transmission frequency are eliminated, leaving only antenna height to be considered. Although the greater percentage of installations will not give the results shown for any one value of height (H° in Fig. 2), the performance will not vary too widely from that shown unless conditions surrounding the antenna are absolutely hopeless. Most amateurs do not have the money nor the time to engineer their stations as thoroughly as do the commercial fellows, but we can and do try to improve whenever and wherever possible.

Half-Wave Verticals

Since the majority of the hams do not go in for directional antennas, the patterns shown are only for single-wire, vertical half-wave antennas at varying distances above the ground. The horizontal pattern of this antenna appears as a circle (theoretically) with the end view, or diameter of the antenna wire, as its center. Of course, in practical installations, both the vertical and horizontal patterns will, to some extent, be altered by guy-wires and other nearby reflecting bodies. Metal roofs, power-lines, power-pole guy-wires and the like are good examples of reflecting bodies.

Fig. 1 illustrates the values of H° given below each pattern in Fig. 2, and the value of d in Fig. 3. The use of Fig. 3 in conjunction with the patterns of Fig. 2 is quite simple.

Let us suppose that you, the reader, choose the radiation pattern resulting from an antenna having a height, H°, of 130°. Assuming that this pattern is desired on 29 mc., the middle of the 10-meter band, we refer to Fig. 3. At 130°, at the bottom of the graph, we follow the line "up" until it crosses the line marked "29 mc." At that point, we go to the side of the drawing where d, in feet, is given. This, we find, for 29 mc., is 3.8 feet, which is the distance from the lower end of the antenna wire to the ground. Similarly, for a half-wave antenna to operate of 7150 kc., at a height of 110° we find that the bottom of the antenna will be 7.5 feet above ground. Of course, for any half-wave antenna having an electrical height, H°, of 90°, its lower end will always be on (but insulated from) ground, regardless of the operating frequency.

The electrical height, H°, to the center of a half-wave antenna is found by a simple calculation:

$$H° = \frac{L \times 360° \times f}{3.28 \times 3{,}000{,}000}$$

where f is the frequency in kilocycles, and L is the distance in feet from the center of the antenna to ground. L is found easily by adding *half* of the total length, in feet, of the antenna to be used to the distance desired between the bottom of the antenna and ground. Plenty

of information and directions regarding the calculation of half-wave antenna length is available in Handbooks, so there is no point in going into the matter here. Remember, however, to use *half* the length of the *half-wave* antenna for the frequency desired.

Grounds for Good Grounds

Comparatively recent opinions seem to be towards the idea that an antenna is no better than its ground, or rather, the ground used with it. Broadcast stations using vertical antennas (their number is growing rapidly) seem to favor the use of 120 radials, each wire one-half wave in length and buried from 8 to 20 inches in the ground.

In only comparatively few cases do we find a ham with a backyard roomy enough to accommodate such an array. Even if we had enough room, the job of burying 120 wires would be enough discouragement unless there were some handy gadget available. Broadcasters have developed such a gadget, in the form of a plow. Everything is conventional with the exception of the blade, which is a straight piece of heavy iron plate. The blade is drilled so as to carry wire from a reel mounted on the plow-handles down into the ground to the desired depth. As the plow travels hither and yon over the terrain, the wire meekly goes to its resting place . . . and stays there. When the burial is started, the end of the wire is tied to an anchor point at the center of the system. Such plows have found popularity with many stations who recently have installed the radial-wire ground. (Brown, Lewis and Epstein, of RCA, show such a plow in the June, 1937, Proc. I.R.E.)

Even though most of us cannot work out the large, 120-wire system, we should be able to afford 30 or 60 quarter-wave wires, especially if we are operating on 20 or 10 meters. In burying these wires, their center in the ground is directly below the line of the antenna extended to the ground. This point is easily found by dropping a plumb-bob or other small weight from the lower end of the wire. All radial wires should be thoroughly soldered together at the center of the system, and also include another wire to run to the ground point of the transmitter. This wire should be equal in size to that of the wires in the radial system. For powers up to 250 watts, No. 12 should be adequate. Higher powers should be favored with at least No. 10 B&S.

Determining Angle

The angle between any two adjacent wires in the ground can be found easily by:

$$\theta = \frac{360^\circ}{n}$$ where n is the number of wires used. So, for the 60-wire ground, the angle between any two adjacent wires will be 60°. These angles can be laid off with reasonable accuracy by placing the center point of an 8- or 10-inch paper protractor (which is quite inexpensive) at the center of the radials. By stretching a string from that point over the desired angle on the protractor scale, on out to the full length of the wire to be used, and placing stakes at intermediate points, a fairly good line can be laid out for the small wire trenches.

In digging the ditches, it is sufficient to make only cuts of 8 or 10 inches in the ground. This can be done quite easily with a "square-pointed" shovel (if there is such a thing). The same tool can be used to shove the wire down in the cut, when the radials are laid.

Although the above is seemingly a complicated job, it is not so tough if you operate on the higher frequencies—a half-wavelength of wire, on 10 or 20 meters, isn't too much bother to bury. Broadcasters certainly swear by, not at, this form of ground since they have installed it. This should be a good hint for us, from the broadcast boys; certainly they have taken a good many hints from ham practice. At any rate, if you stick to business, and have a helper similarly inclined, one full Sunday should find one good ground system installed.

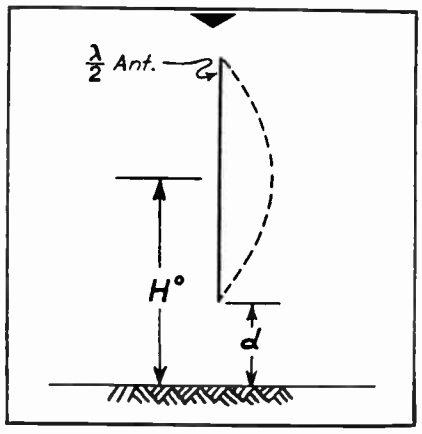


Fig. 3. Height of vertical above ground. The use of this sketch in conjunction with the patterns of Fig. 2 is quite simple.

Individual Patterns

Returning to the subject of antennas proper, those who are interested in working out radiation patterns for their own particular set-up can do so by following a simplified equation for the radiation characteristics of a vertical antenna. Since the characteristic is all we are concerned about, the equation for field strength in microvolts, or microamperes, is not given. Relative values are entirely sufficient.

$$I\theta = \sin\theta \cos(H^\circ \cos\theta)$$

where $I\theta$ is the relative signal intensity at any angle θ between the vertical (0°) and the horizontal (90°). In plotting the pattern, a suitable scale is that of 4 inches for unity, which occurs at 90°, other values of $I\theta$ being plotted to the same scale, proportionately H° is the electrical height of the antenna, i.e., the height in degrees of the center of the half-wave antenna, or the center of current distribution (dotted line in Fig. 3) from the ground.

$$H^\circ = \frac{D \times 360^\circ}{\text{wavelength}}$$

where D is the distance, in feet, from the ground to the center of the antenna, and wavelength is also in feet. (wavelength, ft. = *wavelength, mtrs.*, × 0.3048)

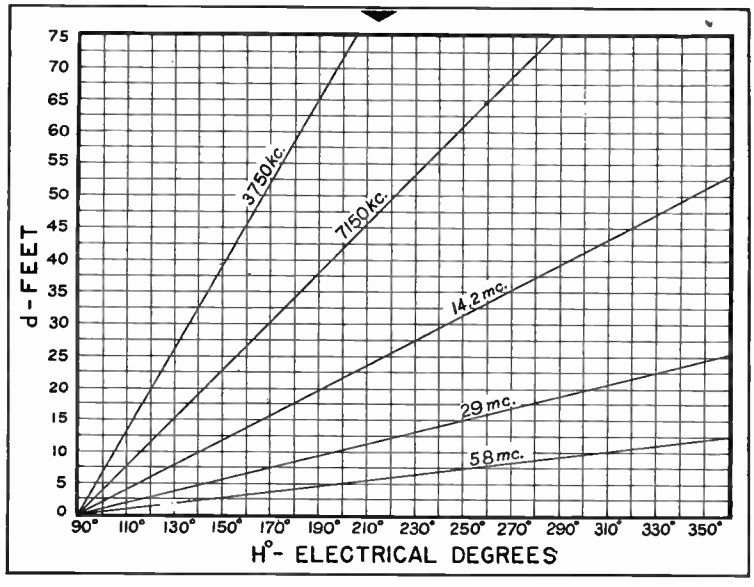


Fig. 1. The values of H°, which are given below each pattern in Fig. 2, and the values of d in Fig. 3.

ULTRA-HIGH

WHEN TO LISTEN—WHAT TO LISTEN FOR

By PERRY FERRELL, Jr.

MR. and Mrs. DXer — experience a new thrill by giving the ultra-high-frequency bands a twirl. Hear R8 signals from the other side of the world and get acquainted with the largest DX phone band. Twist the old dial among the broadcast, police, amateur, forest fire, broadcast pickup, experimental, and television stations to increase your log and aid immeasurably in classifying u. h. f. (ultra-high-frequency) receiving conditions.

As this is a totally new frequency area to most DXers it must first be understood that theoretically these waves have a quasi-optical range, but it now appears that a new DX band is being born and soon transmitters sharing the same frequency will be assigned new ones.

As you read this the ten-meter band is at its peak, so read over the station data to follow and give the ultra-high-frequencies a try.

Broadcast Stations

W6XKG, 25.95 mc., Los Angeles, California, operates 24 hours a day, seven days a week, simultaneously with KGFJ. The transmitter is a composite job and the antenna in use at present is 2 quarter-wave verticals 2 wave lengths above the ground and fed with transposed feeders. The power is 100 watts. Outside of excellent coverage of the United States and Canada, reports have been received from England, Ireland, Scotland, Norway, Japan, Australia, New Zealand, Puerto Rico, Hawaii, and Alaska. Address: W6XKG, 1417 South Figueroa St., Los Angeles, California.

W9XOK, St. Louis, Mo., has been testing lately at 35.6 and 41.0 mc. with a power of 100 watts. These tests are conducted on eight radials, namely the 1, 2, 5, 10, 15, 20, 25 and 40 mile. The antenna is located on the Continental Life Building which is not only the highest building in that section of the city, but is on the highest elevation in the county. W9XOK was heard here twice testing on 35.6 mc. (R7,Q5,F6). Address: Radio W9XOK, St. Louis Star Times, St. Louis, Missouri.

W4XBW, has resumed operations on 31.6 mc. and now relays WDOD with 100 watts power. W4XBW was heard here at 8:30 p. m. (R6,Q4,F4). A report was sent but no veri or acknowledgment has been received. Address: Radio W4XBW, Hotel Patton, Chattanooga, Tenn.

W3XIR, a new WCAU outlet, is under construction and will probably be on the air about the last of January. It will be a 100 watt station operating on either 31.6, 35.6, 38.6, or 41.0 mc.

W9XHW, 31.6 mc., a 50 watt station is reported to operate on the following schedule: 7:15-11:00 a. m., 4 p. m.-12:30 a. m., Mondays, Wednesdays, and Fridays; 9:00-12:30 a. m., Saturdays and Sundays. Address: Radio W9XHW, c/o WCCO, Minneapolis, Minn.

W9XAZ, 26.4 mc. is now relaying WTMJ with 500 watts power. Schedule: 1-12:00 p. m. on weekdays, 1- 5:30 p. m. on Sundays. This frequency is a poor one for U. S. A., but it seems to put a strong signal into Australia. Address: Radio W9XAZ, The Journal, Milwaukee, Wisconsin.

W8XAI, 31.6 mc. is another station that is often heard in Australia. At present it is relaying WHAM from 7:30 to 12:05 a. m. with 100 watts power. Address: Radio W8XAI, Stromber Carlson Co., Rochester, New York.

W3XES is the only active station on 35.6 mc. at present. It now puts 300 watts into the ether from 9 a. m. to 5 p. m. Address: Radio W3XES, Monumental Radio Co., Baltimore, Md.

W8XWJ, 31.6 mc. the pioneer ultra-short wave station is nearing its second year of continuous operation. (see ALL-WAVE RADIO, May, 1936) Reports are still being received from all over the world on their fine 100 watt signal. Schedule: Weekdays, 10:30 a. m.-5:00 p. m. Address: W8XWJ, Detroit News. Detroit, Michigan.

W5XAU, 31.6 mc., the only ten-meter broadcaster in W5, is relaying WKY from 12:00-1:00 p.m. Address: W5XAU, WKY Radiotelephone Co., Oklahoma City, Okla.

W3XEY, 31.6 mc., is another consistent performer with its 100 watts. It relays WFBR from 4:00 p. m. to 12:00 a. m. Address: Radio W3XEY, Baltimore Radio Show, Inc., Baltimore, Md.

W9XPD, 31.6 mc., is for some unknown reason, the best heard 100-watt broadcaster. Last summer it was the only ten-meter station heard in our section and reports from Australia have it at R8 and Q5. Unfortunately a schedule could not be obtained, but from our own observations we conclude that it is on the air every day from 11 a. m. to 6 p. m. Address: Radio W9XPD, Pulitzer Publishing Co., St. Louis, Mo.

W1XEQ, 31.6 mc., Storrs, Conn., is reported to use its 100 watts daily from 3-9 p. m.

One of the "two-way" police radio cars of the Schenectady, New York, Police Department. General Electric equipment is employed. Patrolmen Semerad and Tooley at the controls

The 142-foot mast of the ultra - high - frequency police radio station at Mount Vernon, N. Y., fed by a 50-watt Western Electric transmitter. The station provides complete coverage of the city.

We are uncertain at present upon what frequency W2XDV operates. All sources seem to differ and we are unable to secure information from the station engineer.

W6XRE, 120.0 mc., has discontinued operations on this frequency. This station last spring and summer conducted tests in conjunction with W6XKG.

W4XCA, 31.6 mc., Memphis, Tenn., is another well-heard 250-watt N.B.C. station. It is now relaying WNC on a very irregular schedule. W4XCA was heard here at 4:00 p.m. (R6, Q4, F4). Address: Radio W4XCA, Memphis Commercial Appeal, Memphis, Tenn.

W8XH, 41.0 mc., is using a new turnstile antenna designed by Dr. G. H. Brown, of the RCA Victor Co. This horizontal polarization antenna consists of a 70-foot steel pole, whose maximum height above ground is 350 feet, which supports the turnstile array. The complete array is mounted on the Hotel Statler in Buffalo. We are unable at present to obtain a schedule of the transmissions. Address Radio W8XH, c/o WBEN, Buffalo, New York.

W9XJL, 31.6 mc. Telegram Building, Superior Mich., was heard here at 3:45 p.m. (R4, Q3, F4), when using a power of only 40 watts! This station has no regular schedule as far as we know. It relays the programs of WEBC, Duluth, and the power is now 80 watts. It is understood that W9XJL also transmits on 26.1 mc.

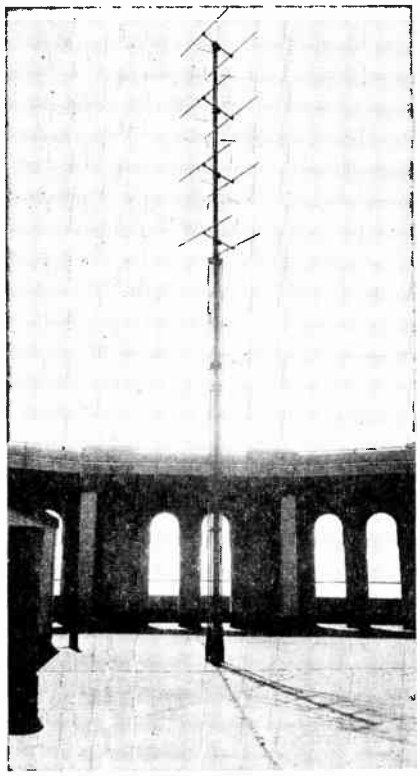
We have listed above a few of the most interesting or the most active of the u.h.f. broadcasters. It must be remembered that these stations are allotted four or more frequencies to be used at will, so schedules and frequencies are always subject to change.

"Forest Fire" Stations

After several hectic seasons with forest fires, the New Jersey Department of Conservation installed a complete two-way radio-phone transmitter in each of their fire towers, airplanes, and portable units. The system now totals over 25 separate stations operating on one of three frequencies. The "C" stations operate on 33.85 mc., while the B stations operate on 36.0 mc., except W3XBT, the Trenton control station, which operates near 39.0 mc.

Below is a list of the stations that are in operation:

Station	Location	Station	Location
W3XBT	Trenton	W3XCG	Wind Beam
W3XBU	Budd Lake	W3XCH	Beaufort
W3XBV	Butler	W3XCI	Cedar Bridge
W3XBW	Mt. Holly	W3XCJ	Farmingdale
W3XBX	Blue Anchor	W3XCS	Mizpah
W3XBY	Bridgeton	W3XCT	Edison
W3XBZ	Silver Lake	W3XCU	Lakehurst
W3XCA	Catfish	W3XCV	Maple Lake
W3XCB	Millville	W3XCQ	On any aircraft
W3XCC	Belle Plains	W3XCR	Airplane
W3XCD	Retreat		Hangar
W3XCE	Batso	W3XD	Portable
W3XCF	McKeetown		



Turnstile antenna atop an office building in lower Manhattan for reception of ultra-short waves in the New York-Philadelphia facsimile circuit of RCA.

By tuning to W3XBX on 36.0 mc. the listener may hear all that goes on, as the Blue Anchor control station transmitter is left on all day. The service becomes quite interesting when a forest fire is under progress and the portable units are in the field.

Experimental Stations

If, when tuning through 55.0 mc. you hear a strange clicking sound, it's not from Mars; it is only the u.h.f. weather balloon of the National Bureau of Standards. These balloons are freed occasionally to collect data on the upper atmosphere and send it by radio to automatic recording receivers. Many times these balloons—depending on their diameter—reach a height of 127,000 feet (24 miles).

W10XFZ, the N.B.C. portable transmitter operates on 40.6 mc., 34.6 mc., and 31.1 mc.

W1XAV, owned and operated by the Shepard Broadcasting Service, of Quincy, Mass., uses a frequency of 61.5 mc.

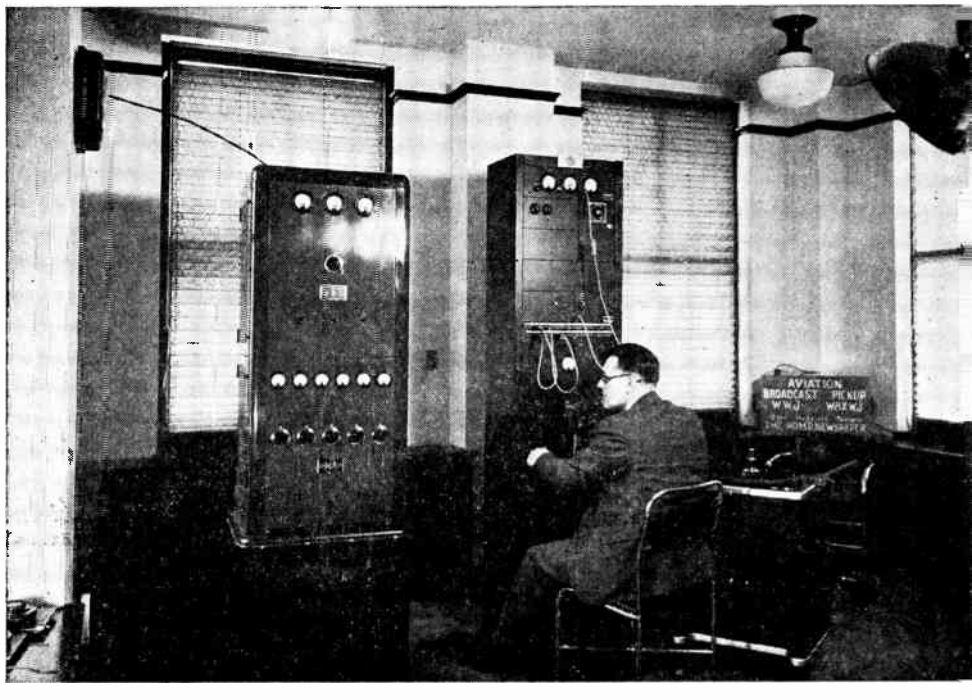
A new u.h.f. beacon system has been devised by the Bureau of Air Commerce. 75.0-mc. installations have been made at Newark, Chicago, Kansas City and Washington airports. All of the 91.0 mc. installations have been shut down because of mechanical difficulties.

Speaking of airplane beacons, a 500-watt Lorenz system has been installed at the Indianapolis airport. The large transmitter operates on 33.3 mc. while the markers operate on 38.0 mc.

W1XR, 53.0 mc., the Mount Washington Observatory station, has established a record for the most reliable u.h.f. circuit in operation; a total of four years. Address: Alexander A. McKenzie, Gorham, New Hampshire.

W1XW, 60.3 mc., the Blue Hill Observatory station, located 142 miles away, exchanges weather reports and other observations with W1XR from day to day. They also free radio-equipped balloons, operating on either

(Continued on page 664)



W8XWJ, the Detroit News ultra-high-frequency broadcast station which has stacked up quite a DX record.. C. H. Wesser at the controls.

Globe Girdling

By J. B. L. HINDS

BBC's 98 CLOCKS . . . HBO-HBL WINTER SCHEDULES . . . FINNISH TESTS . . . NEW CUBAN ZTG, JOHANNESBURG . . . MANCHUKUO SIGNALS UP . . . WARSAW TWINS . . . CT2AJ.

ZTJ, 9606 kc., 31.23 meters, Johannesburg, South Africa, sounds good to the ears of a DXer. ZTJ, 6097 kc. as listed, is still on the air. The latter frequency has long been the goal of all DX fans, but with its 500 watts power, and its close proximity to local short-wave stations which operated at the same hours, very little success was achieved by those in Eastern United States. But with its new 5 kw. transmitter its signal is a good R7 and holds up consistently the full hour it is heard from 11:45 p.m. to 12:45 a.m. These hours represent 6:45 to 7:45 a.m. in Johannesburg.

The station is first heard with its bugle call at the beginning of the physical exercises. At 12 a.m. are heard the clock chimes followed by the toll of 7 by the big Johannesburg clock. News items follow, band selections, another class of physical exercises, stocks and bonds, market reports, prices, etc., all being in English and repeated in the language of the Transvaal. They close with bugle calls as at the beginning. Other programs as scheduled under ZTJ, 6097 kc., are broadcast. The present signal has sufficient strength to override the prevailing static and electrical disturbances, and comes in with remarkable clearness, which speaks well for the engineers of the station. And thus the United States gains another next-door neighbor through the achievements of short-wave radio.

With the continual adding of new stations in nearly every country in the world, the rapid advance in the improvement of facilities, increases in power and the wonderful improvement in receiving equipment, short-wave radio is far from the point of being on its way out, in the opinion of the writer.

NEW STATIONS

KC.	Meters	Call	Location
41000	7.32	W2XHG	New York, N. Y.
38650	7.76	W2XDG	New York, N. Y.
31600	9.4	W2XDV	New York, N. Y.
11990	25.02	CB1199	Valdivia, Chile
11760	25.50	TGWA	Guatamala City, G'tamala
11700	25.64	CB1170	Santiago, Chile
11535	26.01	SPD	Warsaw, Poland
10370	28.93	Radio Nacionales	Salamanca, Spain
9685	30.98	TGWA	Guatemala City, Guat'mala
9640	31.12	CXA8	Montevideo, Uruguay
9630	31.15	HJ7ABD	Bucaramanga, Colombia
9606	31.23	ZTJ	Johannesburg, South Africa
9590	31.28	W2XE	Wayne, N. J.
9510	31.55	HS8PJ	Bangkok, Siam
9505	31.56	HID	Ciudad Trujillo, Dom. Rep.
6900	43.48	T12RS	San Jose, Costa Rica
6072	49.41	OER2	Wien, Austria
5977	50.19	Radio Renascenca	Lisbon, Portugal

STATION CHANGES

New Frequency	New Call	Old Call	Old Frequency
15440	....	XEBM	15300
11435	....	COCX	11500
11801	OER3	OER2	11801
9516.6	HJ6ABH	HJ4ABH	9520
6325	....	YNLG	8505
6145	....	HJ4ABE	6097
6105.1	HJ6ABB	HJ4ABB	6110
6085.7	....	HJ5ABD	6085
6070.5	....	HJ3ABF	6170
6054.3	HJ6ABR	HJ4ABU	6150
6042.3	....	HJ1ABG	6040.5
6007	....	Radio Burma	6097
5813	TIGPH2	T12H	5813
5146	....	PMY	5140
4900	....	HJ3ABH	6012
4880	....	HJ4ABP	6030
4860	....	HJ1ABE	9500
4740	HJ6ABC	HJ4ABC	6090
4660	HJ2ABJ	HJ1ABJ	6025

STATIONS DELETED

KC	Meters	Call	Reason
24380	12.3	CRCX	Not in service
6325	47.43	HH3NW	Not in service

NON-AUTHENTICATED STATIONS

Frequency	Call	Location
15650	JFZ	Japan (Oct.)
14010	VK5DI	Australia (Oct.)
10590	ZIK2	British Honduras (Dec.)
9580	OAX5C	Peru (Dec.)
9565	HP5S	Panama (May)
8900	COKC	Cuba (Dec.)
7600	HC1RJ	Ecuador (May)
7200	HC1AJ	Ecuador (May)
7100	....	Mexico (Nov.)
6600	HI6H	Dom. Rep. (May)
6485	HI1L	Dom. Rep. (Nov.)
6128	OAX7A	Peru (May)
6122	OAX4P	Peru (May)
6122	OAX6A	Peru (May)
6120	HP5Z	Panama (June)
6050	XEKM	Mexico (Nov.)
6000	OAX5A	Peru (May)
5835	YV5RR	Venezuela (Nov.)
4820	HJ7ABB	Colombia (Dec.)

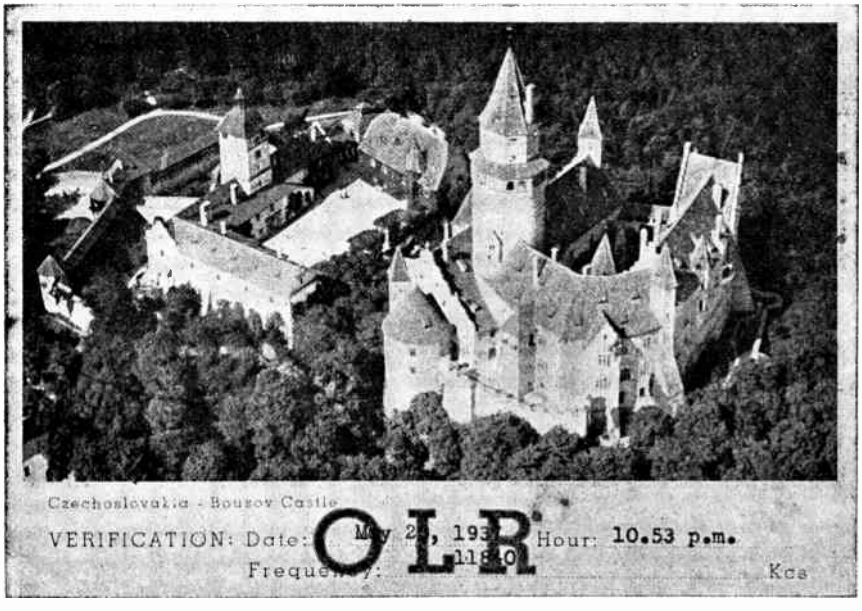


Photo-veri from Praha, Czechoslovakia.. Call in red.

BBC's 98 Clocks

In their daily struggle to maintain the accuracy of program timings, the program officials at Broadcasting House, London, have the assistance of 98 clocks, twenty-two of which are in the studios and the remainder in the silence-rooms associated with the studios. All are controlled electrically from a "master" in the control-room on the eighth floor, the "master's" accuracy being checked with the Royal Observatory, Greenwich, several times a day.

Broadcasting House is connected with Greenwich by a telephone line, which carries the six "pips" of the Greenwich Time Signal on the first stage of its

journey to listeners. The last of those "dot seconds," as they are technically known, indicates a point of time to a normal accuracy of one-twentieth part of a second.

Some of the studio clocks have been fitted with a red "sweep" hand which travels steadily round the clock-face, completing each cycle in sixty seconds. This makes possible, among other things, the calculating to the odd second of the time taken for fading a program in and out, the speed of a "fade" control being synchronized with the "sweep" hand of the clock.

Throughout rehearsals, however, a stop-watch is indispensable, for the running time of every number must be checked to the second. Even so, time is inevitably lost or gained when some programs are actually transmitted, and an over-run of one broadcast can seriously upset the timing of the next. If, for instance, a production has been timed to run for exactly sixty minutes, and the program that it follows over-runs by three minutes, the producer does not know that he will have to "cut" something or, if he does, how much, until the red light in the studio tells him that he is "on the air." Then he has to get each artist outside the studio as opportunity arises so that he can arrange a "cut". Afterwards he must send a note to the band to ensure that they will not play the wrong tune where the item has been deleted.

Recitals of phonograph records also demand split-second timing, especially if a complete opera, or some other big musical work, is being reproduced from several double-sided records. There must be no pause while records are being changed.

Radiophone and Experimental Stations

GBS, 12150 kc., Rugby, England, heard calling DON, 10128 kc., Germany at 4 p. m.

VLK, 10520 kc., Sydney, Australia, carried a program recently transmitted by GBP, 10770 kc., Rugby, England 2:30 to 3 p.m.

TYA2, 9037 kc., Paris, heard 2:17 to 2:28 p.m. broadcasting in French and English.

IRW, 19520 kc., Rome, Italy, heard working JVH, 14600 kc., Nazaki, Japan at 6:43 a.m.

LSL, 21160 kc., Buenos Aires, Argentina, heard calling Rio de Janerio at 5:49 p.m.

LSK-3, 10250 kc., Buenos Aires, heard talking with GCA, 9710 kc., Rugby, England at 6:35 p.m.

SUX, 7860 kc., Cairo, Egypt, heard testing with Europe between 4 and 5:30 a.m.

JCK, 9460 kc., Tripoli, Africa, heard talking with Rome between 5:30 and 6:30 a.m.

FZE8, 17280 kc., Djibonti, French Somaliland, Africa, sends a musical broadcast 6:45-7:15 a.m. first Thursday of each month.

CFA5, 9630 kc., and CJA6, 6760 kc., Drummondville, Ont., Canada tests with Europe near 8 a.m.

CNR, 12830 kc. and 8035 kc., Rabat, Morocco, used in radio telephone service daily with France between 2:30 a.m. and 3:30 p.m.

YSL, 13410 kc., San Salvador, El Salvador, heard testing 11:30-11:40 p.m. on about 10050 kc., and announcing call YSL. It is therefore possible that frequency has been changed.

A beautiful veri from Poland. Colors black and blue (Who's the man on the horse?)

LAST-MINUTE FLASHES

TGWA, 9685 kc., Guatemala City, Guatemala, 10 kw. power. Sunday 7:15 to 10 p.m.; Monday, Tuesday, Thursday, 9-11 p.m.; Wednesday, 9:30 to 10:15 p.m.; Friday silent: Saturday 10 p.m. to 1 a.m.

TGWA, 11760 kc., 15170 kc. and 17800 kc. Monday to Saturday 12:45 to 1:30 p.m.; Sunday 12 noon to 2:45 p.m.

TGWA, 11760 kc., may be used on programs day or night.

XEBT, 6000 kc., Mexico D.F., will soon increase power to 1.5 kw.

HC1PM, 5725 kc., Ecuador, temporarily off the air.

HIIL, 6480 kc., Santiago de los Caballeros, Dom. Rep., in non-authenticated block is on the air. Address: Radioemisora Nacional "El Diario," Calle "Presidente Triyillo, No. 97, Altos.

SM5SX, 15155 kc., Stockholm, Sweden, on the air weekdays 11 a.m. to 5 p.m.; Sundays 9 a.m. to 5 p.m.

SBP, 11765 kc., Motala, Sweden, Monday to Friday, 1:20 to 2 a.m.; 6 to 9 a.m.; 11 a.m. to 1:30 p.m. Saturday, 1:20 to 2 a.m.; 6 a.m. to 1:30 p.m. Sunday 3 a.m. to 1:30 p.m.

SBO, 6065 kc., Motala, Sweden, daily, 1:30 to 5 p.m.

CSW, Lisbon, Portugal, now uses 11840 kc., 11040 kc. and 9940 kc. On the air 1 p.m. to 8 p.m. (Off air until Dec.)

CT1AA, Lisbon, Portugal, 9650 kc. New call reported as CS2WA.

ZIK2, 10600 kc., Belize, British Honduras, on air Tuesday, Thursday and Saturday 7:30 to 7:45 p.m.

TIPG, 6410 kc., San Jose, Costa Rica, being heard with improved signal on about 11980 kc. broadcasting as "The Voice of Costa Rica." Apparently changed frequency or transmitting simultaneously on two frequencies.

Down-Unders

JDY, 9925 kc., Dairen, Manchukuo, is being heard in Eastern United States with excellent power and clarity. Their English period appears to be from 7:45 a.m. to sign off at 8 a.m.

JFAK is said by many listeners to be the call of a station in Japan on 9625 or 9630 kc., and its location to be Taihoku, Taiwan.

JZK, 15160 kc., and JZJ, 11800 kc., are still carrying the regular overseas programs and at the same hours as heretofore.

XGOX, 6820 kc., Nanking, China, is said to be off the air. A station with call of XGRX heard at 9590, 9625, and 9800 kc., but late reports indicate it is silent.

VK3LR, 9580 kc., Melbourne, Australia, advises that pending the provision of the new transmitter in Australia, an immediate improvement is being made by increasing the power of VK3LR to more than double that at which it is now operating.

The Postmaster General's Department, which handles the technical side of broadcasting in Australia, proposes to extend and improve the short-wave service by establishing a new transmitter in Victoria. No information was given as to the approximate date on which the new transmitter would be in operation.

PMY, Bandoeng, Java, is now on 5146 kc., instead of 5140 kc. Station is operated by the Bandoeng Radio Society, and has a new time schedule in this issue.

HS8PJ, 9510 kc., Bangkok, Siam, is

The new "Report of Reception" issued by the BBC. This is not a veri, but it's nice to have.

the new frequency being heard and reported by many as broadcasting on Mondays and Thursdays from 8 to 10 a.m. It is not yet known if broadcasts have been discontinued on 19020 and 9350 kc. Reports are being received that HS8PJ is still being heard on 9350 kc. on other days than Monday and Thursday. It is, therefore, possible that the service has been extended.

League of Nations

HBO, 11402 kc., and HBL, 9345 kc., Geneva, Switzerland, will be used on weekly League of Nations broadcasts this fall and winter, and the transmissions will occur on Friday nights instead of Saturday as formerly, which were sent over HBP, 7797 kc., and HBL, 9595 kc.

On account of the manner of stating these Friday broadcasts by the League, it is possible that those listed past midnight (GMT) will be heard in the United States on Thursday nights, unless the schedules really mean they are on Saturday morning, in which case they would be received here on Friday evening. However, subsequent revision can be made in later issue if incorrectly stated.

HBO, 11402 kc., and HBJ, 14535 kc., will continue to carry the broadcasts of the Swiss broadcasting authorities on Saturday nights from 6:45 to 8:30 p.m. as heretofore. The call "League of Nations Wireless," is not used on these Swiss transmissions. Reception reports for Swiss programs should be sent to address as shown under HBJ, 14535 kc. Those for League of Nations programs should be sent to address as shown under HBL, 9345 kc. The League advises that the response to the League Assembly broadcasts was so favorable that they decided to use the same hours and frequencies on the Friday programs.

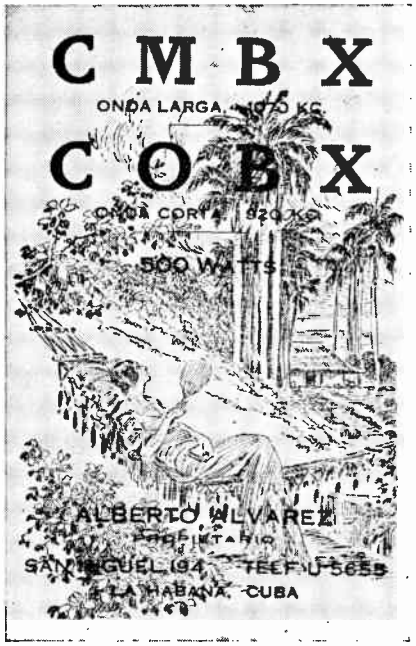
RNE, 12000 kc., Moscow, U.S.S.R., now has an English program daily from 10 to 11 p.m. in addition to its English broadcasts on Sunday and Wednesday. The station schedule shows RNE on 25 meters flat, which the writer figures is 12000 kc. The station comes in close to 12060 kc. Moscow insists it is on 25 meters, so must have a different method of converting kilocycles to meters! Education at long range is a trifle slow, so we will await developments.

RAN, 9600 kc., and RKI, 7520 kc., Moscow, are still broadcasting the English program daily from 7 to 9:15 p.m.

Europeans

The Minister for Posts and Telegraphs of the Irish Free State advises that the question of the erection of a short-wave broadcasting station is under consideration. It is proposed as a preliminary to install short-wave equipment of an experimental character at the Athlone High Power Station, but a decision has not yet been reached as to the frequency on which the station, if ultimately decided on, will transmit.

Radio Renascenca, or "Emissora Catalica Portuguesa" 5977 kc., Lisbon, Portugal, is now operating as shown in list. At present station has 250 watts power, but advises it will soon increase power to 2½ kw. No call letters or interval signals, but plays the hymn, "Our Lady of Fatima" at the opening and closing of transmissions.



COBX veri. Calls in red, sketch in green, the remainder in black. (Who's the woman in the hammock?)

PI1J, Dordrecht, Holland, 7088 and 14164 kc., is not a broadcasting station, but an experimental one for educational and scientific purposes. Dr. Hellingman states, however, that they make regular tests on the scheduled hours as mentioned in this section in November, and transmit recordings of musical selections and give talks in Dutch, English and German.

2RO, Rome, if not found on 11810 kc., will be on 9635 kc., with same schedule as listed under the first mentioned frequency.

ORK, 10330 kc., Brussels, Belgium, is constructing a new building for the housing of its plant at Ruysselede, which will be completed in 1938. New modern equipment will be installed and power of station materially increased, which will insure more satisfactory transmissions.

TPA2-3-4, Radio Coloniale, Paris, do issue a veri card although not so attractive, and quite difficult to secure; persistency must be one of your traits to procure one.

CSW, 9940 and 11040 kc., Lisbon, Portugal, has been off the air for a time, according to reports, due to the installation of a new 10-kw. transmitter. It is not known if a change in frequencies will be made or not.

SPW, 13635 kc., and SPD, 11535 kc., Warsaw, Poland, are on the air simultaneously with 2-kw. power. The call of the latter frequency was given, heretofore, as SPB. While these stations have been broadcasting mostly from 6 to 7 p.m., it is not known as yet what the regular schedule will be or if the programs at the noon hour have been or will be discontinued. They are maintaining a much better signal although some code interference on both frequencies at times. They are employing antennas beamed to North and South America.

Six short-wave broadcasting stations are under construction in Rome. Two will use 100-kw. power, and three will operate with 50-kw., and the sixth is to transmit on ultra-short-waves with 2-kw.

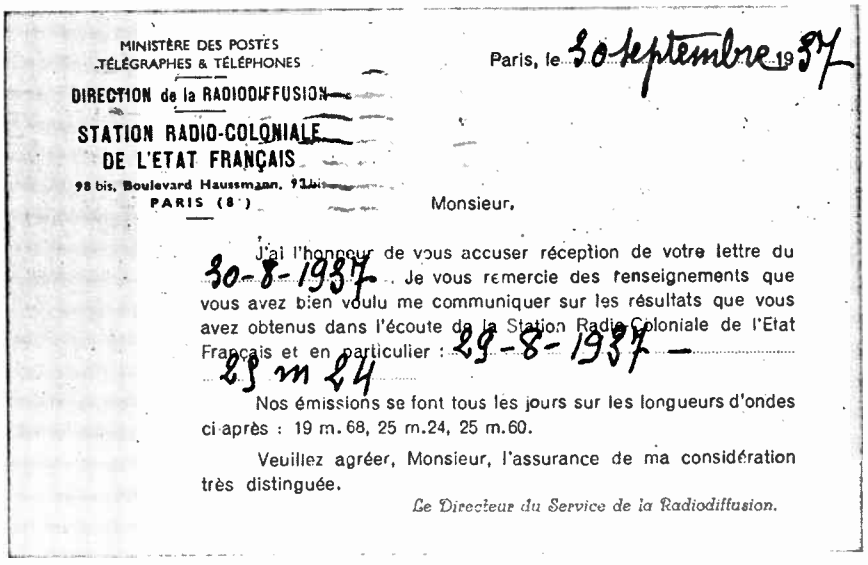
OER2, Vienna, Austria, transmits on 6072 kc., and OER3, on 11801 kc. No advice has as yet been received as to the exact days each week on which these frequencies are used.

Radio Nacionales, 10370 kc., Salamanca, Spain, is the listing of the new Insurgent station being heard with good signal strength nightly on their English program from 9 to 9:45 p.m. A majority of the announcements indicate station is on 10370 kc. or 28.93 meters, although one listener reports hearing them announce 10410 kc. or 28.82 meters. They have been operating from 10370 to 10425 kc. It has not as yet been learned if Radio Nacionales takes the place of EAJ43.

Finland is testing daily from 10 a.m. to 4 p.m. and relaying the National Finnish programs from Lahti, through the short-wave transmitter at Helsinki (Helsingfors). Station said to be on 6135 kc., or 48.90 meters. No advice has as yet been received as to when the new 1-kw. transmitter will be in operation. The station mentioned above is reported as having 75 watts power. This information furnished by Ingvar Gullberg, Hedemora, Sweden, who advises the address of the station is Suomen Ylesradio Fabianink, 15 Helsinki, Finland. A listener on the West Coast recently reported hearing a Finnish station in afternoons and usually signing off at 4 and 5 p.m. Mention of the new transmitter was made in this department in October.

The report of a new short-wave station in Lithuania appears to be premature. The Director General of Posts and Telegraphs advises that the matter of erecting a short-wave transmitter is being given consideration but no definite information can be furnished as plans have not been completed.

At present two long-wave broadcasting stations, LYX and LYY, are in operation with 7 and 10-kw. power respectively.



MINISTÈRE DES POSTES
TÉLÉGRAPHES & TÉLÉPHONES
DIRECTION de la RADIODIFFUSION
STATION RADIO-COLONIALE
DE L'ETAT FRANÇAIS
98 bis, Boulevard Haussmann, 98 bis
PARIS (8e)

Paris, le 30 septembre 1937

Monsieur,

J'ai l'honneur de vous accuser réception de votre lettre du 30-8-1937. Je vous remercie des renseignements que vous avez bien voulu me communiquer sur les résultats que vous avez obtenus dans l'écoute de la Station Radio-Coloniale de l'Etat Français et en particulier : 29-8-1937 — 25 m 24

Nos émissions se font tous les jours sur les longueurs d'ondes ci-après : 19 m. 68, 25 m.24, 25 m.60.

Veuillez agréer, Monsieur, l'assurance de ma considération très distinguée.

Le Directeur du Service de la Radiodiffusion.

Not attractive, but authoritative, is this veri from "Radio Coloniale", France.

South Americans

HJ4ABD, 6133, 5900, 5780 kc., Medellin, HKV, 8795 kc., Bogota, HJ1ABC, 6000 kc., Quibdo, HJ2ABC, 4790 kc., Cucuta and HJ2ABD, 5980 kc., Bucaramanga are not accounted for in the new list of short-wave stations issued by the Minister of Communications of Colombia as being in effect in November and on. The situation on the 31- and 49-meter bands has been relieved somewhat by the transfer of stations to the 60-meter band and the change of frequencies on the first two named bands, which are reflected in station changes, making it unnecessary to detail in this section. It will be noted that changes have been made in call letters of stations as well as in frequencies.

VP3MR, 6070 kc., Georgetown, British Guiana, wishes mention made that they do not verify reports unless the necessary return postage is included, usually in shape of Int. Reply Coupon or in coin. All reports, however, are acknowledged on the air on Saturdays in the weekly mail-bag at approximately 7:15 p.m. E.S.T.

HJ7ABB, 4820 kc., is a new station to be installed at Bucaramanga, Colombia, within six months from the date of license, August 20, 1937. It will transmit with 750 watts power and will be known as Radio Santander. Station owner, Senor Francisco A. Bueno.

HC2CW, 8404 kc., Guayaquil, Ecuador, reported heard near 8618 kc.

HJ7ABD, 9630 kc., Bucaramanga, Colombia, continues to broadcast excellent programs and maintain a fine signal. Some listeners say that HJ7ABD broadcasts simultaneously with HJ2ABD, on 5980 kc. As the latter station was not listed in the late setup of the Minister of Communications of Colombia, it may be that the above statement is incorrect.

CXA8, 9640 kc., Montevideo, Uruguay, is listed in this issue. It is understood to relay LR3, Buenos Aires, Argentina.

CB1170, 11700 kc., Santiago, and CB1199, 11990 kc., Valdivia, Chile, are listed in station list. It is reported that CB1170 was originally broadcasting on 11760 kc., but subsequently changed to 11700 kc., the call being likewise changed. CB1199 is same station which was transmitting near 12007 kc., when its location was thought to have been Santiago instead of Valdivia. Some report the call as "Emisora Valdivia," and the address, Casilla 731.

OAX5C, Radio Universal, Ica, Peru, reported by several listeners as heard recently on 9580 kc. It is not yet clear as to whether OAX5A on 11796 kc., is in operation as "Radio Universal" at Ica, and until such time as facts are available the listing will remain unchanged and the first mentioned station will be shown in the non-authenticated block.

CT2AJ, 4002 kc., Ponta Delgada, Island of St. Michael, Azores is the only station in the Azores which carries broadcasting programs for entertainment regularly, although not received often in the United States. CT2AJ has a small crystal-controlled transmitter assembled some years ago by a British engineer, and only 50 watts power. Station owned by Messrs. Joao Soares, Jr., and son, of Ponta Delgada. The son, Sr. Deodato Soares, is an expert in repairing radios and electrical equipment of all sorts. He also acts as announcer at the broadcasting station.

C.A. and West Indies

Radio Fort de France, 9450 kc., Martinique, is not being heard. The Department of Commerce bulletin states that this station has an assigned frequency of 7000 kc., and power of 200 watts, and further adds that it is reported that station has ordered new 1-kw. equipment.

ZIK2, Beliza, British Honduras, heard testing and broadcasting close to 10590 kc., 7:09 to 7:33 p.m. recently. Musical program of local talent and recordings. Station announced they would be on the air again on Monday at 6:30 p. m.

HI1D, 9505 kc., Ciudad Trujillo, Dominican Republic, is the latest new station to be heard in that country. It broadcasts early evenings and signs with the National Anthem either at 8:40 or 9:40 p.m. Station is maintaining a fairly good signal.

HH3W, 9645 kc., Port-au-Prince, Haiti, uses 4 chime notes preceding station announcements each fifteen minutes. The siren heard is used only before one special advertisement, which is made every fifteen minutes.

HI1A, 6190 kc., Santiago de los Caballeros, Dom. Rep., has a new time schedule. On Thursdays and Sundays this station presents the Duarte Park Municipal band concert from 7:40 to 9:40 p.m.

The call letters and assigned frequency of the Mexican station operating near 7100 kc., has not yet been learned. For details available see page 578 November ALL-WAVE RADIO.

TGWA, 9450 kc., Guatemala City, Guatemala, is evidently out of the picture, as the new 10-kw. station is on the

air with a wonderful signal. They have tested and announced frequencies of 11760 kc., and 9685 kc. It is said that assigned frequencies are 9725, 11760, 15170 and 17080 kc., but this statement has not been verified. We have listed TGWA on 9685 and 11760 kc.

YSM, 11710 kc., and YSD, 7894 kc., San Salvador, El Salvador, now have regular schedule which is shown in station list. As no schedule was given for YSH on 9520 kc., it is assumed this station will be used irregularly. The transmitter in use is Western Electric 14-C, 400 watts output and half-wave antenna.

TG2, 6310 kc., Guatemala City, Guatemala, is still retained in station list on same frequency as no definite advice of its new frequency has been received.

YNRG, 6325 kc., Managua, Nicaragua mentioned in this section in November and in non-authenticated block in same issue, is probably YNLG, which has been changed from 8505 kc.

TI2RS, 6900 kc., San Jose, Costa Rica, is listed in this issue. Station known as "Radioemisora Athena" and operated by Rogelia Sotela, Proprietor.

HP5A, 11700 kc., Panama City, Panama, now has correct schedule of time on the air. Excellent programs are transmitted. Station employs a Collins transmitter with 600 watts instead of 500 watts as first reported.

COKE or COKC may be the call of the new Cuban station being heard from 8900 to 9000 kc. All seem agreed that its location is Havana. The interference from code is rather strong at this point, which makes it difficult to identify the station.

U. S. Stations

W4XB, 6040 kc., Miami, Florida, has not as yet been heard, at least no reports have been received, although the last report from station was to the effect it would again be on the air not later than September 15th.

W1XAL is transmitting its regular program material on 15250, 11790 and 6040 kc.

W2XE has a new frequency—9590 kc. This station is authorized to share time with W3XAU but frequency is not being used at the present.

W1XK, 9570 kc., Boston, advises that station does not issue verification cards, and, as a general statement, does not verify reception reports unless such reports are more or less outstanding, or from individuals who have, by their letters, given information which is of definite value. But from reports received verification cards have been issued and at late dates.

W2XDV, 31600 kc., 50-watt experimental ultra-high-frequency broadcast station, relaying the programs of WABC, Columbia Broadcasting System, has been added to list. W2XDV is located in the CBS Building, New York, N. Y. It is licensed also to operate on 35600, 38600 and 41000 kc., but is using only the 31600 frequency at present.

W2XHG, 41000 kc., and W2XDG, 38650 kc., ultra-high-frequency broadcast stations of the National Broadcasting Company have been added to station lists. These stations are located on top of the RCA Building in New York City with an elevation of approximately 830 feet. The power radiated is 100 watts which gives a fairly good coverage over Metropolitan New York.

DECEMBER ACE REPORTERS

L. P. Ambrosius, Louisville, Ky.
Paul J. Barter, Melrose, Mass.
W. E. Blanchard, W3E1, Bangor, Maine
T. G. Brawley, W9J6, Greenville, Ohio
Ernest Curry, W4F9, Pittsfield, Mass.
Frank R. Dryden, Houston, Texas
Zygmunt Drega, W3F27, Ware, Mass.
J. L. Everett, V37F3, Toronto, Ont., Canada
G. C. Gallagher, San Francisco, Calif.
Frank J. Gleeson, F12S1, New Orleans, La.
E. G. Granger, W5F2, Syracuse, New York
D. C. Greenwood, W3G13, East Longmeadow, Mass.
Edgar H. Grossman, VE29A3, Vancouver, B. C., Canada
R. Jones, W8J1, Coshocton, Ohio
M. E. Leshner, W3F32, Lawrence, Mass.
Arthur Maitland, New York City, N. Y.
H. M. McIntyre, W11H28, Harvey, Ill.
Anthony L. Okolish, Barberton, Ohio
R. B. Oxrieder, W6H5, State College, Pa.
John Pollack, Brooklyn, N. Y.
J. A. Piechuta, W3G14, Meriden, Conn.
J. W. Partner, W29C1, Tacoma, Wash.
Harry G. Runyon, W4H38, Bernardsville, N. J.
George C. Starry, W7J12, Derry, Penna.
R. Simpson, VK3, Concord West, Australia
Theodore C. Smith, Ogdensburg, New York
Shiko Tahara, Compton, Calif.
P. E. Thompson, New York City, N. Y.
Harold I. Tucker, W4G20, West Point, New York
W. J. Thomas, W5J4, Ashton, Md.
J. M. Unkefer, W8H14, Minerva, Ohio
A. Velasco, Mexico City, Mexico
Roy Waite, W4F11, Ballston Spa, New York
H. Wilson, Jr., Ithaca, New York
Mr. & Mrs. R. E. Weikals, Pratt, Kansas
C. R. Wilson, W3E3, Portland, Me.


Radiodifusora Maracaibo
(Ex Y V 7 R M O)
YV1RD | P. O. BOX | YV1RE
6070 Kc. | 100 | 1153 Kc.
Maracaibo, Venezuela, S. A.
Agradecemos su calioso reportaje de nuestro programa de
-193- -y gustosos verificamos su exactitud, rogándole se sirva reportarnos nuevamente.
YV1RD
We are glad to send you this QSL card verifying your appreciated report of our program dated January 30th 1937. We thank you and will be glad to receive new reports again.
Maracaibo: April 28th 1937
Luis Mantellini, hijo: (Proprietario owner)

Radiodifusora Maracaibo veri. Call in red, printing in blue.

Canadians

CJRX, 11720 kc., and CJRO, 6150 kc., advise they are still operating simultaneously on these frequencies from the Royal Alexandria Hotel in Winnipeg, Manitoba, Canada. New time schedule in this issue.

VE9CA, 6030 kc., Calgary, Alberta, Canada, advises there is no change in schedule as listed. Radio VE9CA relays all the regular programs of long-wave station CF6N at Calgary.

CRCX, 6090 kc., Bowmanville, Ont., Canada states that at the present time

(Continued on page 670)

Channel Echoes

By ZEH BOUCK

WANTED—A PROGRAM PICKET . . . PUGS AND PLUGS . . . SCIENTIFIC LOGGING

IT'S ABOUT time something were done concerning the inane laughter which provides additional pollution to so many of the programs featuring our so-called comedians. Doubtless many readers have wondered at the consistent collection of imbeciles which the broadcasters accumulate for studio audiences — congregations of morons who laugh uproariously at the most stupid *witlesscism* . . . pale ghosts of jokes that leave you, in front of the loud speaker, with about as much inclination to laugh as a Green mask for Anguish. We hasten to assure you that this is no fault of the studio audience — except to the extent of following instructions. They laugh when the program director holds up a big sign that reads "LAUGH" — which he does every time the word "laugh" is written into the script.

This business started back around a decade ago when comedians were running short of gags. The jokes were so bad that the radio audience rightly kicked about the programs. The comedians tried to improve upon their lines — but as the majority of them were as stupid as they sounded (then and now) few of them could concoct a joke that really rippled the midriff. The professional gagmen, patterning their efforts on the past style of the comedians, were of little assistance. Finally some bright lad had the inspiration to revoke the then universal rule of silence on the part of the studio audience. In fact he went the old order one better and commanded the audience to laugh at all jokes. Appreciating that it would be very difficult to tell what was a joke and what wasn't, the elementary but effective sign system was devised.

It worked like magic. An irate listener who ordinarily would have written a scoriating bit of sarcasm to the station concerning the quality of humor on the Whoosis Baker's Wisecracker Hour was nicely subdued, figuring that when so many people went into hysterics over the joke, he himself might be the one out of step.

The system is insidious and malicious. It has lowered the never very lofty standard of radio humor until it is somewhat less elevated than a snake's shadow. Aside from the decreased protest on the part of the radio audience, the laughter of the studio claque convinces the would-be comedian that he is good — despite the fact that he is of course aware that it is command laughter. He, his gagmen and script writers make no effort to improve upon his technique and gags. On the stage — before an unprompted audience — the utter silence of his listeners, except for an occasional groan, would promptly force him to revise both or go out of business.

What to do? ALL-WAVE RADIO will present a life subscription to anyone who will make an adequate protest. It can be done very easily, and with a reasonable amount of dignity. Simply attend a broadcast as a studio guest. We'll personally be glad to supply you with tickets for any broadcast you feel worthy of this special attention. Take a seat up front. When the sign is raised "LAUGH," just yell at the top of your voice, "I won't laugh." Don't indulge in profanity, no matter how great the urge. That would be a serious federal offense, and we'd much rather send ALL-WAVE RADIO to you at your own home. You will of course immediately be escorted from the studio. Go without physical protest—but get in as many "I won't laughs" as you can on the way out. Drop a letter to each of your local newspapers, explaining that you were ejected from such and such a studio — and tell why. Then send us a clipping and ALL-WAVE RADIO is yours until death do us part — one way or the other. Or better yet, let us know beforehand just what program you are going to picket and we'll be in front of the loudspeaker all ears.

✦

ECHOES . . . The Colliers Hour . . . first, and for many years foremost among the dramatic hours. The accompanying photograph shows this old classic being rehearsed back in 1923. TEASER FOR THE MONTH: A free subscription to the first satisfactory explanation as to why this is a rehearsal and not a broadcast. This is one for old timers.

AND WHILE SPEAKING of free subscriptions, one goes to Allan B. Shaw, 3449 79th Street, Jackson Heights, N. Y., who nominates the "Lucky Strike Hit Parade" as radiodor for the month. He writes: "I consider the type of advertising on this program the lowest thing in all the major broadcasts. You say that Boake Carter's technique is bad. If so, Lucky Strike's is blasphemous!"

(Continued on page 670)

Rehearsing the Colliers Hour—an old time radio thriller—back in 1923. There's a catch in this picture for sleuths who will take time to read the accompanying paragraph.

Night-Owl Hoots

By RAY LA ROCQUE

DX CONTEST UNDER WAY . . . MONITOR VERIES . . . CUBAN HETERODYNES . . . IDA STUNT . . . FCC FREQUENCY TEST PROGRAMS . . . AUSSIE AND ZEDDER CHANGES

THEY'RE off! We mean the DXers entered in this season's ALL-WAVE RADIO Championship Contest. This year's entries include practically all the leading DXers of North America as well as the defending champions—the 1936-37 winners! There is still time to enter, if you have not already done so. Late entries will be able to participate by reporting 20 stations instead of 10 during each semi-weekly period of competition until they have reported the same number of times as the charter entries. No new teams will be formed, but late entries may get an opportunity to be placed upon a team as a substitute for some DXer who has found it impossible to keep step with the others. So, if you are interested in enjoying some fine competition among the cream of DXers, or if you merely want to have some good, clean fun, enroll now! The first scoring results will appear next month.

Monitor Verifying

The Chief Night Owl is in an argumentative mood, owlets—so it giffs an editorial. We simply want to take up the cudgel in defense of a few of the country's most prominent DXers, who have been accused, among other things, of ruining our favorite hobby. We refer to the unjust panning directed against the boys who are giving up much of their spare time in order to keep a log (or to monitor as it is called) of certain stations maintaining a non-verifying policy. From these logs the boys are able to check reports that are submitted by DXers. Reports are then verified by means of an attractive card in which they have invested some of their spending money. That the boys ask a few pennies from the DXers to help defray this cost and the cost of postage is only fair. "A racket," someone has called it, but 'tis a darn poor paying racket, say we! If the boys do not spend twice the amount received, not to mention the time lost in performing this service, then we'll eat these words, letter for letter. We have only our noisiest jeers for a large broadcasting house (who refuse to spend any money or time on DXers themselves) that has publicly denounced these boys for trying to perform a service to DXers. They have tried to

New Stations

——	Goerlitz, Germany	1231 kc.	5000
——	Maridiaz, Colombia	1500 kc.	——
——	El Poblado, Colombia	1370 kc.	——
——	Saarbruecken, Germany	1231 kc.	5000
CBF	Vercheres, Quebec	910 kc.	50000
CMBL	Havana, Cuba	710 kc.	2500
CMCH	Havana, Cuba	1110 kc.	5000
CMCM	Havana, Cuba	850 kc.	250
CMJQ	Camaguey, Cuba	1080 kc.	200
CMKS	Guantanamo, Cuba	960 kc.	60
YV5RS	Caracas, Venezuela	1300 kc.	2000
3LK	Lubeck, Australia	1090 kc.	2000
4LG	Longreach, Australia	1100 kc.	300
4ZR	Roma, Australia	1450 kc.	100
5DN	Adelaide, Australia	960 kc.	500
5SR	Adelaide, Australia	1340 kc.	100
6PM	Freemantle, Australia	1390 kc.	100
7QT	Queenstown, Australia	900 kc.	100

Frequency Changes

Gleiwitz, Ger.	1230-1231 kc.	2BH	1050-1060 kc.
		2DU	1060-660 kc.
Hamburg, Ger.	900-904 kc.	3AR	630-620 kc.
		3MA	900-1360 kc.
Konigsburg, Ger.	1348-1384 kc.	3MB	1390-1490 kc.
		3YB	1270-1210 kc.
CKY	910-960 kc.	4TO	1080-1160 kc.
CMBC	850-640 kc.	4VL	1130-1430 kc.
CMCJ	1100-1110 kc.	4WK	1360-1340 kc.
CMCU	1280-1290 kc.	5MU	1340-1450 kc.
CMGF	1120-1150 kc.	7ZL	590-630 kc.
CMHO	1070-1480 kc.	7NT	750-710 kc.
CMK	640-730 kc.	7HT	1330-1080 kc.
CRCM	910-1050 kc.	7BU	1390-660 kc.
XEDP	610-1080 kc.	1-ZJ	1320-1310 kc.
XELO	1110-670 kc.		

Power Changes

Kassell, Ger.	(1195)	2000-500	
Konigsburg, Ger.	(1031)	10000-100000	
Magdeburg, Ger.	(1330)	2000-500	
CMQ	(880)	2500-25000	
CMX	(920)	1000-10000	
LS-11 (IDA)	(1440)	700-60000	
ZHL (IDA)	(1333)	-3000	
2AD	(1080)	-100	
2CO	(670)	1000-7500	
2KO	(1410)	100-500	
2QN	(1440)	-100	
2WG	(1150)	200-1000	
2ZB	(1120)	-1000	
3BA	(1320)	50-500	
3BO	(970)	1000-200	
3MB	(1490)	-100	
3HA	(1010)	300-750	
3YB	(1210)	50-100	
3TR	(1240)	500-100	
3SR	(1260)	500-2000	
3SH	(1130)	50-100	
3UL	(1000)	100-200	
4AY	(860)	100-500	
4MB	(1060)	50-100	
4AK	(1220)	1000-500	
4WK	(1340)	50-100	
5CL	(730)	2000-4000	
5MU	(1450)	200-100	
6KG	(1210)	85-500	
7BU	(660)	-100	
1-YX	(880)	500-150	

Location

——	(1195)	Kaiserslautern to Freiburg, Ger.
XELO	(670)	Piedras Negras to Tiajuana, Mex.
4ZC	(1280)	Otago to Cromwell, N. Z.

Call Letters

CRCM	(1050)	to CBM
CRCO	(880)	to CBO
CRCT	(840)	to CBT
CRCV	(1100)	to CBR
CRCW	(600)	to CBW
2VW	(1110)	to 2UW
4ZB	(1010)	to 4ZD

Delete

CRCY	(1420)	3HS	(1370)
2LV	(880)	3YB	(1060)
2TM	(1490)	4GY	(1420)

Neat veri card from KWG, Stockton, California, sent along by Anthony C. Tarr to whom it belongs.

stop them with threatening letters.

The fear that all DXers personally will try their hand at monitoring stations in order to make a little extra cash is just an unfounded one—for DXers still prefer to get their veries direct from the stations when possible. It is only in the case of non-verifying stations that the idea can be worked out and non-verifying stations on the broadcast band are too few to make the situation alarming. So we ask DXers and clubs to give a few cheers for these generous and helpful minded DXers—and to stand by them now as they stood by you when you needed that veri last season! Should we sit idling while our hobby is being controlled by a group of broadcasters who are not even mildly interested in the hobby and who have never contributed anything to its support? No says the chief. What do you say?

With the Night Owls

Choice selections from the Letters of the Month constitute the copy for this department. Instead of acknowledging all letters here, where space is valuable, the chief acknowledges all of them personally.

Richard Wright (W11H6), Chicago, Ill.: "Have heard XELO testing from Tiajuana on 670 kc. every morning about 1:30 a. m. WSIX now in Nashville is testing a new 250-watt xmittr."

Richard H. Cooper, Kittanning, Penna.: "KSUN has long been among the stations that refuse to verify. I have recently arranged to furnish this station with a quantity of verification cards and they will now verify all correct reports that include a 3c stamp. Reports should be sent to David G. Karbach, the chief engineer at the station."

C. J. Cooper (VE29A2), Vancouver, B. C.: "The Canadian Broadcasting Commission's station CRCV has changed its call to CBR. Frequency—1100 kc.; power—5000 w.; schedule 8 a. m. to 11 p. m. They will verify correct reports."

Harry Honda, Los Angeles, Calif.: "Time on the air for the following Southwestern stations: XELO—670 kc. tests from 2 a. m. nightly. XEBG signs off at 1 a. m. daily."

Anthony C. Tarr, Seattle, Wash.: "Here's a new one: XEAU, 1310 kc., Tiajuana, Lower California, heard testing and requesting reports at 3:10 a. m. From the signals I would judge the power to be 250 or 500 watts.

Richard Wright (W11H6), Chicago, Ill.: "Recently heard a program over NBC-WENR in which there was an exchange of programs between TGW and NBC. Secretary of State Hull sent greetings to TGW and TGWA on completion of their new 10 kw. xmitter. Later I heard TGWA and they announced that TGW was operating on 1230 kc., not 1210 kc. as listed. I am compiling card catalog of transmitter locations. Anyone able to furnish information please forward to 2762 Harper Ave., Chicago."

Bill Stone, Toronto, Ontario: "CHWK, Chilliwack, B. C., 780 kc., will conduct a DX program for NNRC. According to arrangements between myself and the station this program will be conducted in the first Saturday of each month from 2:45-4 a. m."

Bill Stone, Toronto, Ontario: "You are mistaken regarding CRCT and CRCY not verifying. They both verified for me this week. CRCT sent back my own veri, CRCY sent one of theirs." (We're glad to know this, but are inclined to believe your veri is due entirely to local favoritism as they emphatically refused to check any contest reports last season and sent every one of them back without so much as commenting on them. Of course they may have changed their policy—we hope so. —The Chief.)

Isaac T. Davis, Elkhart, Texas: (Too late to be included in the regular forecast, come a few tips from Southwestern DXers from this correspondent—. The Chief) "XGOA—660 kc. should come in around R5, 5-7 a. m.; JOCK-1—730 kc., 4-7 a. m. R6; JOSK—740 kc., 4-7 a.m. R6; JOHK—770 kc., 4-7 a. m. R7; JOIK—810 kc., 5-7 a. m. R6.; JOBK—990 kc., 4-7 a.m., R6.; Munich, Germany—740 kc., 2-3 a. m., R6."

Kilocycling Around

It's mutiny, that's what it is! First the Cuban Radio Bureau flashes out the news of some important changes about to take place in Cuba—then the changes never materialize and we're stuck with them. CMBC was supposed to move from 630 to 850 kc., and CMK was to take over the 630 kc. channel leaving 730 kc. vacant. Before any changes take place a new one, CMCM, takes possession of 850 and both CMBC and CMK necessarily must remain on their original channels. Now what chance has the Chief of getting the Cuban listings correct, when press releases contradict each other as these do? . . . Here's one Cuban change which you can accept as authentic—it should be, as it was heard on the air over the stations concerned in the changes. The news is that CMQ's former transmitter is operating on 710 kc. under the call CMBL, the new CMQ with 25 kw. using the old 880 channel. These two stations, together with CLCQ, usually operate simultaneously as a local network . . . Another complicated situation has been cooked up in Cuba. A permit authorizes a Havana firm to operate a new station, CMCH, with 5 kw. on 1110 kc. CMCJ is now firmly entrenched on this channel and the Radio Bureau clearly (?) explains the situation by saying that the matter will have to be adjusted between the two stations. It's the Chief's opinion that CMCJ is not going to give up any of its money producing hours to a new station.The result will only be known by keeping tuned to 1110 kc. for the next few months.

A clipping sent to us by W. Hallgren (W31J6) of Santa Rosa, California, reveals the following method of airing news items used by the Santa Rosa *Press Democrat* and the Santa Rosa *Republican.* News flashes from both papers are relayed to Panama City and are broadcast over the air by announcer George Williams at HP5J. These programs occur every second and fourth Monday at 3:30 p. m. and the station's short-wave frequency of 9590 kc. enables the Santa Rosa residents to tune in on their local news via Panama! . . . By

ALL-WAVE RADIO'S
Time Table of DX Programs
(All schedules given in E. S. T.)

Specials

Wednesday Morning, Dec. 1		
WTOC	Savannah, Ga.	1260 kc. 3:00-4:00
Saturday Morning, Dec. 4		
CHWX	Chilliwack, B. C. (NNRC)	780 kc. 2:45-4:00
Sunday Morning, Dec. 5		
KOB	Albuquerque, N. M. (IDA)	1180 kc. 3:00-4:00
WJBO	Baton Rouge, La.	1120 kc. 2:00-4:00
Thursday Morning, Dec. 9		
WHIS	Bluefield, W. Va.	1410 kc. 2:30-3:30
WLLH	Lowell, Mass.	1370 kc. 1:45-2:00
Sunday Morning, Dec. 12		
CKWX	Vancouver, B. C. (IDA)	1010 kc. 2:45-4:30
WFMD	Frederick, Md.	900 kc. 2:00-5:00
Thursday Morning, Dec. 23		
WJJD	Chicago, Ill. (IDA)	1130 kc. 4:00-5:00
Sunday Morning, Dec. 26		
WJBO	Baton Rouge, La.	1120 kc. 2:00-4:00
Wednesday Morning, Dec. 29		
WTAM	Cleveland, Ohio (IDA)	1070 kc. 3:00-4:00
Friday Morning, Dec. 31		
WEAU	Columbus, Ohio	1050 kc. 5:30-6:00
WLLH	Lowell, Mass.	1370 kc. 1:00-1:15

Regulars

Every Saturday Morning		
KRLC	Lewiston, Idaho	1390 kc. 3:00-4:00
Every Sunday Morning		
KMTR	Los Angeles, Calif.	570 kc. 12:00-12:30
TGW	Guatamala City, Guatamala	1230 kc. 12:00-6:00

the way, you'll notice many changes in Australia and New Zealand of late. Our thanks to G. E. Botts of New Zealand for furnishing us with a revised list. Besides those stations listed in the deleted section of the changes, the following commercial stations have been sold to the government and will undoubtedly be closed down: 4ZO (1010), 4ZR (1340), 2ZM (1150), 2ZD (1170), 2ZH (820), 2ZR (920), 2ZF (960), 2ZP (900), 3ZM (1470) and 3ZR (940) . . . If you miss the NNRC special broadcast from WFMD in Frederick, Md., on the 12th, then you can just about say you've missed the best program of the year. It's to be another of those super-collosal specials put on by the Baltimore boys and they'll do everything from razzing the other chapters to singing Christmas Carols! The station will have its usual supply of recordings on hand, but once the boys get hold of the mike—it's the gate for those canned artists. Souvenirs will go to everyone reporting and prizes will be given so many. So, Night Owls, 'tis 900 kc. on the morning of December 12 for the potentially best program of the season!

Now that WCAL and WLB have obtained permission to move to 760 kc., WTCN will have full time privileges on 1250 kc. . . . For the benefit of those who have asked and those who are wondering whether the FCC frequency test programs will count in the new contest this year—we reply very decidedly in the affirmative. Just in case you did not already know it, these tests are conducted during the second week of each month. Below we list the Monday and Tuesday morning tests. Tests for the rest of the week will appear in succeeding issues of AWR.

Every Second Monday		*Every Second Tuesday*	
2:00	WLNH 1310 kc.	2:00	WBAX 1210 kc.
	WJBO 1120 kc.	2:10	WDAS 1370 kc.
2:10	WBRB 1210 kc.	2:20	WBBL 1210 kc.
	WHBB 1500 kc.	2:30	WFBG 1310 kc.
2:20	WMAS 1420 kc.	2:40	WMBG 1210 kc.
	WIOD 1300 kc.	2:50	WEBR 1310 kc.
2:30	WWRL 1500 kc.	3:00	KDAL 1500 kc.
	WJBW 1200 kc.		WLVA 1200 kc.
2:40	WOKO 1430 kc.	3:10	KPAC 1260 kc.
	WMBR 1370 kc.		WBTM 1370 kc.
2:50	WCAX 1200 kc.	3:20	WKRC 550 kc.
	WOPI 1500 kc.		WHEC 1430 kc.
3:00	WMBO 1310 kc.	3:30	WNAD 1010 kc.
	WMSD 1420 kc.		WMBC 1420 kc.
3:10	WOC 1370 kc.		WRAK 1370 kc.
	WCAD 1220 kc.	3:40	KFVS 1210 kc.
	WMFN 1210 kc.		WJAC 1310 kc.
3:20	KWLC 1270 kc.	3:50	WTAW 1120 kc.
	WMBQ 1500 kc.		WBNS 1430 kc.
	WNBR 1430 kc.		WBNY 1370 kc.
3:30	KFPW 1210 kc.	4:00	WCOL 1210 kc.
	WMFF 1310 kc.		WBRE 1310 kc.
	WDBO 580 kc.	4:10	KLPM 1240 kc.
3:40	KABC 1420 kc.		WPAR 1420 kc.
	WQDM 1390 kc.		WPAY 1370 kc.
	WSMB 1320 kc.	4:20	KRMD 1310 kc.
3:50	WFAS 1210 kc.		WOMT 1210 kc.
	WHEF 1500 kc.		WSYR 570 kc.
4:00	KFDM 560 kc.	4:30	KGCA 1270 kc.
	KLS 1280 kc.		WJAY 610 kc.
	WCAP 1280 kc.		WNBF 1500 kc.
	WAGF 1370 kc.	4:40	KTEM 1370 kc.
4:10	KCRJ 1310 kc.		KGBU 900 kc.
	KMLB 1200 kc.		
	KYOS 1040 kc.		WGH 1310 kc.
4:20	KLUF 1370 kc.	4:50	KGVO 1260 kc.
	KGDM 1100 kc.		KRLH 1420 kc.
	WDEV 550 kc.		WHK 1390 kc.
	WDNC 1500 kc.		WWSW 1500 kc.
4:30	KROC 1310 kc.	5:00	KGCX 1450 kc.
	KGAR 1370 kc.		KRMC 1370 kc.
	KALB 1210 kc.		WSPD 1340 kc.
4:40	KOVC 1500 kc.	5:10	KAST 1370 kc.
	KROY 1210 kc.		KNET 1420 kc.
	WBNO 1200 kc.		WAVE 940 kc.
4:50	KEUB 1420 kc.	5:20	KCMO 1370 kc.
	KRE 1370 kc.		KFH 1210 kc.
	WLAK 1310 kc.		WXYZ 1240 kc.
5:00	KBST 1500 kc.	5:30	KIDW 1420 kc.
	KIEM 1450 kc.		KPQ 1500 kc.
	WFOY 1210 kc.		WGAR 1450 kc.
5:10	KDON 1210 kc.	5:40	KFIO 1120 kc.
	WMIN 1370 kc.		KOY 1380 kc.
	WTAL 1310 kc.		WCAT 1200 kc.
5:20	KTRH 1290 kc.	5:50	KLAH 1210 kc.
	KUMA 1420 kc.		KORE 1420 kc.
	WAIR 1250 kc.	6:00	KOOS 1200 kc.
5:30	KFGQ 1370 kc.		WLBL 900 kc.
	KWG 1200 kc.		
	WGCM 1210 kc.		
5:40	KGMB 1320 kc.		
5:50	KGLO 1210 kc.		
	KVCV 1200 kc.		
6:00	KHUB 1310 kc.		

The above listing shows the commencement time for each broadcast. Tests are all of 20 minutes duration and station announcements are made every three minutes.

Cheers and Jeers

Three cheers to the IDA for their original "Programs of the Week" idea. During the DX season stations will conduct programs of high entertainment quality for all DXers and listeners regardless of club affiliations. At the close of the season a $10.00 cash prize will be given to the DXer who verifies the

(Continued on page 661)

ALL-WAVE RADIO'S DX FORECAST FOR DECEMBER

EASTERN NORTH AMERICA

General Forecast: *This is the month for Europeans. There may be a few TP's (very few) or more SA's, but efforts should be concentrated on the signals from across the Atlantic.*

Specific Forecast

T.A. ---	1st-31st, 12-3 a.m. and 5-7 p.m., R8. In short, don't be surprised at any signal that comes your way from this direction in December. Try every channel on which high-powered Europeans are located from midnight till 2:30 or 3 a.m. and from sunset till 6 or 7 p.m. Germans start at midnight, French and Italians around 1:45 or 2 a.m. 1st-31st, 5:30 to sunrise, R4 (maybe).
JOAK-2 870 kc.	Our long shot prediction for this month. We pick the Jap over the Aussies and Zedders because the mid-winter months are not so favorable for reception from the down-under stations. The long nights make it easier for the signals to cover the distance from Nippon to the eastern shores. If you should wake up to find this Jap's signals, then also try for JOAK-1 (590), JBCK (850), and JOIK (810).
1070 kc.	1st-31st, 6-10 p.m., R8. We'll stick to last month's prediction and pick these other Argentines as well as LR1: LR3 (1070), LR4 (990), LR5 (830), LR6 (870), LS2 (1190), LRA (750). And you might also try LS-11 (1440) who have just increased power.
PRE8 980 kc.	1st-31st, 6-8 p.m. R6. Good reception in localities remote from KDKA.
YV5RA 960 kc.	1st-31st, 5:30-10 p.m., R6. Best before XEAW signs on. While in Venezuela try for YV5RQ (882); and a new one, YV5RS (1300).
CMQ 880 kc.	1st-31st, sunset till 1 a.m., R9. This Cuban has been completely blotting out everything on 880. You cannot miss the new CMQ if reception is half-way decent. Rhumbas can also be heard over the following: CMX (920), CMBS (770), CMCF (815), CMBY (970), CMCJ (1110), CMCO (1200), CMBC (630), CMCM (850), CMCY (570), and CMCX (1050).
XEW 890 kc.	1st-31st, 12-2 a.m., R8. Border stations using high power are considered locals and are not listed. In interior Mexico try for: XEP (1160), XEK (990), XEMO (860), XEU (1010). Searching will reveal many more than we can list here.
XEFO 940 kc.	1st-31st, 1-2 a.m., R8. Daily program in English for American listeners.
TGW 1230 kc.	5th, 12th, 19th, 26th, 12-6 a.m., R7. Beg pardon folks, sorry to have caused you to lose any sleep over this one, but TGW has slipped one over on us and changed to 1230 kc. If you do not find them there—we'll give up forecasting Guatamalan reception!
TIPG 625 kc.	1st-31st, 7-12 p.m., R5. A good catch. Try sneaking in between 620 and 630 kc.—both very much overcrowded channels.
WKAQ 1240 kc.	1st-31st, 6-7 p.m., R7. Best just after sundown before locals get too strong.

WESTERN NORTH AMERICA

General Forecast: *Aussies and Zedders will drop in signal strength this month, but Japs will be stronger and a few European's may show up. Latin Americans should continue to come in well.*

Specific Forecast

4YA 790 kc.	1st-31st, 4-6:30 a.m., R7. Other Zedders easily heard: 1YA (650), 3YA (720), 2YC (840), 2YA (570). Those listed first are strongest.
JOAK-2 870 kc.	1st-31st, 5-7, R7. This one should be easy in December as well as many other Japs scattered over the band. Easiest heard stations shown in East Forecast.
4BH 1380 kc.	1st-31st, 5-6:30 unless otherwise stated, R6. This station, though not of very high power, is reported to be the most consistent Aussie in the west. Others which may be heard are:—R5: 4QN (600), 2CO (670), 2NR (770), 2BL (740), 4QG (800), 3GI (830), 2GZ (990) (till 6), 2KY (1040), 4AK (1220), 2CR (550), 3KZ (1180), 2CH (1190). R4 or less: 4BU (1480), 3BA (1320) (on at 5:30), 3DB (1030), 2GB (870), 5CL (730), 7NT (710) (on at 6), 2WL (1430) (on at 5:30), 3LK (1000), 3LO (770), and 5CK (640).
KGU 750 kc.	1st-31st, 3-5 a.m., R6. Other Hawaiians: KHBC (1400) 3-4:30 a.m., R7-8. KGMB (1320) 4-5:30 a.m., R7-8.
Rennes 1040 kc.	1st-31st, 2-3 a.m., R5. On occasions when reception from the east is good this one may be heard. Try Normandie on 1113 also.
YV5RA 960 kc.	1st-31st, R6. Just before XEAW comes on the air. Seldom reaches Northwest.
LR1 1070 kc.	1st-31st, 2-3 a.m., R6. Heard on occasional tests.
PRE8 980 kc.	1st-31st, 7-9 p.m., R7. Only in Southwest.
TGW 1230 kc.	5th, 12th, 19th, 26th, R5, 12-6 a.m. See East. Northwest DXers need not be too expectant.
WKAQ 1240 kc.	8th only, 2:40-3 a.m., R8 (weaker in Northwest).
WNEL 1290 kc.	11th only, 3:20-3:40 a.m., R8 (weaker in Northwest).
HAL 546 kc.	1st-31st, 6-7 a.m., R4. Here's our long shot for the West coast DXers. This station reported early in season by Northwest DXers. Signal evidently travels over the North Pole or takes an easterly route via Asia judging from the hour of reception. 100-1 you will not hear it, but it's worth trying anyhow.
XEC 1150 kc.	1st-31st, 12-1 a.m., R6. Announcements in Spanish. Mickey Mouse mentioned frequently in Spanish.

Hamfest

By W8QMR ex-2PI • LU4S

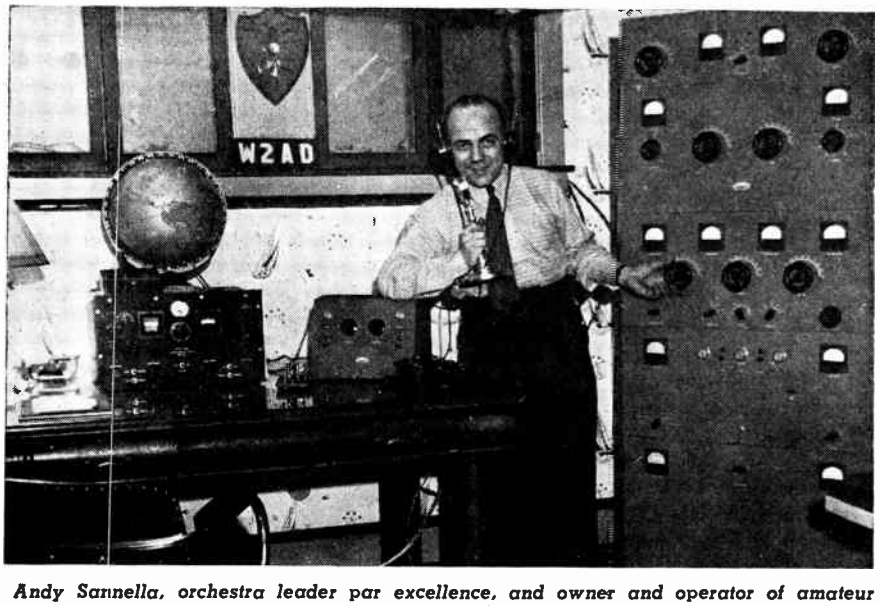
OT'S AND LIDS . . . W2AD . . . QSL CARDITIS . . . QSO'S ON SHARES

SOME months ago we made a note to remind us to comment in this department on the excellent operating characteristics on the 80-meter c.w. band—quick, snappy calls, break-in operation, intelligent use of abbreviations, excellent fists and fast operating—not to mention good, clean notes and other factors contributing to efficient transmission. We take most of it back. The 80-meter band is no better nor worse than the others.

A few nights ago we were listening to W2GCE working W2ENZ—hearing only GCE's end of the conversation. It appears that ENZ—on a busman's holiday—is a commercial operator recently returned from the tropics. GCE remarked that it was a pleasure to work a commercial operator, and that while there were some good ops on 80, he was sick of the average run.

We check with GCE—100%. And we're not necessarily kicking about the beginner—the lad whose speed just tops 13 words per and whose fist, from professional standards, is about as awkward as a toddling infant. We were each a beginner once—and more power to him, if that's the only thing that's wrong with him. What we are kicking about is just plain lack of intelligence—interminable calls, and, still worse, interminable signs, unnecessary calls before and following each transmisison, (after the QSO is under way) rotten chirpy notes—and what have you. Of course the majority of these attributes of sloppy operating are perpetrated by beginners. But we're wondering if we old timers are not to some extent responsible for their sins???

It's not much fun working a lid—we grant you. But if we are selfish enough to leave them to themselves—lid working lid and no one else—they will never see the errors of their ways, bad practices will become mutually standardized, and the ultimate product will be that least admirable of all operators, the fellow who has plenty of speed and ability but who simply hogs the air without rhyme, reason or the faintest idea that he is doing other than what all good operators should do! We can do a lot for the lid by precept. Make it a practice to work two or three beginners at every session in the shack. And, with the exception of speed, employ exactly the same technique you would in working an old timer. Give a short call and a shorter sign. Encourage the lad to break in on you. Go back at him again and again without a lot of preliminary calling and signing—and conclude each transmission in the QSO with a simple AR K (or perhaps HW?—as the occasion calls for) rather than with a peroration of calls and signs (excepting of course once every fifteen minutes or so to conform with the FCC rules).



Andy Sannella, orchestra leader par excellence, and owner and operator of amateur station W2AD, Hartsdale, New York.

✦

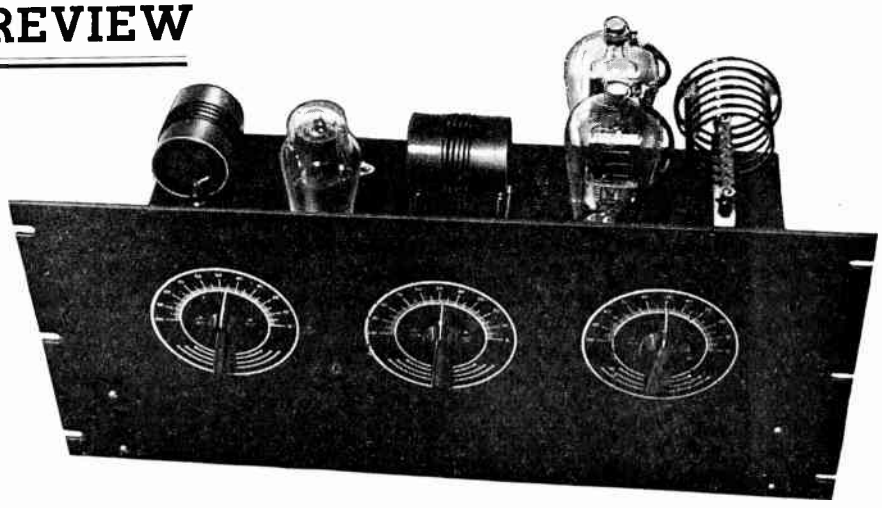
WE'VE WRITTEN ABOUT Andy Sannella before—but not about W2AD. As we recall it we said some nasty things about one of the programs with which he was associated — Lucky Strike, Campbell Soup or Rexall Drug Stores—in a fan column in the New York *Sun* a good many years back. (Which of course was no reflection on Andy.) Andy, as most of you know, is one of our ranking radio stars and orchestra leaders, plays a mean Hawaiian guitar and saxophone, and, incidentally, is no second fiddle on the bug.

Concerning W2AD, (photo on this page) Andy tells his own story—"Became interested in amateur radio about ten years ago, and started out with a 150-watt transmitter using a pair of 852s in the final of a bread-board layout. I've had several other transmitters which were built by friends who were also amateurs. Last year I purchased my Temco one-kilowatt transmitter from Mort Kahn (W2KR) and certainly have enjoyed it. I operate mostly on 20 meters, using a compromise 20-75-meter doublet, center fed with Bassett concentric cable. Have also operated on 40, 75 and 160 as occasions called for it.

"As to the bug on the table, it is authentic, as I do enjoy pounding brass. I venture to say that I work code more than fone. Of course, being in the musical profession, the fone comes in very handy with my professional friends. For, believe it or not, though these friends are radio stars and make their living in front of a microphone, they get a tremendous kick out of operating a ham station." (Just another bunch of busmen. Wonder if they ever get mike fright at W2AD?)

(Continued on page 668)

A PROVING-POST REVIEW



The MB-100 C.W. KIT TRANSMITTER

THE present reviewer does not have to delve very far back into memory to recall the days when 50 watts was considered reasonably good power and represented an outlay of about $75.00 for the transmitter proper and about the same for a motor generator delivering some 1500 volts of plate supply. The MB-100 does considerably better than that so far as power is concerned, and the cost, including tubes and crystal, should be under $30.00. The power supply is extra, and the price will vary with the desired power output, which can be pushed to as high as 175 watts! For lower powers — in the neighborhood of 80 watts input to the finals, such as was employed in the transmitter under test at the Proving Post—standard receiving parts, can be used, and the cost of the power supply, complete with rectifier, should be under twelve dollars. Thus the MB-100 is an ideal recommendation for the beginner, who is usually somewhat limited in reference to the exchequer and who will have the advantage of considerably more power than that usually available to the amateur newcomer at no greater than the average cost for lower-power rigs. At the same time, the MB-100 is altogether adequate for the established amateur, and its low cost in no way affects the excellent manner in which it fulfills his exacting requirements. During the two months this transmitter was on test in the Proving Post, it was used consistently on 80 meters operating on all schedules of the ENY net of the AARS. and provided one hundred per cent reliable service in traffic handling and drills. Reports were usually R7 and R8 occasionaliy R9, and always T9X.

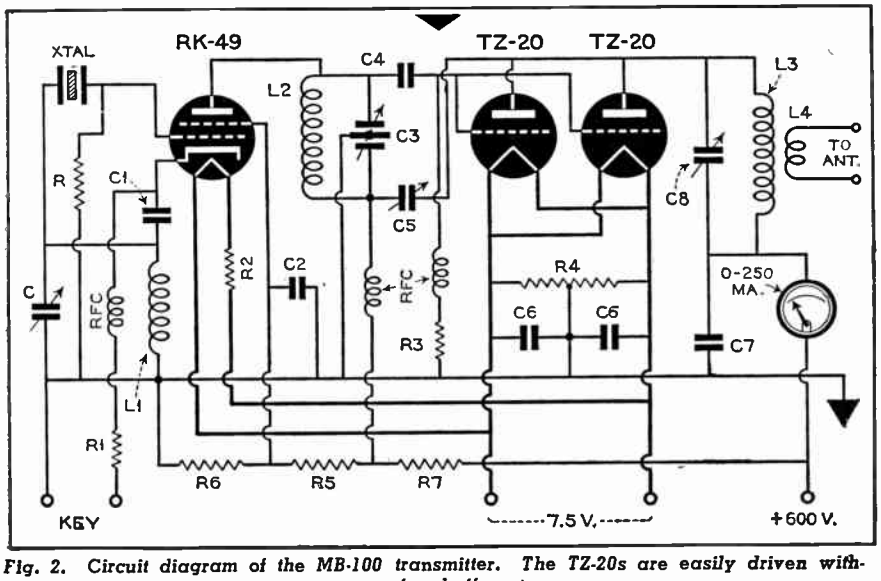


Fig. 2. Circuit diagram of the MB-100 transmitter. The TZ-20s are easily driven without use of a buffer stage.

KEY TO PARTS

R—25,000 ohms, 1 watt
R1—400 ohms, 2 watts
R2—1 ohm, 10 watts
R3—2000 ohms, 10 watts
R4—50 ohms, center tapped, 2 watts
R5—12,500 ohms, 10 watts
R6—17,500 ohms, 10 watts
R7—1500 ohms, 10 watts
RFC—(3 required) 2.5 mh.
C—150 mmfd.
C1—.002 mfd. 1000 volts
C2—.002 mfd. 600 volts
C3—100 mmfd. dual
C4—.0001 mfd.
C5—15 mmfd.
C6—(two required) .002 mfd.
C7—.002 mfd. 1000 volts
C8—100 mmfd.

Miscellaneous

6—large jack type feed-through insulators
6—small feed-through insulators
5—clip tite sockets
2—large plate clips
1—drilled chassis, 17 x 10 x 3 inches
1—8¾ x 19 inches relay rack panel
3—2¼ inch bar knobs
3—3½-inch dial plates

A Kit Transmitter

The MB-100 is available in stripped kit form from the M & H Sporting Goods Company, Philadelphia, Pa. The kit includes a drilled chassis and all essential parts, less meters, tubes, crystal and power supply. It can readily be assembled in a few hours of pleasant labor. The transmitter received at this laboratory was equipped with a rack type panel which is nicely adapted to the beginner and the desirability of a commercial appearing job for the old timer. The rack and panel design provides for flexibility, and additional units —high power stage, modulator, etc.— can be added at a later date.

For the beginner, a wooden rack is

TABLE I

BAND	XTAL	COILS		
		Osc.Cath	Osc. Plate	Final
160	160	shorted	55 turns, 2"	160B*
80	80	shorted	29 turns, 2"	80B*
40	80	14 turns,	14 turns, 2"	40B*
40	40	shorted	14 turns, 2"	40B*
20	40	7 turns, 2"	7 turns, 2"	20B*
10	20	4 turns, 1½"	5 turns, 1½"	4 turns, 1½"

* Barker and Williamson type numbers.

suggested such as that shown in Fig. 1. The cost is negligible and it can be discarded later on when additional units are designed for standard relay rack mounting. The power supply sits on the table under the transmitter. While the most convenient power supply available was used at the Proving Post, it is suggested that the amateur construct his own on a rack panel, which can then be mounted directly under the transmitter on the same wooden rack. Logically and conveniently, the power supply panel can be dressed up a bit with the very essential plate milliammeter. (Plate current to the finals only. There is little necessity of a meter in the RK49 plate circuit as the bias resistor tends to keep the plate current constant, and there is relatively little dip at resonance.)

As will be observed in the wiring diagram, Fig. 2, the antenna is coupled to the tank coil without any special antenna coupling system. This is the easiest way of doing the job, and highly effective. A twisted transmission line is used —such as EO-1 cable, Lynch Giant-Killer, or Bassett concentric feeder. No condensers, transmission line spacers, or other complications are required.

However, the number of turns provided on the coupling coil, L4, may not be sufficient to load the TZ-20s which should draw from about 125 milliamperes up — depending upon the plate voltage. Under such circumstances, additional turns should be added to L4 which in the stock coil is a simple 2-turn link.

In adding these turns, some form of radiation indicator is desirable. A standard 115-volt, 75-watt lamp works out nicely, and with 80 watts input this will light up to a medium brilliancy. It should be disconnected (shorted) when the proper number of turns on L4 is determined and the tank condenser retuned slightly for maximum dip. The additional turns on L4 can be conveniently wound with No. 18 bell wire directly over the spaces in L3. Be sure to wind and connect in the same direction. Incidentally, no jacks were provided for the banana plugs on L4. The same holds for antenna posts. We used loose jacks and wired them with short lengths of flexible wire to the stand-off insulators (antenna posts) on the side of the wooden rack. Only two of the three stand-offs are generally used — the third merely providing a connection to a radiation indicating device when employed.

The Circuit

The oscillator will be recognized as a slightly modified tri-tet. For harmonic operation, the cathode coil, L1, is tuned by condenser C. When operating on the fundamentals, C is shorted by turning to full capacity, the tip of a rotor plate being bent to scrape the stator. The RK-49 oscillator is a somewhat exalted 6L6G with an isolantite base. The oscillator tank coil, L2, is tuned with the split-stator condenser C3, the r. f. voltage being perfectly balanced to provide satisfactory neutralization to the TZ-20s in parallel through C5. In practice neutralization is constant and readily obtained with the usual neon lamp technique.

The zero bias TZ-20s are exceedingly easy to drive, and the output of the RK-49 is altogether adequate for this purpose.

Coil Data

While the transmitter on test was used exclusively on 80-meter c. w. there is no reason why comparable efficiency should not be secured on other bands. The recommended data is given in Table I.

The gauge of wire used to wind the coils is not critical. Enamel wire is preferred, and in general No. 26 may be used for 160 meters, No. 22 for 80 meters and No. 18 for the balance.

Efficiency, Output and Operating Voltages

The efficiency obtainable with this transmitter is excellent and varies from 70 to almost 90 percent, depending upon the plate voltage available and other operating conditions.

With a plate potential of 500 volts, 87.5 watts can be fed to the finals with an output of 63.75 watts. With 600 volts, the input is raised to slightly over 100 watts and the output to 75 watts. This is about as high as it is desirable to go with the zero bias TZ-20 tubes without some form of external bias. Employing self-bias across a 400-ohm resistor, the plate voltage can be raised to about 700, inputting 143 watts for a 100-watt output.

The efficiency rises with the plate potential, but at higher voltages battery bias is desirable if the oscillator is keyed. With a plate potential of 1040 volts and a fixed bias permitting 190 milliamperes to the finals, the input is 196 watts, the output 175 watts (we're getting into real power now) and the efficiency 87.5 percent.

As will be noted from the diagram, the transmitter is keyed in the oscil-

(Continued on page 661)

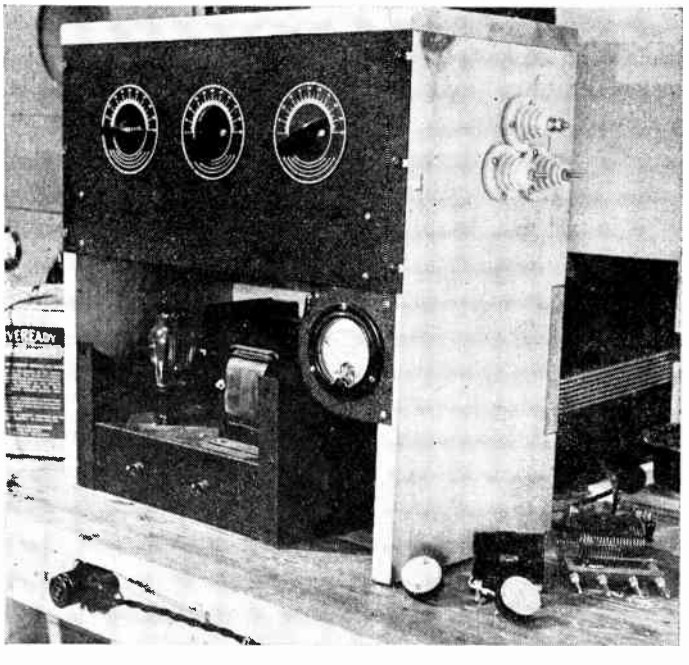


Fig. 1. An economical arrangement for an economy transmitter. Also both neat and effective. The wooden relay rack can be discarded later when additional units are built up.

RADIO SIGNAL SURVEY LEAGUE NEWS

THE signal survey on station WANC terminates December 1st. All members who monitored this station and have not as yet sent in their reports are requested to do so as soon after this date as possible. As usual, reports should be sent to Sectional Managers, or direct to headquarters in the event no Manager has been appointed in your territory.

Communications

Sectional Managers, who serve the League without pay, are in some instances being put to unnecessary expense in handling letters from applicants. We greatly appreciate the endeavors of all members in obtaining recruits, but it is urgently requested that applicants be referred to headquarters rather than to the Sectional Manager in their locality. This procedure will ease matters considerably and at the same time expedite the handling of new applications.

Monitoring Station Identifications

C. D. Jaffe, W5L2, Algonquin Park, Norfolk, Va., and others, have brought up a point with regard to R.S.S.L. Monitoring Station "calls" that we believe should be aired and commented upon. As Mr. Jaffe points out; "Since the calls issued to individual members by the League do not correspond to the U. S. Amateur call areas or districts, they often prove confusing to foreign amateurs and others to whom signal reports are sent." For instance, Mr. Jaffe is located in the 3rd U. S. Radio District where amateur and experimental station calls carry the prefix W3. On the other hand, his R.S.S.L. Monitor Station Identification is W5L2 . . . the "W5" suggesting the 5th call area.

Mr. Jaffe suggests as a solution to the problem the changing of all R.S.S.L. Monitoring Station Identifications to coincide with the U. S. call areas, or use, in the case of the United States, the prefix W10.

The proposals are worthy of serious consideration, so let us review possible objections. First of all, numerous R.S.S.L. members have had cards printed carrying their Monitoring Station Identifications, and a change would require the scrapping of these cards or the imprinting of a new identification. Second, too close a similarity between amateur station calls and R.S.S.L. Monitoring Station Identifications would be just as confusing and rather unethical to boot. The use of the prefix W10 is ruled out since this is assigned by the government to experimental stations, expeditions, etc.

It might be explained again that the Monitoring Station Identifications issued by the League have definite geographical significance. The first letter or letters,

(Continued on page 666)

NEW R.S.S.L. MEMBERS

CALIFORNIA
Leslie Bud King, Arcadia—W29N8
Stanley L. Bruce, Burlingame—W31J14
William W. Cloud, Long Beach—W29N9
Elmer Patrick, Maywood—W29M28
Kenneth Knutson, Pasadena—W29M29
John A. Gilmont, Jr., San Francisco—W31J15
Myron Huebler, San Francisco—W31J16

CONNECTICUT
Louis Kuslan, West Haven—W4G22

IDAHO
LeRoy Earl Jones, Pocatello—W25G1

ILLINOIS
Clarence Streck, Belleville—W13L11
Wallace Grove, Chicago—W11H52
Norbert C. Fortman, Chicago—W11H51
Walter B. Roetter, Highland Park—W12H7
James Hall, Litchfield—W12K6
Peter J. Massey, Jr., River Forest—W12H8

INDIANA
Michael Gajdos, East Chicago—W11H53

IOWA
Henry C. Hendrickson, Jr., McGregor—W13G2

KANSAS
Dick Cahill, Salina—W17H1

KENTUCKY
Gilbert Everrett Fuller, Ft. Mitchell—W10K14

LOUISIANA
J. I. Vaught, New Orleans—W12S2

MAINE
Eugene Howard Herrick, Rangeley Lakes—W3D1
Harold Cole, Saco—W3E9

MARYLAND
Bernard Farace, Baltimore—W5J19
Joseph Lenoir, Baltimore—W5J20
James Reed Coale, Baltimore—W5J21
Robert H. Willner, Baltimore—W5J22

MASSACHUSETTS
Preston Hicks, Belmont—W3F61
Cecil Kent Drinker, Jr., Brookline—W3F63
J. Gorham Underhill, North Attleboro—W3F62

MICHIGAN
Herman J. Pfeiffer, Jr., Detroit—W9G16
James Brager, Jackson—W9J20
Paul J. Ambrose, Jackson—W10H14
Ralph Horton, Jackson—W10H15

MINNESOTA
Charles M. Johnson, Annandale—W15F3

MISSISSIPPI
Warren O. Parkerson, Indianola—W13P2

MISSOURI
Wallace W. Johnston, Kirkwood—W13L12
Charles A. Parrish, Jr., St. Louis—W13L13
O. C. Von Burg, St. Louis—W13L14

NEW JERSEY
G. Albert Rhoads, Jr., Haddon Heights—W4H163
Morgan T. Kennedy, Oaklyn—W4H162
Israel Sinofsky, Passaic—W4H153
John Csubak, Woodbridge—W4H168

NEW YORK
Sidney Wolkin, Brooklyn—W4H160
Bernard N. Gensler, Brooklyn—W4H155
Edward Badwick, Brooklyn—W4H154
Sam Horowitz, Brooklyn—W4H156
William Raymond Goetz, Brooklyn—W4H161
Wilson Walter Streeter, Brooklyn—W4H159
Max Levine, Brooklyn—W4H152
Charles F. Dieter, Jr., Brooklyn—W4H167
Curtis Nickerson, Binghamton—W5G4
Donald L. Williams, Jordan—W5F9
Theodore C. Smith, Ogdensburg—W5F8

OHIO
Lowell A. Ditmer, Dayton—W9J19
Robert Carlton Fleischman, Dayton—W9J18
Wilson R. Scott, Dayton—W9J17
Wilbur Neff Nungesser, Portsmouth—W9K2
Stanley B. Dickerson, Springfield—W9J21
Lee Kemberling, Toledo—W9H7
William Carl Noltemeyer, Trilby—W9H8

OKLAHOMA
R. M. Farnam, Ponca City—W17M4

PENNSYLVANIA
James Clifford Rill, Lancaster—W5H13
Jack Haberman, Philadelphia—W4H165
James Garfield Shock, Jr., Philadelphia—W4H169
Howard L. Dutkin, Philadelphia—W4H158
Marcella T. Dutkin, Philadelphia—W4H157
Rudolph R. Sutter, Philadelphia—W4H166
George F. Kline, Jr., Williamsport—W4H164

RHODE ISLAND
George Charles Onoyan, Cranston—W3G29

SOUTH CAROLINA
Larry S. Hatfield, Florence—W6N1

WASHINGTON
Dennis Fenno, Anacortes—W29B9
Robert Mack Bissell, Tacoma—W29C4

WYOMING
C. H. Johnson, Casper—W21G1

NEW FOREIGN MEMBERS

CANADA
Emanuel H. Manning, Edmonton, Alberta—VE24A9
Donald Gordon, Edmonton, Alberta—VE24A6
Harold Leslie Ray, Edmonton, Alberta—VE24A7
Paul A. Green, Edmonton, Alberta—VE24A8
William C. Buchanan, Sydney, Nova Scotia—VE1B1
James Pratt, London, Ontario—VE8G7

ENGLAND
William Isaacs, Bucks—G33
Norman Owen, Brighton, Sussex—G34
Laurence F. J. Hobden, Brighton, Sussex—G35
James Philip Barnes, Faversham, Kent—G36
William James Croft, Bristol, Glos.—G37
William Douglas Andrews, Chepstow, Monmouthshire—G38
Percy Kenealy, Manchaster, Lancashire—G39
John Terence Anglin, Grimsby, Lincolnshire—G40
Harold Willets, Bolton, Lancashire—G41
Percival Royston Dinham, Bristol—G42
George Ludkin, Chepstow, Monmouthshire—G43
Charles Frederick Biggs, Tottenham, London—G44
Ernest Wright, Liverpool, Lancs.—G45
Leonard Sidney Wright, Liverpool, Lancs.—G46
Stanley R. Price, Dorchester, Dorset—G47
Edward R. Crane, London—G48
Kenneth Bertram Michaelson, London—G49
Leonard James Marsh, Portsmouth, Hants—G50
George W. King, Liverpool, Lancashire—G51
Joseph George Christmas, Bristol—G52
Reginald McDonald, Plaistow, West Ham.—G53
Francis William Moore, Devon—G54
Roland Thomas Wiggins, Newbury Park, Essex—G55
Desmond Alimundo, Manchester—G56

SCOTLAND
Alan Owen, Inverness, Inverness-shire—G32

NOTES ON THE WIDE-RANGE SYSTEM

DETECTOR STABILIZATION • ADDING INVERSE FEEDBACK • BASS BOOST

AN unusual amount of interest has been shown in the articles by Watzel and Bohlen on Wide-Range Music for the Home, which appeared in the September and October issues of ALL-WAVE RADIO. Which naturally leaves the impression that "high fidelity" is far from being a dead issue. Moreover, the number of letters received, and their nature, suggest that additional notes on the system would be welcomed. Therefore we shall cover in this article the various points brought up by readers, and at the same time deal with a few simple alterations that can be made in the original job that will improve overall results.

The Tuner

Presumably some difficulty has been experienced in obtaining through the usual dealer channels the type 1501 antenna transformer, L, specified in the original article. This transformer may be replaced by the Aladdin type 502 which will function equally as well, and is carried by the average radio dealer.

Because the infinite-impedance detector introduces a negative resistance in its grid circuit, difficulty is apt to be experienced from oscillation. Moreover, as previously brought out by Watzel and Bohlen, hum may be introduced into the amplifier if the infinite-impedance detector tube has appreciable heater-cathode leakage. After some research it has been found that oscillation can be eliminated, and hum greatly reduced in a leaky tube, by the introduction of a filter in the plate circuit. This filter is shown in the accompanying schematic diagram and is composed of the resistor, R9, of 10,000 ohms value, in series with the plate circuit of the 6C5 detector tube, and the 0.1-mfd. bypass condenser, C8, connected from plate to chassis. It is recommended that this addition be made.

All other component values in the tuner remain the same as originally specified, but are repeated in the accompanying list of parts for your convenience.

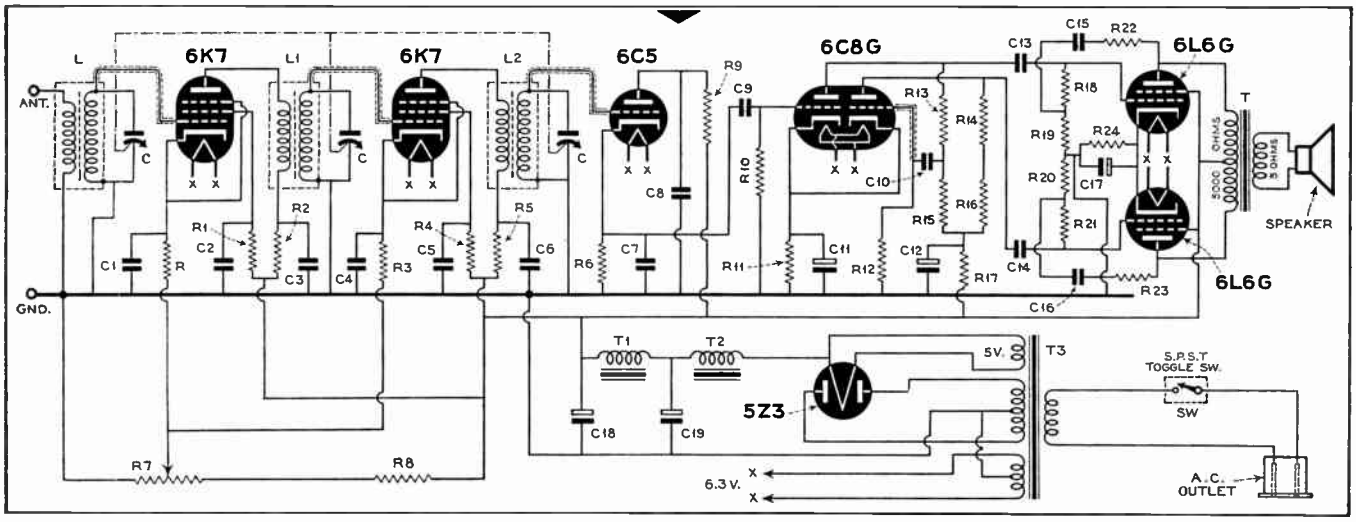
The Power Supply

A type 80 rectifier was specified in the original article. This tube is satisfactory for the purpose, but considering subsequent alterations depicted in the accompanying schematic diagram, all of which are highly recommended, it is suggested that the 80 tube be replaced with a type 5Z3. The 5Z3 is interchangeable with the 80, so no circuit changes are required.

Condenser input was specified in the original article. With the addition of inverse feedback—to be explained presently—and the advantages of operating the amplifier at a slightly lower voltage, the input condenser, C17, in the original diagram can be put to better use.

It will be seen from the diagram on this page that choke input is employed.

(Continued on page 650)



Revised schematic diagram of the Wide-Range System without volume expander, and including tone-compensated inverse feedback, balanced phase inverter and stabilized infinite-impedance detector.

L —Aladdin type 502 ant. trans.
L1 —Aladdin type 3001 interstage trans.
L2 —Aladdin type 3001 interstage trans.
T —UTC type LS-55 output trans.
T1 —UTC type CS-301 filter choke
T2 —UTC type CS-301 filter choke
T3 —UTC type UH-6 power trans.
R —IRC 350 ohms, ½ watt
R1 —IRC 100,000 ohms, ½ watt
R2 —IRC 2000 ohms, ½ watt
R3 —IRC 350 ohms, ½ watt
R4 —IRC 350 ohms, ½ watt
R5 —IRC 2000 ohms, ½ watt
R6 —IRC 100,000 ohms; ½ watt
R7 —Yaxley 50,000-ohm pot.
R8 —IRC 50,000 ohms, 1 watt
R9 —IRC 10,000 ohms, ½ watt
R10—IRC 250,000 ohms, ½ watt
R11—IRC 1500 ohms, ½ watt
R12—IRC 50,000 ohms, ½ watt
R13—IRC 100,000 ohms, ½ watt
R14—IRC 100,000 ohms, ½ watt
R15—IRC 10,000 ohms, ½ watt
R16—IRC 10,000 ohms, ½ watt
R17—IRC 10,000 ohms, 2 watts
R18—IRC 75,000 ohms, ½ watt
R19—IRC 5000 ohms, ½ watt
R20—IRC 5000 ohms, ½ watt
R21—IRC 75,000 ohms, ½ watt
R22—IRC 50,000 ohms, ½ watt
R23—IRC 50,000 ohms, ½ watt
R24—Ward Leonard 200 ohms, 25 watts, wire wound
C —Variable gang condenser, .000365 mfd.
C1 —C-D .1 mfd., 400 v.
C2 —C-D .1 mfd., 400 v.
C3 —C-D .1 mfd., 400 v.
C4 —C-D .1 mfd., 400 v.
C5 —C-D .1 mfd., 400 v.
C6 —C-D .1 mfd., 400 v.
C7 —C-D .0001 mfd. mica
C8 —C-D .1 mfd., 400 v.
C9 —C-D .1 mfd., 400 v.
C10—C-D .1 mfd., 400 v.
C11—C-D 25 mfd., 25 v. elect.
C12—C-D 8 mfd., 475 v. elect.
C13—C-D .1 mfd., 400 v.
C14—C-D .1 mfd., 400 v.
C15—C-D .1 mfd., 400 v.
C16—C-D .1 mfd., 400 v.
C17—C-D 25 mfd., 25 v. elect.
C18—C-D 24 mfd., 475 v. elect.
C19—C-D 24 mfd., 475 v. elect.
Loudspeaker—Cinaudagraph FY12-12

A PROVING-POST REVIEW

THE NEW SILVER MASTERPIECE VI

THE Masterpiece VI differs from its immediate predecessor, the Masterpiece V, in refinements rather than radical changes. The former model was characterized by a high degree of all-around excellence upon which it would be difficult to improve. However, the sum total of the refinements is such as to contribute to ease of operation, flexibility and superior operation under adverse conditions. The audio frequency curve has been flattened somewhat, both electrically and acoustically, by the use of inverse feedback and a new baffle arrangement of the "bass reflex" type. Independent automatic volume control has been applied to the r.f. circuits and to the intermediate-frequency amplifier, providing a superior degree of control. Similarly, selectivity is controlled in both the r.f. and i.f. circuits and four different bandwidths are provided instead of the "sharp" and "broad" adjustments available on the Masterpiece V. This change extends the fidelity admittance of the Masterpiece VI to 16,000-cycle sidebands. The tuning range has also been extended and now embraces the 56-megacycle ham band. Octal base glass tubes are used, instead of the metal tubes featured in the previous model. All important electrical features have been retained—volume expansion, independent bass and treble tone adjustments, etc.

The Masterpiece VI is similar in appearance to its immediate predecessor, but here again refinements are to be noted. The secondary controls are grouped on two escutcheons, rather than being mounted with individual plates. The dial mechanism is unchanged and the large dial is very similar to that on the Masterpiece V. However, the vernier dial has been considerably improved to facilitate logging and relogging of short-wave stations. The set shield now fastens to the chassis.

Controls

The controls from left to right are:—

Fidelity: This control switches the audio system over to microphone or phonograph, as well as controlling the four degrees of bandwidth—4000, 8000, 12,000 and 32,000 cycles.

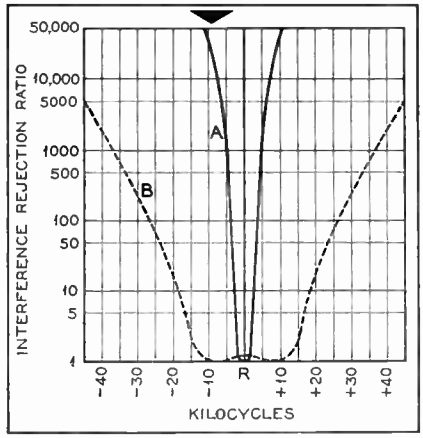


Fig. 2. Selectivity characteristics of the Masterpiece VI at maximum and minimum selectivity settings.

Volume Control: This is of the tone-compensated type maintaining a desirable balance between treble and bass response at different volume levels.

Expander: The degree of expansion is continuously variable.

Tuning Knob: Planetary type with two ratios—16 to 1 and 80 to 1.

Bass Tone Control: Makes possible the emphasis of low notes without affecting the treble tones.

Waveband Switch: Five bands, designated as A, B, C, D, E, are available and tune respectively from 140 to 450 kc., 550 to 1800 kc., 1800 to 575 kc., 5.75 to 18.5 mc. and from 17 to 65 mc. There are reasonable overlaps between all bands (except A and B) not necessarily indicated by numerals on the dial.

Treble Tone: Provides for emphasis of high notes without cutting down on the bass. The combined use of the bass and treble controls makes possible the compensation of any tonal range deficiencies encountered in present-day broadcasting and recording. Frequency discrimination characteristic of chain programs piped over land lines can be readily corrected. Turned completely counter-clockwise, the treble tone control connects in the beat-frequency oscillator for c.w. code reception, location of stations or precise logging (to zero beat).

Fidelity - Selectivity Control

The fidelity control is altogether independent of the audio-frequency tone control system, and, as we have already men-

tioned, operates independently on both the r.f. and i.f. amplifiers. Selectivity (or, inversely, the width of the admitted band) is controlled in two ways—by choosing the number of r.f. and i.f. stages, and by changing the type of transformer used in the intermediate-frequency amplifier. This last is an innovation, and was preferred by the designer to the more conventional method of varying the selectivity characteristics of a single type transformer.

In the wiring diagram, Fig. 1, the fidelity control switches ("I.F. Switch Gang") are shown running in row A, from 6 to 17. There are six of these switches ganged, and in the diagram they are in the 4-kilocycle fidelity position. At this adjustment all r.f. and i.f. tubes are employed, and the i.f. transformers in row C, T1, T2, T3 T4, are in the circuit. As the control is turned counterclockwise, the original first i.f. tube, the 6K7G at C-10, is eliminated from the circuit, along with its associated i.f. transformers T1 and T2. The output of the first detector is now coupled to the second 6K7G through the transformer T5 at B-10. The remainder of the circuit remains unchanged. The bandwidth in this position is 8 kilocycles. Turning the control to the next point counterclockwise, or to the 12-kilocycle position, eliminates the first *radio-frequency* amplifying stage but does not alter the i.f. circuit. In ordinary operation, with a simple L-type antenna, the "LONG ANT." post is connected to ground, and the lead-in connected to the "SHORT ANT." terminal. Thus, at the 12-kilocycle position, the antenna is shunted around, by the switch at A-7, and through condenser C1c to what ordinarily would be the plate coil of the first r.f. stage. The aerial is therefore coupled directly to the grid coil of the second r.f. stage.

In the maximum fidelity position, with a bandwidth of 32 kilocycles, i.f. transformer T3 is eliminated and T6, at B-14, is substituted.

The extremes of selectivity which can be obtained with this system are indicated in the curves of Fig. 2, which show the 4- and 32-kilocycle characteristics. It will be observed that the interference rejection ratio is 1000 at 5 kc. off resonance, and that sidebands above 2000 cycles are very rapidly attenuated. Yet excellent tone quality can be obtained by means of treble tone compensation. The 32-kilocycle adjustment will rarely be used except within the local range of one of the few experimental high-fidelity stations.

The wave-band switch runs vertically in column 5-6. With the selectivity control in positions for 4- or 8-kilocycle bandwidths, it will be observed that the

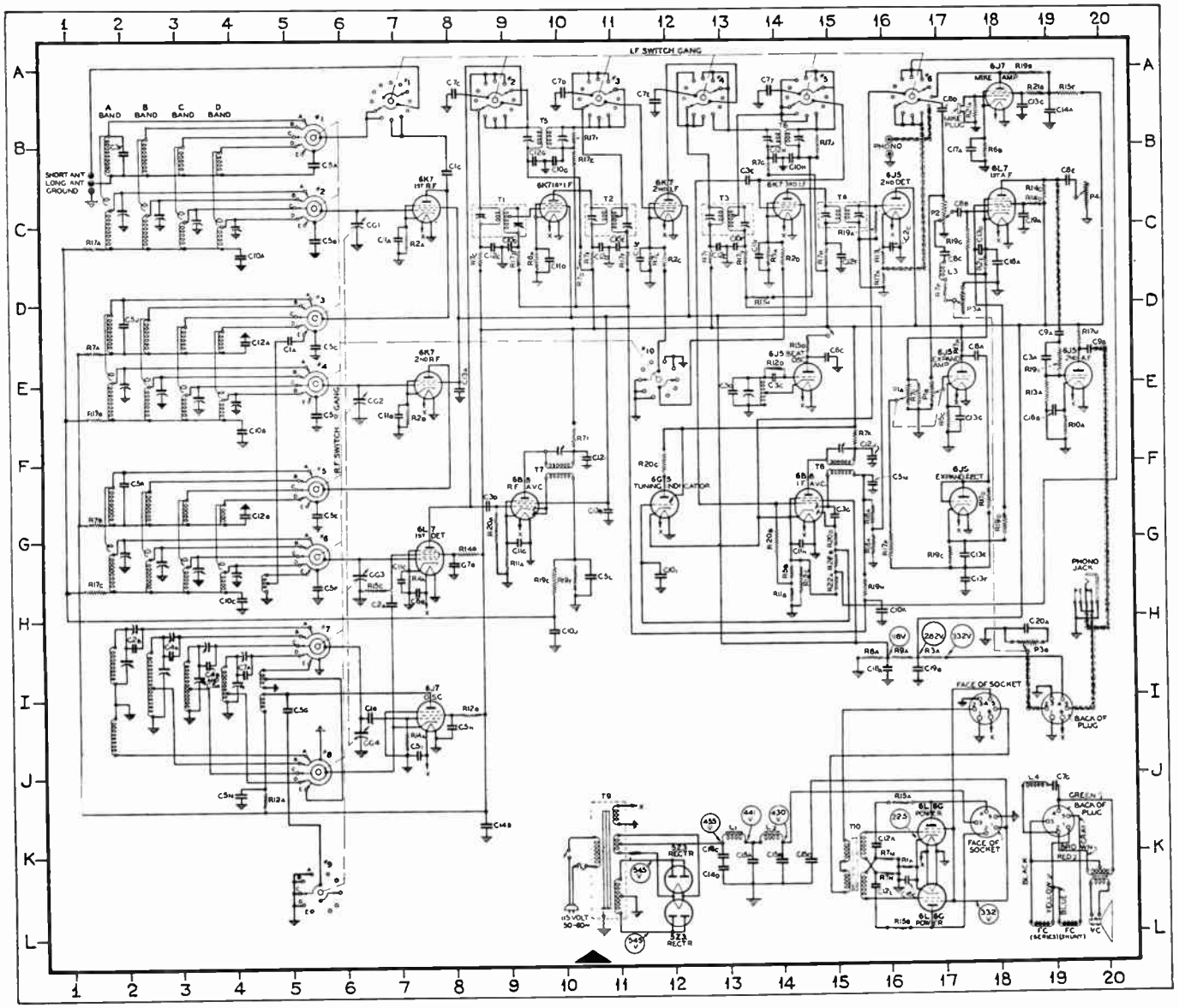


Fig. 1. Wiring diagram of the Silver Masterpiece VI. Though not indicated, "G" type tubes are supplied with the receiver.

two r.f. stages are employed on all bands excepting the extreme high-frequency band, E. When switched to band E, the two r.f. stages are eliminated and the antenna is coupled to the grid of the first detector through the auto-transformer located at G-4. To complete this circuit, the selectivity switch must be in the 12- or 32-kc. position. This is desirable as fairly broad tuning is essential on some of the higher frequency bands—particularly for amateur 5-meter reception. The switch at E-12 is ganged with the wave-change switches, and preserves optimum sensitivity in the i.f. amplifier on different bands by altering grid biases.

Two A.V.C. Amplifiers

Next in the order of the unusual in the Masterpiece VI is the use of two a.v.c. actions, one operating more or less conventionally on the i.f. amplifier, and the other on the r.f. circuits. The i.f. a.v.c. tube is at F-15, and receives its excitation in parallel with the 6K7G 3rd i.f. tube. The i.f. signal is amplified in the pentode section of the 6B8G, fed to transformer T8, and rectified in the diode section of the tube—the rectified output being applied through an appropriate resistor network, to the i.f. grids and to the magic tuning eye.

The r.f. a.v.c. tube is a similar 6B8G at F-9. It obtains excitation from the first detector tube to which it is impedance-coupled through condenser C3d. (The coupling impedance is the primary of the i.f. transformer in the first detector plate circuit.) Again the signal is amplified in the pentode section and rectified in the diode section. (The diode plates are tied together. In the case of the i.f. a.v.c. tube, one plate supplies rectified current for the a.v.c. action, and the other for the tuning indicator.) The a.v.c. bias obtained is applied to all r.f. tubes including the first detector. The efficacy of this dual a.v.c. system is indicated in the curve of Fig. 3.

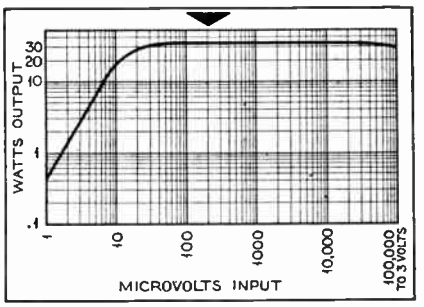


Fig. 3. Showing the a.v.c. control maintained by the dual system operating independently on r.f. and i.f. circuits.

Second Detector

The second detector in the Masterpiece VI is of the infinite-impedance type, the main advantage of which is the tendency to cancel out harmonic distortion—to provide distortionless detection. This is accomplished by means of inverse feedback or degeneration. Instead of taking the output of the second detector from the plate of the tube by means of resistance, impedance or transformer coupling, it is obtained across part of the cathode resistor at D-16. This resistor is common to both grid and plate circuits, and the interaction results in degeneration. This is elementary and obvious. An increase in plate current will increase the negative bias applied to the grid, and this in turn will act to reduce the plate current. A very low value of cathode condenser—.0001 mfd.—is used at C2c so that this effect will function at audio frequencies.

The Audio-Frequency System

When switched for radio reception, the output of the second detector is coupled to the 6L7G first a.f. tube at C-18 as described. Phono. input is coupled through the condenser C8d. When using a microphone, a pre-amplifier is automatically switched into the circuit. The tube is a 6J7G at A-18, which is resistance coupled to the regular first a.f. tube. This additional amplification makes it possible to employ a low sensitivity crystal microphone for p.a. work within the power capabilities of the amplifier and for amusement. The first a.f. tube is in turn resistance-coupled to the 6J5G triode second a.f. amplifier, which is transformer-coupled to the push-pull 6L6Gs. The amplifier is peaked for high frequencies, and treble tone control is obtained by the elementary bypass arrangement shown at B-20. The bass compensation is considerably more complicated and requires the ganged potentiometer and rheostat shown respectively at C-17 and D-17, the latter operating in conjunction with the indicated resistor, condenser and air-core audio choke L3.

The volume expander obtains its input in parallel with the first audio tube. It will therefore function on radio, phono. and mike. The output of the 6J5G expander amplifier (E-18) is rectified by the 6J5G at F-18 and the rectified current used to bias the second control grid of the first audio, 6L7G, and thus control the amount of amplification. The degree of control, or expansion, is adjusted by the double potentiometers at E-17.

By combining the actions of the fidelity control, bass and treble compensations, a variety of over-all audio-frequency characteristic can be secured, as will be noted from the graphs of Fig. 4. The pronounced dip at 10,000 cycles is due to the whistle trap—coil L4 and condenser C7g at J-19 in Fig. 1. This trap is tuned very sharply to 10 kc., to eliminate the heterodynes occasioned by our 10-kilocycle station separation system. The whistle, of course, will not be heard on the ordinary receiver which is incapable of reproducing frequencies of that order.

The rated output of the audio system is 34 watts with 2.5% total harmonic distortion. The output is distortionless at five watts which is ample for the average home reception, excepting perhaps fortissimo passages.

While at the present writing no sensitivity measurements have been made on the Masterpiece VI at this laboratory, its performance is such as to substantiate the manufacturer's claims for a very high order of sensitivity and a low noise level.

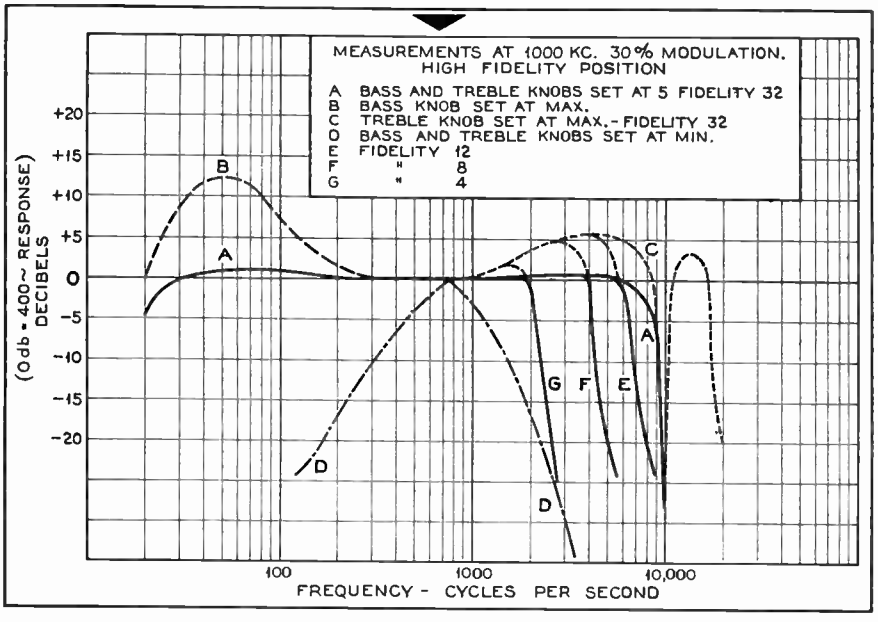


Fig. 4. Various overall a.f. characteristics which are obtained with different settings of fidelity, treble and bass controls.

Queries

DOUBLE SUPERHETERODYNES . . . LOUDSPEAKER AS MIKE . . . THE ANSWER IS NO!

THE primary purpose of the Queries Department is to solve the technical and semi-technical problems of our readers who feel they require such assistance. However, questions, so long as they are related to radio, need not be of a technical nature. ¶Every question will be answered personally, by mail. A self-addressed and stamped envelope should be included. ¶In questions concerning specific apparatus, it will be of considerable assistance to our technicians if the inquiry is accompanied with a wiring diagram, original operating instructions, and all relevant literature. While it is the desire of this department to be of assistance in all possible instances, it should be borne in mind that the manufacturer will occasionally be in a position to give better advice concerning his own product, and usually maintains a technical department at the service of those who purchase his equipment.

Question No. 45: I have recently come across several references to "double superheterodynes" and should appreciate it if you would explain to me just what these receivers are and their advantages over the ordinary super.—*A. J. C., Leonia, N. J.*

Answer: The double super is exactly what its name implies—two superheterodyne actions in one receiver. These receivers are coming into more general use —Westinghouse and other manufacturers are featuring them.

In the double super the incoming signal is changed to a more or less conventional intermediate frequency—say 465 kilocycles—in the usual manner through a combination of local oscillator and first detector or mixer tube. This intermediate frequency is changed to a second intermediate frequency—say 100 kc.—by means of another oscillator and a second mixer or detector. (This second detector should not be confused with the familiar second detector in the conventional super. In the usual super, the second detector separates the audio-frequency component from the intermediate frequency—in the double super it merely changes one intermediate frequency into another intermediate frequency.) This second i.f. is now amplified in the usual way through one or more stages of intermediate-frequency amplification and passed on to the third detector which functions exactly as does the second detector in the ordinary super—that is, separates the audio or sound frequencies from the radio-frequency component for further amplification in the audio system.

When a short-wave converter is used in conjunction with the conventional super, the result is a double super. The converter converts the short-wave signal to an intermediate frequency in the standard broadcast band. The super then takes this frequency and converts it to the i.f. of the receiver.

There is no special advantage in the double super except in automatic frequency control circuits—which are responsible for its introduction in the commercial field. Automatic frequency control tends to correct tuning deficiencies. If the station is not correctly tuned, distortion is the result—as we all know. In automatic frequency control circuits, minor variations in tuning are compensated by the local oscillator which automatically changes its frequency so that the intermediate frequency is correct. This is accomplished by changes in the effective inductance in the oscillator circuit—the amount of change being automatically governed by the degree of off-resonance of the intermediate frequency. The variation in oscillator circuit inductance will be the same for a given number of kilocycles off resonance regardless of the frequency to which the receiver is tuned—long wave or short wave. However, the change in oscillator frequency for a given change in inductance will be considerably greater at high frequencies than on the broadcast band. Hence the compensation will not be the same at all wavelengths. The solution is to apply a.f.c. to an oscillator that remains practically constant in frequency regardless of the wavelength to which the receiver is tuned—and this can be accomplished in the double super.

Fig. 1 shows a block diagram of a double super. The first oscillator operates at a frequency of 465 kilocycles above the signal frequency. The frequency of oscillation will of course vary considerably on different bands. For instance, when tuning a signal of 5000 kc., the oscillator frequency will be 5465 kc. At 1000 kc., the oscillator frequency will be 1465 kc. At 20 megacycles the oscillator frequency will be 20465 kilocycles. Obviously such an oscillator is not suitable for automatic frequency control except on the long-wave band where its frequency change will be relatively limited — from about 1965 kc. (for 200 meters) to 965 kc. (for 500 meters). The output of the first detector tube will be practically constant in frequency at 465 kilocycles. This first intermediate frequency is immediately mixed with the second oscillator so as to produce a second intermediate frequency of 100 kc. This second oscillator will therefore always oscillate at a practically constant frequency (the only variations being the minor shifts caused by a.f.c compensation) of 365 kilocycles—and can therefore be satisfactorily controlled by the a.f.c. circuit, regardless of the frequency to which the receiver is tuned. (A frequency of 565 kilocycles could of course

(Continued on page 667)

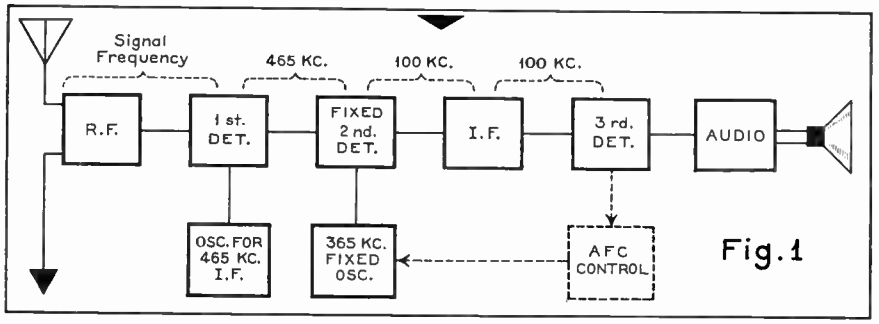


Fig. 1

Block diagram explaining the action of the "double super." The connection of the a.f.c. circuit (the main reason for the double super) is shown by the dotted lines.

U. S. BROADCAST STATION LIST

POWERS IN ITALICS INDICATE STATION IS LICENSED TO OPERATE DAYTIME ONLY

550 KC		
KFUO	St. Louis, Mo.	500
KFYR	Bismarck, N. D.	1000
KOAC	Corvalis, Ore.	1000
KSD	St. Louis, Mo.	1000
KTSA	San Antonio, Texas	1000
WDEV	Waterbury, Vt.	*500*
WGR	Buffalo, N. Y.	1000
WKRC	Cincinnati, Ohio	1000
WSVA	Harrisonburg, Va.	*500*
560 KC		
KFDM	Beaumont, Texas	500
KLZ	Denver, Colo.	1000
KSFO	San Francisco, Calif.	1000
KWTO	Springfield, Mo.	*5000*
WFIL	Philadelphia, Pa.	1000
WIND	Gary, Ind.	1000
WIS	Columbia, S. C.	1000
WQAN	Miami, Fla.	1000
570 KC		
KGKO	Wichita Falls, Texas	250
KMTR	Hollywood, Calif.	1000
KVI	Tacoma, Wash.	1000
WKBN	Youngstown, Ohio	500
WMCA	New York, N. Y.	1000
WNAX	Yankton, S. D.	1000
WOSU	Columbus, Ohio	750
WSYR	Syracuse, N. Y.	250
WWNC	Asheville, N. C.	1000
580 KC		
KMJ	Fresno, Calif.	1000
KSAC	Manhattan, Kans.	500
WCHS	Charleston, W. Va.	500
WDBO	Orlando, Fla.	1000
WIBW	Topeka, Kans.	1000
WILL	Urbana, Ill.	250
WTAG	Worcester, Mass.	1000
590 KC		
KHQ	Spokane, Wash.	1000
WEEI	Boston, Mass.	1000
WKZO	Kalamazoo, Mich.	*1000*
WOW	Omaha, Nebr.	1000
600 KC		
KFSD	San Diego, Calif.	1000
WCAO	Baltimore, Md.	500
WICC	Bridgeport, Conn.	500
WMT	Waterloo, Iowa	1000
WREC	Memphis, Tenn.	1000
610 KC		
KFRC	San Francisco, Calif.	1000
WDAF	Kansas City, Mo.	1000
WIOD	Miami, Fla.	1000
WIP	Philadelphia, Pa.	1000
WJAY	Cleveland, Ohio	*500*
620 KC		
KGW	Portland, Ore.	1000
KTAR	Phoenix, Ariz.	1000
WFLA	Clearwater, Fla.	1000
WHJB	Greensburg, Pa.	*250*
WLBZ	Bangor, Me.	500
WSUN	St. Petersburg, Fla.	1000
WTMJ	Milwaukee, Wis.	1000
630 KC		
KFRU	Columbia, Mo.	500
KGFX	Pierre, S. D.	*250*
WGBF	Evansville, Ind.	500
WMAL	Washington, D. C.	250
WPRO	Providence, R. I.	500
640 KC		
KFI	Los Angeles, Calif.	50000
WGAN	Portland, Me.	500
WHKC	Columhus, Ohio	500
WOI	Ames, Iowa	*5000*
650 KC		
WSM	Nashville, Tenn.	50000
660 KC		
WAAW	Omaha, Nebr.	*500*
WEAF	New York, N. Y.	50000
670 KC		
WMAW	Chicago, Ill.	50000
680 KC		
KFEQ	St. Joseph, Mo.	*2500*
KPO	San Francisco, Calif.	50000
WLAW	Lawrence, Mass.	*1000*
WPTF	Raleigh, N. C.	5000
700 KC		
WLW	Cincinnati, Ohio	500000
710 KC		
KIRO	Seattle, Wash.	1000
KMPC	Beverly Hills, Calif.	500
WOR	Newark, N. J.	50000
720 KC		
WGN	Chicago, Ill.	50000
740 KC		
KMMJ	Clay Center, Nebr.	*1000*
KTRB	Modesto, Calif.	*250*
WHEB	Portsmouth, N. H.	*250*
WSB	Atlanta, Ga.	50000
750 KC		
KGU	Honolulu, Hawaii	2500
WJR	Detroit, Mich.	50000
760 KC		
KXA	Seattle, Wash.	250
WBAL	Baltimore, Md.	2500
WCAL	Northfield, Minn.	5000
WEW	St. Louis, Mo.	*1000*
WJZ	New York, N. Y.	50000
WLB	Minneapolis, Minn.	5000
770 KC		
KFAB	Lincoln, Nebr.	10000
WBBM	Chicago, Ill.	50000
780 KC		
—	Longview, Wash.	*250*
KEHE	Los Angeles, Calif.	500
KFDY	Brookings, S. D.	*1000*
KFQD	Anchorage, Alaska	250
KGHL	Billings, Mont.	1000
WEAN	Providence, R. I.	1000
WMC	Memphis, Tenn.	1000
WTAR	Norfolk, Va.	1000
790 KC		
KGO	San Francisco, Calif.	7500
KOAM	Pittsburg, Kans.	*1000*
800 KC		
WBAP	Fort Worth, Tex.	50000
WFAA	Dallas, Texas	50000
WTBO	Cumberland, Md.	*250*
810 KC		
WCCO	Minneapolis, Minn.	50000
WNYC	New York, N. Y.	*1000*
820 KC		
WHAS	Louisville, Ky.	50000
830 KC		
KOA	Denver, Colo.	50000
WEEU	Reading, Pa.	*1000*
WHDH	Boston, Mass.	*1000*
WRUF	Gainesville, Fla.	*5000*
850 KC		
KIEV	Glendale, Calif.	*250*
WESG	Elmira, N. Y.	1000
WKAR	East Lansing, Mich.	*1000*
WWL	New Orleans, La.	10000
860 KC		
WABC	New York, N. Y.	50000
WHB	Kansas City, Mo.	*1000*
870 KC		
WENR	Chicago, Ill.	50000
WLS	Chicago, Ill.	50000
880 KC		
KFKA	Greeley, Colo.	1000
KLX	Oakland, Calif.	1000
KPOF	Denver, Colo.	500
WCOC	Meridian, Miss.	500
WGBI	Scranton, Pa.	500
WRNI	Richmond, Va.	*500*
WQAN	Scranton, Pa.	1000
WSUI	Iowa City, Iowa	500
890 KC		
KARK	Little Rock, Ark.	250
KFNF	Shenandoah, Iowa	500
KFPY	Spokane, Wash.	1000
KUSD	Vermilion, S. D.	500
WBAA	West Lafayette, Ind.	*1000*
WGST	Atlanta, Ga.	1000
WJAR	Providence, R. I.	500
WMMN	Fairmont, W. V.	500
900 KC		
KGBU	Ketchikan, Alaska	500
KHJ	Los Angeles, Calif.	1000
KSEI	Pocatello, Idaho	250
WBEN	Buffalo, N. Y.	1000
WELI	New Haven, Conn.	*500*
WFMD	Frederick, Md.	*500*
WIAX	Jacksonville, Fla.	1000
WKY	Oklahoma City, Okla.	1000
WLBL	Stevens Point, Wis.	5000
WTAD	Quincy, Ill.	*500*
920 KC		
KFEL	Denver, Colo.	500
KOMO	Seattle, Wash.	1000
KPRC	Houston, Texas	1000
KVOD	Denver, Colo.	500
WAAF	Chicago, Ill.	*1000*
WORL	Boston, Mass.	*500*
WPEN	Philadelphia, Pa.	1000
WRAX	Philadelphia, Pa.	1000
WSPA	Spartanburg, S. C.	*1000*
WWJ	Detroit, Mich.	5000
930 KC		
KGBZ	York, Nebr.	1000
KMA	Shenandoah, Iowa	1000
KROW	Oakland, Calif.	1000
WBRC	Birmingham, Ala.	1000
WDBJ	Roanoke, Va.	5000
940 KC		
KOIN	Portland, Ore.	1000
WAAT	Jersey City, N. J.	*500*
WAVE	Louisville, Ky.	1000
WCSH	Portland, Me.	1000
WDAY	Fargo, N. D.	1000
WHA	Madison, Wis.	2500
WICA	Ashtabula, Ohio	250
950 KC		
KFWB	Hollywood, Calif	1000
WMBC	Kansas City, Mo.	1000
WHAL	Saginaw, Mich.	500
WRC	Washington, D. C.	1000
970 KC		
KJR	Seattle, Wash.	5000
WCFL	Chicago, Ill.	5000
WIBG	Glenside, Pa.	100
980 KC		
KDKA	Pittsburgh, Pa.	50000
990 KC		
WBZ	Boston, Mass.	50000
WBZA	Springfield, Mass.	1000
1000 KC		
KFVD	Los Angeles, Calif.	*1000*
WHO	Des Moines, Iowa	50000
1010 KC		
KGGF	Coffeyville, Kans.	1000
KQW	San Jose, Calif.	1000
WHN	New York, N. Y.	1000
WNAD	Norman, Okla.	1000
WNOX	Knoxville, Tenn.	1000
1020 KC		
KYW	Philadelphia, Pa.	10000
WDZ	Tuscola, Ill.	250
1040 KC		
KRLD	Dallas, Texas	10000
KYOS	Merced, Calif.	*250*
KWJJ	Portland, Ore.	500
WTIC	Hartford, Conn.	50000
1050 KC		
KFBI	Abilene, Kans.	*5000*
KNX	Hollywood, Calif.	50000
WEAU	Eau Claire, Wis.	250
WGVA	Indianapolis, Ind.	*1000*
1060 KC		
KTHS	Hot Springs, Ark.	10000
WBAL	Baltimore, Md.	10000
WJAG	Norfolk, Nebr.	*1000*
—	College Park, Md.	100
1070 KC		
KJBS	San Francisco, Calif.	*500*
WCAZ	Carthage, Ill.	*100*
WTAM	Cleveland, Ohio	50000
1080 KC		
WBT	Charlotte, N. C.	50000
WCBD	Waukegan, Ill.	*5000*
WMBI	Chicago, Ill.	*5000*
1090 KC		
KMOX	St. Louis, Mo.	50000
1100 KC		
KGDM	Stockton, Calif.	*1000*
KWKH	Shreveport, La.	10000
WBIL	New York, N. Y.	5000
WPG	Atlantic City, N. J.	5000
1110 KC		
KSOO	Sioux Falls, S. D.	*2500*
WRVA	Richmond, Va.	5000
1120 KC		
KFIO	Spokane, Wash.	*100*
KFSG	Los Angeles, Calif.	500
KRKD	Los Angeles, Calif.	500
KRSC	Seattle, Wash.	250
KTBC	Austin, Texas	*1000*
WCOP	Boston, Mass.	*500*
WDEL	Wilmington, Del.	250
WISN	Milwaukee, Wis.	250
WJBO	Baton Rouge, La.	500
WTAW	College Station, Texas	500
1130 KC		
KSL	Salt Lake City, Utah	50000
WJJD	Chicago, Ill.	*20000*
WOV	New York, N. Y.	*1000*
1140 KC		
KVOO	Tulsa, Okla.	25000
WAPI	Birmingham, Ala.	5000
WSPR	Springfield, Mass.	500
1150 KC		
WHAM	Rochester, N. Y.	50000

1160 KC		
WOWO	Fort Wayne, Ind.	10000
WWVA	Wheeling, W. Va.	5000
1170 KC		
WCAU	Philadelphia, Pa.	50000
1180 KC		
KEX	Portland, Ore.	5000
KOB	Albuquerque, N. M.	10000
WDGY	Minneapolis, Minn.	*1000*
WINS	New York, N. Y.	1000
WMAZ	Macon, Ga.	1000
1190 KC		
KTKC	Visalia, Calif.	*250*
WOAI	San Antonio, Texas	50000
WSAZ	Huntington, W. Va.	1000
1200 KC		
—	Coeur d'Alene, Idaho	*100*
KADA	Ada, Okla.	*100*
KBTM	Jonesboro, Ark.	*100*
KDNC	Lewiston, Mont.	100
KFJB	Marshalltown, Iowa	100
KFXD	Nampa, Idaho	100
KFXJ	Grand Junction, Colo.	100
KGDE	Fergus Falls, Minn.	100
KGEK	Sterling, Colo.	100
KGFJ	Los Angeles, Calif.	100
KGHI	Little Rock, Ark.	100
KGSS	Sioux Falls, S. D.	100
KGVL	Greenville, Texas	*100*
KMLB	Monroe, La.	100
KSUN	Lowell, Ariz.	100
KVCV	Redding, Calif.	100
KVEC	San Luis Obispo, Calif.	*250*
KVOS	Bellingham, Wash.	100
KWG	Stockton, Calif.	100
KWNO	Winona, Minn.	*100*
WABI	Bangor, Me.	100
WAIM	Anderson, S. C.	100
WAYX	Waycross, Ga.	100
WBBZ	Ponca City, Okla.	100
WBHP	Huntsville, Ala.	100
WBNO	New Orleans, La.	100
WCAT	Rapid City, S. D.	*100*
WCAX	Burlington, Vt.	100
WCLO	Janesville, Wis.	100
WCPO	Cincinnati, Ohio	100
WDSN	Superior, Wis.	100
WEST	Easton, Pa.	100
WFAM	South Bend, Ind.	100
WFTC	Kinston, N. C.	100
WHBC	Canton, Ohio	100
WHBY	Green Bay, Wis.	100
WIBX	Utica, N. Y.	100
WIL	St. Louis, Mo.	100
WJBC	Bloomington, Ill.	100
WJBL	Decatur, Ill.	100
WJBW	New Orleans, La.	100
WJNO	West Palm Beach, Fla.	100
WJRD	Tuscaloosa, Ala.	*100*
WKBO	Harrisburg, Pa.	100
WLVA	Lynchburg, Va.	100
WMFR	High Point, N. C.	*100*
WMPC	Lapeer, Mich.	100
WOLS	Florence, S. C.	*100*
WRBL	Columbus, Ga.	100
WSAL	Salisbury, Md.	*250*
WTHT	Hartford, Conn.	100
WTOL	Toledo, Ohio	*100*
WWAE	Hammond, Ind.	100
1210 KC		
KALB	Alexandria, La.	*100*
KANS	Wichita, Kans.	100
KASA	Elk City, Okla.	100
KDLR	Devils Lake, N. D.	100
KDON	Del Monte, Calif.	100
KFJI	Klamath Falls, Ore.	100
KFOR	Lincoln, Nebr.	100
KFPA	Helena, Mont.	*250*
KFPW	Fort Smith, Ark.	100
KFRO	Longview, Texas	100
KFVS	Cape Girardeau, Mo.	100
KFXM	San Bernardino, Calif.	100
KGLO	Mason City, Iowa	100
KGY	Olympia, Wash.	100
KHBG	Okmulgee, Okla.	*100*
KIUL	Garden City, Kans.	100
KLAH	Carlsbad, N. M.	100
KOCA	Kilgore, Texas	100
KPPC	Pasadena, Calif.	100
KVSO	Ardmore, Okla.	*100*
KWTN	Watertown, S. D.	100
WALR	Zanesville, Ohio	100
WBAX	Wilkes-Barre, Pa.	100
WBBL	Richmond, Va.	100
WBLY	Lima, Ohio	100
WBRB	Red Bank, N. J.	100
WCOL	Columbus, Ohio	100
WCRW	Chicago, Ill.	100
WEBQ	Harrisburg, Ill.	100
WEDC	Chicago, Ill.	100
WFAS	White Plains, N. Y.	100
WFOY	St. Augustine, Fla.	100
WGBB	Freeport, N. Y.	100
WGCM	Gulfport, Miss.	100
WGNY	Chester Township, N. Y.	100
WHBF	Rock Island, Ill.	100
WHBU	Anderson, Ind.	100
WIBU	Poynette, Wis.	100
WIBY	Gadsden, Ala.	100
WIEL	Hagerstown, Md.	*100*
WJIM	Lansing, Mich.	100
WJTN	Jamestown, N. Y.	100
WJW	Akron, Ohio	100
WKOK	Sunbury, Pa.	100
WLMU	Middlesboro, Ky.	100
WMBG	Richmond, Va.	100
WMFG	Hibbing, Minn.	100
WMFN	Clarksdale, Miss.	100
WOMT	Manitowoc, Wis.	100
WPAX	Thomasville, Ga.	*250*
WSAY	Rochester, N. Y.	*100*
WSBC	Chicago, Ill.	100
WSIX	Nashville, Tenn.	100
WSNJ	Bridgeton, N. J.	*100*
WSOC	Charlotte, N. C.	100
WTAX	Springfield, Ill.	100
1220 KC		
KFKU	Lawrence, Kansas	1000
KTMS	Santa Barbara, Calif.	500
KTW	Seattle, Wash.	1000
KWSC	Pullman, Wash.	1000
WCAD	Canton, N. Y.	*500*
WCAE	Pittsburgh, Pa.	1000
WDAE	Tampa, Fla.	1000
WREN	Lawrence, Kans.	1000
1230 KC		
KGBX	Springfield, Mo.	500
KGGM	Albuquerque, N. M.	1000
KYA	San Francisco, Calif.	1000
WFBM	Indianapolis, Ind.	1000
WNAC	Boston, Mass.	1000
WOL	Washington, D. C.	1000
1240 KC		
KTAT	Fort Worth, Texas	1000
KTFI	Twin Falls, Idaho	1000
WKAQ	San Juan, Porto Rico	1000
WXYZ	Detroit, Mich.	1000
1250 KC		
KFOX	Long Beach, Calif.	1000
KIT	Yakima, Wash.	250
KXOX	St. Louis, Mo.	1000
WAIR	Winston Salem, N. C.	*250*
WDSU	New Orleans, La.	1000
WHBI	Newark, N. J.	1000
WNEW	New York, N. Y.	1000
WTCN	Minneapolis, Minn.	1000
1260 KC		
KGVO	Missoula, Mont.	1000
KHSL	Chico, Calif.	*250*
KOIL	Council Bluffs, Iowa	1000
KPAC	Port Arthur, Texas	*500*
KRGV	Welasco, Texas	1000
KUOA	Fayetteville, Ark.	*1000*
WHIO	Dayton, Ohio	1000
WNBX	Springfield, Vt.	1000
WTOC	Savannah, Ga.	1000
1270 KC		
KGCA	Decorah, Iowa	*100*
KOL	Seattle, Wash.	1000
KVOR	Colorado Springs, Colo.	1000
KWLC	Decorah, Iowa	*100*
WASH	Grand Rapids, Mich.	500
WFBR	Baltimore, Md.	500
WJDX	Jackson, Miss.	1000
WOOD	Grand Rapids, Mich.	500
1280 KC		
KFBB	Great Falls, Mont.	1000
KLS	Oakland, Calif.	*250*
WCAM	Camden, N. J.	500
WCAP	Asbury Park, N. J.	500
WDOD	Chattanooga, Tenn.	1000
WTNJ	Madison, Wis.	1000
WIBA	Worcester, Mass.	500
WORC	Dallas, Texas	500
WRR	Trenton, N. J.	500
1290 KC		
KDYL	Salt Lake City, Utah	1000
KLCN	Blytheville, Ark.	*100*
KTRH	Houston, Texas	1000
WATR	Waterbury, Conn.	250
WEBC	Superior, Wis.	1000
WJAS	Pittsburgh, Pa.	1000
WNBZ	Saranac Lake, N. Y.	*100*
WNEL	San Juan, Porto Rico	1000
1300 KC		
KALE	Portland, Ore.	500
KFAC	Los Angeles, Calif.	1000
KFH	Wichita, Kans.	1000
KFJR	Portland, Ore.	500
WBBR	Brooklyn, N. Y.	1000
WEVD	New York, N. Y.	1000
WFAB	New York, N. Y.	1000
WFBC	Greenville, S. C.	1000
WHAZ	Troy, N. Y.	500
WHBL	Sheboygan, Wis.	500
1310 KC		
KAND	Corsicana, Texas	*100*
KARM	Fresno, Calif.	100
KCKN	Kansas City, Kans.	100
KCRJ	Jerome, Ariz.	100
KFPL	Dublin, Texas	1000
KFXR	Oklahoma City, Okla.	100
KFYO	Lubbock, Texas	100
KGEZ	Kalispell, Mont.	100
KGFW	Kearney, Nebr.	100
KHUB	Watsonville, Calif.	*250*
KPDN	Pampa, Texas	*100*
KRKV	Sherman, Texas	100
WRAB	Lufkin, Texas	*100*
KRMD	Shreveport, La.	100
KROC	Rochester, Minn.	100
KROY	Sacramento, Calif.	*100*
KROA	Santa Fe, N. M.	100
KSRO	Santa Rosa, Calif.	*250*
KSUB	Cedar City, Utah	100
KTSM	El Paso, Texas	100
KVOL	Lafayette, La.	100
KVOX	Moorhead, Minn.	100
KWOS	Jefferson City, Mo.	*100*
KXRO	Aberdeen, Wash.	100
WAML	Laurel, Miss.	100
WBEO	Marquette, Mich.	100
WBOW	Terre Haute, Ind.	100
WBRE	Wilkes-Barre, Pa.	100
WBRK	Pittsfield, Mass.	100
WCLS	Joliet, Ill.	100
WCMI	Ashland, Ky.	100
WDAH	El Paso, Texas	100
WEBR	Buffalo, N. Y.	100
WEMP	Milwaukee, Wis.	*100*
WEXL	Royal Oak, Mich.	100
WFBG	Altoona, Pa.	100
WFDF	Flint, Mich.	100
WGH	Newport News, Va.	100
WGTM	Wilson, N. C.	*100*
WHAT	Philadelphia, Pa.	100
WJAC	Johnstown, Pa.	100
WLAK	Lakeland, Fla.	100
WLBC	Muncie, Ind.	100
WLNH	Laconia, N. H.	100
WMBO	Auburn, N. Y.	100
WMFF	Plattsburg, N. Y.	*250*
WNBH	New Bedford, Mass.	100
WRAW	Reading, Pa.	100
WROL	Knoxville, Tenn.	100
WSAJ	Grove City, Pa.	100
WSGN	Birmingham, Ala.	100
WSJS	Winston-Salem, N. C.	100
WTAL	Tallahassee, Fla.	100
WTEL	Philadelphia, Pa.	100
WTJS	Jackson, Tenn.	100
WTRC	Elkhart, Ind.	100
1320 KC		
KGHF	Pueblo, Colo.	500
KGMB	Honolulu, Hawaii	1000
KID	Idaho Falls, Idaho	500
KRNT	Des Moines, Iowa	1000
WADC	Akron, Ohio	1000
WORK	York, Pa.	1000
WSMB	New Orleans, La.	1000
1330 KC		
KGB	San Diego, Calif.	1000
KMO	Tacoma, Wash.	1000
KSCJ	Sioux City, Iowa	1000
WDRC	Hartford, Conn.	1000
WSAI	Cincinnati, Ohio	1000
WTAQ	Green Bay, Wis.	1000
KRIS	Corpus Christi, Tex.	500
1340 KC		
KDTH	Dubuque, Iowa	*500*
KGDY	Huron, S. D.	*250*
KGIR	Butte, Mont.	1000
KGNO	Dodge City, Kans.	250
WCOA	Pensacola, Fla.	1000
WFEA	Manchester, N. H.	500
WSPD	Toledo, Ohio	1000
1350 KC		
KIDO	Boise, Idaho	1000
KWK	St. Louis, Mo.	1000
WAWZ	Zarephath, N. J.	500
WBNX	New York, N. Y.	1000
1360 KC		
KCRC	Enid, Okla.	250
KGER	Long Beach, Calif.	1000
KLPM	Minot, N. D.	500
WCSC	Charleston, S. C.	500
WFBL	Syracuse, N. Y.	1000
WGES	Chicago, Ill.	500
WQBC	Vicksburg, Miss.	*1000*
WSBT	South Bend, Ind.	500
1370 KC		
KAST	Astoria, Ore.	*100*
KCMO	Kansas City, Mo.	100
KELD	El Dorado, Ark.	100
KERN	Bakersfield, Calif.	100
KTOK	Boone, Iowa	100
KFJZ	Fort Worth, Texas	100
KGAR	Tucson, Ariz.	100
KGFG	Oklahoma City, Okla.	100
KGFL	Roswell, N. M.	100
KGKL	San Angelo, Texas.	100
KICA	Clovis, N. M.	100
KIUP	Durango, Colo.	100
KLUF	Galveston, Texas	100
KMAC	San Antonio, Texas	100
KOBH	Rapid City, S. D.	100
KOKO	La Junta, Colo.	100
KONO	San Antonio Texas	100
KRE	Berkeley, Calif.	100
KRKO	Everett, Wash.	50
KRMC	Jamestown, N. D.	100
KSLM	Salem, Ore.	100
KTEM	Temple, Texas	*250*
KUJ	Walla Walla, Wash.	100
KVGB	Great Bend, Kans.	100
KVL	Seattle, Wash.	100
KWYO	Sheridan, Wyo.	100
WABY	Albany, N. Y.	100
WAGF	Dothan, Ala.	*250*
WATL	Atlanta, Ga.	100
WBNY	Buffalo, N. Y.	100
WBTM	Danville, Va.	100
WCBM	Baltimore, Md.	100
WDAS	Philadelphia, Pa.	100
WDNS	Champaign, Ill.	*100*
WEOA	Evansville, Ind.	100
WBLK	Clarksburg, W. Va.	100
WFOR	Hattiesburg, Miss.	100
WGL	Fort Wayne, Ind.	100
WGRC	New Albany, Ind.	*250*
WHBQ	Memphis, Tenn.	100
WHDF	Calumet, Mich.	100
WHLB	Virginia, Minn.	100
WIBM	Jackson, Mich.	100
WLLH	Lowell, Mass.	100
WMBR	Jacksonville, Fla.	100
WMFD	Wilmington, N. C.	*100*
WMFO	Decatur, Ill.	*100*

WMIN	St. Paul, Minn.	100
WOC	Davenport, Iowa	100
WPAY	Portsmouth, Ohio	100
WPRA	Mayaguez, P. R.	100
WRAK	Williamsport, Pa.	100
WRDO	Augusta, Ga.	100
WRJN	Racine, Wis.	100
WSAU	Wausau, Wis.	100
KSVS	Buffalo, N. Y.	*50*
KVRS	Rocky Springs, Wyo.	100
1380 KC		
KOH	Reno, Nevada	500
KQV	Pittsburgh, Pa.	500
WALA	Mobile, Ala.	500
WKBH	La Crosse, Wis.	1000
WNBC	New Britain, Conn.	250
WSMK	Dayton, Ohio	200
1390 KC		
KLRA	Little Rock, Ark.	1000
KRLC	Lewiston, Idaho	250
KOOS	Marshfield, Ore.	*250*
KOY	Phoenix, Ariz.	500
WHK	Cleveland, Ohio	1000
WQDM	St. Albans, Vt.	1000
1400 KC		
KLO	Ogden, Utah	500
KTUL	Tulsa, Okla.	500
WBBC	Brooklyn, N. Y.	500
WEGL	Brooklyn, N. Y.	500
WHDL	Olean, N. Y.	250
WIRE	Indianapolis, Ind.	1000
WVFW	Brooklyn, N. Y.	500
1410 KC		
KFJM	Grand Forks, N. D.	500
KGCX	Wolf Point, Mont.	500
KGNC	Amarillo, Texas	1000
KMED	Medford, Ore.	250
WAAB	Boston, Mass.	500
WBCM	Bay City, Mich.	500
WHIS	Bluefield, W. Va.	250
WROK	Rockford, Ill.	500
WSFA	Montgomery, Ala.	500
1420 KC		
KABC	San Antonio, Texas	100
KABR	Aberdeen, S. D.	100
KATE	Albert Lea, Minn.	*250*
KBPS	Portland, Ore.	100
KCMC	Texarkana, Ark.	100
KEUB	Price, Utah	100
KFIZ	Fond du Lac, Wis.	100
KGFF	Shawnee, Okla.	100
KGGC	San Francisco, Calif.	100
KGIW	Alamosa, Colo.	100
KHBC	Hilo, Hawaii	100
KIDW	Lamar, Colo.	100
KIUN	Pecos, Texas	100
KLBM	La Grande, Ore.	100
KNET	Palestine, Texas	*100*
KORE	Eugene, Ore.	100
KRBC	Abilene, Texas	100
KRLH	Midland, Texas	*100*
KTRI	Sioux City, Iowa	100
KUMA	Yuma, Ariz.	100
KWBG	Hutchinson, Kans.	100
KXL	Portland, Ore.	100
WACO	Waco, Texas	100
WAGM	Presque Isle, Me.	100
WAPO	Chattanooga, Tenn.	*100*
WAZL	Hazleton, Pa.	100
WCBS	Springfield, Ill.	100
WCHV	Charlotteville, Va.	100
WEED	Rocky Mount, N. C.	100
WEHS	Cicero, Ill.	100
WELL	Battle Creek, Mich.	100
WFAM	St. Cloud, Minn.	100
WGPC	Albany, Ga.	100
WHFC	Cicero, Ill.	100
WILM	Wilmington, N. C.	100
WJBR	Gastonia, N. C.	100
WJMS	Ironwood, Mich.	100
WKBI	Cicero, Ill.	100
WLAP	Lexington, Ky.	100
WLEU	Erie, Pa.	100
WMAS	Springfield, Mass.	100
WMBC	Detroit, Mich.	100
WMBH	Joplin, Mo.	100
WMFJ	Daytona Beach, Fla.	100
WMSD	Sheffield, Ala.	100
WNNY	Watertown, N. Y.	100
WPAD	Paducah, Ky.	100
WPAR	Parkersburg, W. Va.	100
WPRP	Ponce, P. R.	100
1430 KC		
KECA	Los Angeles, Calif.	1000
KGNF	North Platte, Nebr.	*1000*
KINY	Juneau, Alaska	250
KSO	Des Moines, Iowa	500
WBNS	Columbus, Ohio	500
WHEC	Rochester, N. Y.	500
WHP	Harrisburg, Pa.	500
WMPS	Memphis, Tenn.	500
WOKO	Albany, N. Y.	500
1440 KC		
KDFN	Casper, Wyo.	500
KELA	Centralia, Wash.	500
KXYZ	Houston, Texas	1000
WBIG	Greensboro, N. C.	1000
WCBA	Allentown, Pa.	500
WMBD	Peoria, Ill.	1000
WSAN	Allentown, Pa.	500
1450 KC		
KIEM	Eureka, Calif.	500
KTBS	Shreveport, La.	1000
WGAR	Cleveland, Ohio	500
WHOM	Jersey City, N. J.	250
WMBS	Uniontown, Pa.	*250*
WSAR	Fall River, Mass.	1000
WAGA	Atlanta, Ga.	500
1460 KC		
KSTP	St. Paul, Minn.	25000
WJSV	Washington, D. C.	10000
1470 KC		
KGA	Spokane, Wash.	5000
WLAC	Nashville, Tenn.	5000
WMEX	Boston, Mass.	5000
1480 KC		
KOMA	Oklahoma City, Okla.	5000
WHIP	Hammond, Ind.	*5000*
WKBW	Buffalo, N. Y.	5000
1490 KC		
KFBK	Sacramento, Calif.	5000
WCKY	Covington, Ky.	5000
1500 KC		
KAWM	Gallup, N. Mex.	100
KBIX	Muskogee, Okla.	100
KBST	Big Springs, Texas	100
KDAL	Duluth, Minn.	100
KDB	Santa Barbara, Calif.	100
KGFI	Brownsville, Tex.	100
KGKB	Tyler, Texas	100
KGKY	Scottsbluff, Nebr.	100
KNEL	Brady, Texas	*250*
KNOW	Austin, Texas	100
KOTN	Pine Bluff, Ark.	*100*
KOVC	Valley City, N. D.	100
KPLC	Lake Charles, La.	100
KPLT	Paris, Texas	*250*
KPQ	Wenatchee, Wash.	100
KRNR	Roseburg, Ore.	*100*
KROD	El Paso, Texas	100
KSAL	Salina, Kans.	100
KUTA	Salt Lake City, Utah	100
KVOE	Santa Ana, Calif.	100
KXO	El Centro, Calif.	100
WCNW	Brooklyn, N. Y.	100
WDNC	Durham, N. C.	100
WGAL	Lancaster, Pa.	100
WHBB	Selma, Ala.	*100*
WHEF	Kosciusko, Miss.	100
WJBK	Detroit, Mich.	100
WKAT	Miami Beach, Fla.	100
WKBB	East Dubuque, Ill.	100
WKBV	Richmond, Ind.	100
WKBZ	Muskegon, Mich.	100
WKEU	Griffin, Ga.	*100*
WMBQ	Brooklyn, N. Y.	100
WNBF	Binghamton, N. Y.	100
WNLC	New London, Conn.	*100*
WOMI	Owensboro, Ky.	100
WOPI	Bristol, Tenn.	100
WRDW	Augusta, Ga.	100
WRGA	Rome, Ga.	100
WRTD	Richmond, Va.	100
WSYB	Rutland, Vt.	100
WTMV	East St. Louis, Ill.	100
WWRL	Woodside, N. Y.	100
WWSW	Pittsburgh, Pa.	100
—	El Paso, Texas	100
1530 KC		
KXBY	Kansas City, Mo.	1000
WBRY	Waterbury, Conn.	1000
1550 KC		
KPMC	Bakersfield, Calif.	1000
WQXR	Long Island City, N. Y.	1000

NOTES ON THE WIDE-RANGE SYSTEM

(Continued from page 643)

In order to reduce hum to the absolute minimum, the capacities of the filter condensers C18 and C19 have been increased, each of these two being 24 mfd., or one of the Cornell-Dubilier KR-5888 units each of which is composed of three 8-mfd. sections in a single can. This accounts for two of the three large electrolytic condenser units used in the original amplifier, the third unit being used to bypass circuits in the volume expander. The fourth unit—which is a single 8-mfd. electrolytic condenser in a smaller container, is used to bypass the plate feed circuit to the two sections of the 6C8G tube, and is C12 in the accompanying diagram.

It might be added that two 24-mfd. filter condensers in the power-supply circuit are not essential; one can get along with a single 8-8-8 mfd. unit, using one section for C18, a second section for C19 and the third section for C12. But the higher capacities for C18 and C19 are advantageous.

The Phase Inverter

A minor change has also been made in the output circuit of the phase inverter, this being the addition of a 10,000-ohm, ½-watt resistor, R16, in the plate circuit of the second section of the 6C8G tube. This places the same amount of resistance in both plate circuits—100,000 ohms and 10,000 ohms respectively—with the result that plate current is equal for both sections of the tube.

Originally a certain amount of degeneration was introduced in the phase inverter, but with the addition of inverse feedback in the output stage, and in the interests of balanced operation of the phase inverter, the cathode resistor, R11, is bypassed by a 25-mfd., 25-volt electrolytic condenser. Again, this condenser is by no means a necessity, but is a worthwhile addition.

Inverse Feedback

By far the most notable contribution to the original circuit is the addition of inverse feedback. To the best of our knowledge, no data has been published on the application of this system to a resistance-coupled push-pull amplifier, though there is nothing complex about it. And the advantages of this system can be gained by the mere addition of four resistors and two fixed condensers. Anyone can add it in a few minutes of soldering and the improved results obtained make the addition extremely worth while.

The advantages gained through the use of inverse feedback are numerous. Most even harmonic distortion is balanced out in a push-pull amplifier stage, but odd harmonic distortion persists. The latter harmonics, which may be a product of distortion developed in earlier amplifier stages, are reduced appreciably by the function of inverse feedback. This is accomplished by feeding back to the grid circuits out-of-phase voltages which cancel out the original distortion, the amount of cancellation or equalization depending upon the percentage of feedback. This feedback reduces the gain or power sensitivity of the output tubes, the reduction also being dependent upon the percentage of feedback voltage, but this loss of gain can be readily compensated for by in-

(Continued on page 662)

SHORT-WAVE BROADCAST STATION LIST

BOLD NUMERALS: MEGACYCLES. LIGHT NUMERALS: METERS. DOT (●): STATION DOES NOT VERIFY. DIAMOND (◆): STATION NOT IN USE.

Abbreviations: O—Opening; C—Closing; I—Interval; S—Signal; I.R.C.—International Reply Coupon. Schedules in E.S.T.

41.000 7.32 W2XHG — National Broadcasting Co., 30 Rockefeller Plaza, New York, N. Y. Daily 9 a.m.-12 midnight.

38.650 7.76 W2XDG — New York, N. Y. (see 41.000 mc.) Daily 9 a.m.-12 midnight.

31.600 9.4 ● W1XKA — Boston, Mass. (see W1XK 9.570 mc.) Daily 7 a.m.-1 a.m.

31.600 9.4 ● W8XKB — Westinghouse Electric & Mfg. Co., Springfield, Mass. Daily 7 a.m.-1 a.m.

31.600 9.4 ● W1XKB — Pittsburgh, Pa. (see W8XK 21.540 mc.) Daily 10 a.m.-12 Midnight.

31.600 9.4 W3XKA — Philadelphia, Pa. (see W3XAU 9.590 mc.) Daily 9 a.m.-10 p.m.

31.600 9.4 W8XWJ — 4465 Penobscot Bldg., Detroit, Mich. Daily exc. Sun. 10:30 a.m.-5 p.m.

31.600 9.4 W2XDV — New York, N. Y. (see 21.520 mc.) Mon. to. Fri. 6-11 p.m. Sat-Sun. 1:30-6 p.m.; 7-10 p.m.

26.100 11.49 ● ◆ GSK — British Broadcasting Corp., Broadcasting House, London W1, England. Big Ben strikes the hour according to arrangement program. C: **God Save The King.** I. **Bow Bells.**

25.950 11.56 W6XKG — Washington Blvd. at Oak St., Los Angeles, Calif. Continuously 24 hours each day.

21.550 13.92 ● ◆ GST — Daventry, England. (see 26.100 mc.)

21.540 13.92 ● W8XK — Grant Bldg., Pittsburgh, Pa. O-C: **Stars and Stripes Forever.** Daily 6:45-9 a.m.

21.530 13.93 ● GSJ — Daventry, England. (see 26.100 mc.) Daily 5:45-8:55 a.m.; 9:15 a.m.-10:30 a.m.

21.520 13.94 W2XE — 485 Madison Ave., New York, N. Y. C: **Star Spangled Banner.** Mon. to Fri. 7:30-10 a.m. Sat.-Sun. 8 a.m.-1 p.m.

21.520 13.94 ◆ JZM — Overseas Section, The Broadcasting Corp. of Japan, Tokyo, Japan. O-C: **Kimigayo** National Anthem. Musical chimes follow. (see 11.800-15.160 mc.)

21.470 13.97 ● GSH — Daventry, England. (see 26.100 mc.) Daily 5:45-8:55 a.m.; 9:15 a.m.-12 noon.

21.460 13.98 W1XAL — World Wide Broadcasting Corp., University Club, Boston, Mass. O: **News, Blaze Away.** C: **Star Spangled Banner.** Irregular.

21.450 13.99 OLR6A — Radiojournal, Praha XII, Fochova Tr. 16, Praha, (Prague) Czechoslovakia. O-C: Melody **New World Symphony** and Cathedral chimes. I: 9 note trumpet call, repeated. Irregular (see 9.550-11.840 mc.)

19.020 15.77 HS8PJ — Superintending Engineer, Post and Telegraph Dept., Technical Section, Bangkok, Siam. O: 3 chimes, English Mondays, 8:10 a.m.

17.790 16.86 GSG — Daventry, England. (see 26.100 mc.) Daily 3:15-5:30 a.m., 5:45-8:55 a.m., 9:15-12 noon, 12:20-3:45 p.m.

17.785 16.87 JZL — Nazaki, Japan. (see 21:20 mc.) **Irregular.**

17.780 16.87 W3XAL — 30 Rockefeller Plaza, New York. N. Y. Daily 8:55 a.m.-6:45 p.m., 7-9 p.m.

17.780 16.87 ◆ W9XAA — 666 Lake Shore Drive, Chicago, Ill. S: 3 chimes each 15 minutes. O: **Star Spangled Banner.**

17.770 16.88 PHI — Philips Radio, Hilversum, Holland. Call: Seven languages. I: Metronome 80 beats per minute. C: National Anthem. Sun., 7:25-10:25 a.m., Mon., Tues., Thurs., Fri. 8:25-10 a.m., Sat. 8:25-10:30 a.m.

17.760 16.89 DJE — German Short Wave Station, Broadcasting House, Berlin, Germany. I: 9 musical notes. Folk Song. C: **National Horst-Wessel Lied and Deutschlandlied.** Daily 12:05 midnight-11 a.m.; Sunday 11:10 a.m.-12:25 p.m.

17.760 16.89 W2XE — Wayne, N. J. (see 21.520 mc.) Daily 6:30-8 p.m.

17.755 16.90 ZBW-5 — Hong Kong, China. (see 9.525 mc.)

15.530 19.32 HS8PJ — Bangkok, Siam. (see 19.020 mc.) Occasional Mondays 8-10 a.m.

15.440 19.43 XEBM — P. O. Box 50, Mazatlan, Mexico. Daily 9-10 a.m.; 1-2 p.m., 8-10 p.m.

15.370 19.52 HAS-3 — Director Radio, Hungarian Post, Gyali St., 22, Budapest, Hungary. I: Musical Box Melody; O. Bells ringing; C: **Lord Bless the Hungarian (national anthem).** Sunday 9-10 a.m.

15.360 19.53 DZG — Zeesen, Germany (see 17.760 mc.) **Irregular.**

15.340 19.56 DJR — Zeesen, Germany (see 17.760 mc.) Daily 8-9 a.m.

15.330 19.56 W2XAD — General Electric Co., 1 River Rd., Schenectady, N. Y.; O: Spark Discharge. C: **Star Spangled Banner.** Daily 11 a.m.-9 p.m.

15.320 19.58 OLR5B — Prague, Czechoslovakia, (see 21.450 mc.) **Irregular** (see 9.550-11.840 mc.)

15.310 19.60 ● GSP — Daventry, England (see 26.100 mc.) Daily 4-6 p.m., 6:20-8:30 p.m.

15.300 19.61 YDB — Soerabaja, Java. Daily 7:30 p.m.-2 a.m. (see 15.150 mc.)

15.290 19.62 LRU — Radio El Mundo, Maipu, 555, Buenos Aires, Argentina, S.A. O-C: English only. Daily 7-9 a.m.

15.280 19.63 HI3X — J. R. Saladin, Director of Radio Communications, Ciudad Trujillo, Dominican Republic. S: Bells. Weekdays 12:10-1:10 p.m.; Sundays 7:40-10:40 a.m.

15.280 19.63 DJQ — Zeesen, Germany (see 17.760 mc.) Daily 12:05-5:45 a.m.; 6-8 a.m.; 8:10-11 a.m.; 4:50-10:45 p.m. Sunday 11:10 a.m.-12:25 p.m.

15.270 19.64 W2XE — Wayne, N. J. (see 21.520 mc.) Mon. to Fri. 1-6 p.m. 8:30 p.m.-12 a.m. Sat. & Sun. 2:30 p.m.-6 p.m. 8:30 p.m.-12 a.m.

15.260 19.66 ● GSI — Daventry, England (see 26.100 mc.) Daily 12:20-3:45 p.m.

15.250 19.67 WIXAL — Boston, Mass. (see 21.460 mc.) Sun. 11 a.m.-12 noon. Daily 2:15-4 p.m.

15.243 19.68 TPA-2 — Minister des Postes, Boulevard Haussmann, 98, Bis., Paris, France. I: Three tones F in Morse. O-C: **La Marseillaise;** S: chimes ¼ hours. Daily 6-11 a.m.

15.230 19.70 OLR5A — Prague, Czechoslovakia (see 21.450 mc.) Irregular.

15.220 19.71 PCJ — Phillips Radio, Hilversum, Holland. Tues. 4:30-6 a.m.

15.210 19.72 W8XK — Pittsburgh, Pa. (see 21.540 mc.) Daily 9 a.m.-7 p.m.

15.200 19.74 DJB — Zeesen, Germany (see 17.760 mc.) Daily 12:05 a.m.-11 a.m.; 11:10 a.m.-12:25 p.m.; 4:50-10:45 p.m. Sunday 8-9 a.m.

15.190 19.75 ZBW-4 — Hong Kong, China (see 9.525 mc.)

15.183 19.76 RV96 — Moscow, U.S.S.R. (see RKI 15.040 mc.) **Irregular.**

15.180 19.76 ● GSO — Daventry, England (see 26.100 mc.) Daily 3:15-5:30 a.m., 5:45-8:55 a.m., 4-6 p.m.

15.160 19.79 OLR5C — Prague, Czechoslovakia (see 21.450 mc.) **Irregular** (see 9:550-11.840 mc.)

15.160 19.79 XEWW — Mexico, D. F. (see 9.500 mc.) Daily 9 a.m.-12 midnight.

15.160 19.79 JZK — Nazaki, Japan (see 21.520 mc.) Daily 12:30-1:30 a.m.; 8-9 a.m.; 3-4 p.m.; 4:30-5:30 p.m.

15.155 19.80 SM5SX — Royal Technical University. Stockholm, Sweden. Daily 11:00 a.m.-5 p. m.

15.150 19.80 YDC — N.I.R.O.M., Koningsplein West 5, Batavia, Java, N.E.I. (Location-Soerabaja), Weekdays 5:30-10 a.m. (Sat. 11:30 a.m.) 6-7:30 p.m. 10:30 p.m.-2 a.m. Sunday 5:30-10 a.m. 7:30 p.m.-2 a.m.

15.140 19.82 ● GSF — Daventry, England (see 26.100 mc.) Daily 9:15 a.m.-12 noon, 4-6 p.m.

15.121 19.84 HVJ — Stazione Radio HVJ, Citta del Vaticano, Vatican City. I: clock ticks 5 m. S: Bells. C: (spoken) **Laudetur Jesus Christus.** Weekdays 10:30-10:45 a.m.

15.110 19.85 DJL — Zeesen, Germany (see 17.760 mc.) Daily 12-2 a.m.; 8-9 a.m.; 10:40 a.m.-4:30 p.m.; Sunday 6-8 a.m.

15.040 19.95 RKI — Radio Centre, Solianka 12, Moscow, USSR. Call: "This Is Moscow Calling." O-C: **Internationale.** Irregular. **No I.R.C. required.**

14.970 20.04 LZA — Director General, Telegraphs and Telephones, Sofia, Bulgaria. O: **Racherutza**-(Bulgarian Folk Dance). C: National Anthem and **Hymn of His Majesty the King.** Weekdays 5-6:30 a.m.; 12-2:45 p.m.; Sundays 12 a.m.-4 p.m.

14.935 20.07 PSE — Rio de Janeiro, Brazil, (P) Phones LSL-WLK day irreg.; EDM-EHY 8 a.m. Broadcasts German program 4-4.10 p.m. Wednesdays (see 21.080 mc.)

14.600 20.55 JVH — Nazaki, Japan (see 21.520 mc.) **Irregular.**

14.535 20.64 HBJ — Radio Suisse, S.A., 12, Quai de la Poste, Geneva, Switzerland. No opening or closing selection (see HBO 11.402 mc.) Saturdays 6:45-8:30 p.m.

14.480 20.75 DZH — Zeesen, Germany (see 17.760 mc.) **Irregular.**

13.635 22.00 SPW — Polskie Radio, 5., Mazowiecka St., Warsaw, Poland. Mon., Wed., Fri. 12:30-1:30 p.m. Sun. 11:30 a.m.-1:30 p.m. Daily 6-7 p.m.

13.600 22.06 ZMBJ — TSS **Awatea,** Union Line S.S., Coy Head Office, Wellington, New Zealand. Daily 1-3 a.m., Sundays 6:40-7 p.m.

12.500 24.00 HIN — Ciudad Trujillo, Dom. Rep., W. I. (see 6.243 mc.) Daily exc. Sun. 11:40 a.m.-1:40 p.m.; 7:10-9:50 p.m.

12.300 24.39 CB615 — Radio Service, Desmaras and Cia., Ltd., Casilla 761, Santiago, Chile, S.A. Daily 12-2 p.m, 5-8 p.m.

12.235 24.52 TFJ — Icelandic State Broadcasting Service, P. O. Box 547, Reykjavik, Iceland. First half English. C: Icelandic National Orchestra and chorus voices. Sundays 1:40-2:30 p.m.

12.130 24.73 DZE — Zeesen, Germany (see 17.760 mc.) **Irregular.**

12.000 25.00 RNE — Moscow, U.S.S.R. (see RKI; 15.040 mc.) Daily 10-11 p.m. Sun. 6-7 a.m.; 10-11 a.m.; 4-5 p.m.; Wed. 6-7 a.m.; 4-5 p.m.; Fri. 4-5 p.m.

11.990 25.02 CB1199 — Casilla 642, Valdivia, Chile. Daily 6-11 p.m.

11.960 25.08 HI2X — Ciudad Trujillo, Dom. Rep. (see 15.280 mc.) Tues. and Fri. 8:10-10:10 p.m. Sunday 7:40-10:40 a.m.

11.900 25.21 XEWI — P. O. Box 2874, Mexico, D.F. S: 2 strokes gong. O-C: **May Angels Guard Thee.** Sun. 12:30-2 p.m. Mon., Wed., Fri. 3-4 p.m.; 9 p.m.-12 a.m.; Tues., Thurs. 7:30 p.m.-12 a.m.; Sat. 9 p.m.-12 a.m. (see 6.015 mc.)

11.900 25.21 OLR4D — Prague, Czechoslovakia (see 21.450 mc.) Irregular (see 9.550-11.840 mc.)

11.895 25.22 XEXR — Departmento Autonomo de Propaganda y Publicidad, Mexico, D. F. Daily 6-11:30 p.m.

11.895 25.22 HP5I — Emisora HP5I, Aguadulce, Panama. English—beginning and closing. I: three notes gong, thrice (9) ea. 30 mins. O-C: **El Tambor de la Algeria.** Daily 7:30-9:30 p.m. **Verl cards free.**

11.885 25.24 TPA3 — Pontoise, France (see 15.243 mc.) Daily 2-5 a.m. 12:15-6 p.m.

11.880 25.25 XEXA — Secretaria de Educacion Publica, Mexico, D. F. O-C: **March of the Toys.** Weekdays 8:30-11 a.m. 2:30-4:30 p.m.; 7 p.m.-12 a.m.; Sun. 7 p.m.-12 a.m.

11.875 25.26 OLR4C — Prague, Czechoslovakia (see 21.450 mc.) Irregular (see 9:550-11.840 mc.)

11.870 25.26 W8XK — Pittsburgh, Pa. (see 21.540 mc.) Daily 7-9 p.m.

11.860 25.29 YDB — Soerabaja, Java (see 15.150 mc.) Daily 10:30 p.m.-2 a.m.

11.860 25.29 ● ◆ GSE — Daventry, England. (See 26.100 mc.)

11.855 25.31 DJP — Zeesen, Germany (see 17.760 mc.) **Irregular.**

11.840 25.34 OLR4A — Prague, Czechoslovakia (see 21.450 mc.) Daily 2-2:15 p.m. Mon. & Thurs. 7-9:10 p.m.

11.840 25.34 KZRM — Erlanger and Galinger, Inc., Regina Bldg., David St., Manila, P. I. Daily 4-10 a.m. (see 9.570 mc.)

11.830 25.36 ◆ W2XE — Wayne, N. J. (see 21.520 mc.)

11.830 **W9XAA** Chicago, Ill. (see 17.780 mc.) **Week** days 9 a.m.-6 p.m., Sun 9-11 a.m., 1-5:30 p.m.
25.36

11.820 **XEBR** Apartado 68, Hermosillo, Con. Mex-
25.38 ico. O-C: **Over The Waves.** Daily 1-4 p.m.; 9 p.m.-12 a.m.

11.820 **GSN** Daventry, England (see 26.100 mc.)
25.38 ● ◆

11.810 **2RO-4** 5 Via Montello, Rome, Italy. O: **Bells of Rome.** C: **Italian Royal**
25.40 **March and Giovinezza.** I: bird call—black cap bird (see 9.635 mc.) Daily 6:43 a.m.-12:20 p.m.

11.805 **OXY** Skamleback, Denmark (see 6.060
25.41 mc.) Daily 5-10 p.m.

11.801 **OER-3** Osterr. Radioverkehrs A.G., Johannes-
25.42 gasse 4h, Wien 1, Austria. Call: "Hier Radio Wien." I: Metronome—60 beats per m. Weekdays 9 a.m.-5 p.m. Sat. to 6 p.m.

11.800 **JZJ** Nazaki, Japan (see 21.520 mc.)
25.42 Daily 8-9 a.m.; 3-4 p.m.; 4:30-5:30 p.m.

11.800 **COGF** General Betancourt 51. (Playa)
25.42 Mantanzas, Cuba. O-C: **Vals Diana.** Weekdays 1-4 p.m., 6-10 p.m. Sun. 9-10 p.m.

11.796 **OAX5A** Avenida San Luis, Ica, Peru, S.A.
25.43 O: March, **"Relator".** C: **"Estrellita."** Daily 12-4 p.m. 7-11:30 p.m.

11.795 **DJQ** Zeesen, Germany (see 17.760 mc.)
25.43 **Irregular.**

11.790 **WIAXL** Boston, Mass. (see 21.460 mc.) Mon.
25.43 to Fri. 4:45-6:30 p.m. Sat. 1:15-5 p.m. Sun. 3-6:30 p.m.

11.770 **DJD** Zeesen, Germany (see 17.760 mc.)
25.49 Daily 10:40 a.m.-4:30 p.m.; 4:50-10:45 p.m.

11.760 **TGWA** Guatemala City, Guatemala, C.A.
25.50 (see 9.450 mc.) Evenings. Irregular.

11.760 **XETA** Apartado 203, Monterey, Mexico.
25.50 Daily 7-11 p.m.

11.760 **OLR4B** Prague, Czechoslovakia (see 21.450
25.50 mc.) **Irregular** (see 9.550-11.840 mc.)

11.750 **GSD** Daventry, England (see 26.100 mc.)
25.53 ● Daily 3:15-5:30 a.m.; 10:45 a.m.-12 noon; 12:20-3:45 p.m.; 6:20-8:30 p.m.; 9-11 p.m.

11.740 **HP5L** Apartado 129, David, Chirigui, Pan-
25.55 ama, C. A. Daily 4-7 p.m.

11.730 **XETM** Villahermosa, Mexico. Daily 6-11
25.57 p.m.

1.730 **PHI** Hilversum, Holland (see 17.770 mc.)
25.57 Sun. 8-9 p.m.

11.720 **CJRX** Royal Alexandra Hotel, Winnipeg,
25.60 Manitoba, Canada. Weekdays 6 p.m.-12 a.m. Sundays 5-10 p.m.

11.720 **TPA-4** Pontoise, France (see 15.243 mc.)
25.60 Daily 6:15-8:15 p.m.; 10 p.m.-1 a.m.

11.718 **CR7BH** Lourenco Marques, Portuguese East
25.60 Africa (see CR7AA, 6.137 mc.) Weekdays 4:30-6:30 a.m.; 9:30-11 a.m.; 12:30-4 p.m. Sundays 5-7 a.m.; 10 a.m.-12:30 p.m.; 2-4 p.m.

11.710 **YSM** Director of Communicaciones, San
25.62 Salvador, El Salvador, C. A. Daily 1:30-2:30 p.m.

11.710 **Philco** 211-213D Rue Catinat, Saigon,
25.62 **Radio** Indo-China. Daily 6:30-9:30 a.m. **News in French** 9-9:10 a.m.

11.710 **XEWB** Juarez 289, Guadalajara, Mexico.
25.62 Daily 7-11 p.m.

11.710 **VK9MI** M.V. **Kanimbla,** McIllwraith and
25.62 McEacharn, Bridge St., Sydney, Australia. 11 p.m.-8 a.m. and later.

11.705 **SBP** Chief Engineer, Motala, Sweden.
25.62 Daily 6-9 a.m., 11 a.m.-4 p.m.

11.700 **HP5A** P. O. Box 954, Panama City, Pan-
25.64 ama, C.A. O-C: **"Anvil Chorus".** Daily 11:45 a.m.-1 p.m., 6-10 p.m. Sundays—open at 10 a.m. Thurs., Fri., Sat.—open at 5 p.m.

11.700 **CB1170** Broadcasting Populares, Santiago,
25.64 Chile, S.A. Daily 6-11 p.m.

11.570 **HH2T** Societe Haitienne Radiodifiusion,
25.93 P.O. Box 103, Port-au-Prince, Haiti, W.I. S: 4 tones gong 1-3-2-4. English and French O-C: **The Swan. Special programs, irregular.**

11.535 **SPD** Warsaw, Poland (see 13.635 kc.)
26.01 Daily 6-7 p.m.

11.435 **COCX** P. O. Box 32, Havana, Cuba. S:
26.23 5 bells. English each ½ hr. O-C: **Pajarillo Barranqueno.** Daily 8 a.m.-1 a.m.

11.402 **HBO** Geneva, Switzerland (see HBJ,
26.31 14.535 mc.) Mondays 12:40-1:40 a.m. Fridays 2-2:15 p.m. Saturdays 6:45-8:30 p.m.

11.040 **CSW** Emissora Nacional, Rua do Quelhas,
27.17 No. 2, Lisbon, Portugal. Daily 2-6 p.m.

11.000 **PLP** J. Sanders, Chief Engr., Java Wire-
27.27 less Stations, Bandoeng, Java; D.E.I. Weekdays 4:30-10 a.m. (Sat. 11:30 a.m.); 6-7:30 p.m. 10:30 p.m.-2 a.m.; Sunday 4:30-10 a.m.; 7:30 p.m.-2 a.m.

10.960 **JZB** Nazaki, Japan. (see 21.520 mc.) **Ir-**
27.37 **regular.**

10.740 **JVM** Nazaki, Japan (see 21.520 mc.) 4:30-
27.93 7:30 a.m. **Irregular.**

10.670 **CEC** Cia Internacional de Radio, Casilla
28.12 16-D, Santiago, Chile. Daily exc. Sat. and Sun. 7-7:20 p.m. (see CED, 10.230 mc.)

10.660 **JVN** Nazaki, Japan (see 21:520 mc.)
28.14 Daily 3-7:30 a.m.

10.370 Radio Nacionales, Salamanca, Spain.
28.93 Daily 9-9:45 p.m.

10.370 **EAJ43** Radio Club Tenerife, Apartado 225,
28.93 Santa Cruz, Tenerife, C.I. Daily 2:15-3:30 p.m.; 6-7 p.m.; 7:10-9:30 p.m.

10.370 **EHZ** Tablero, Tenerife, C. I. Daily 3-4
28.93 p.m.; 6-8:15 p.m.

10.350 **LSX** Transradio Internacional, San Mar-
28.98 tin, 329, Buenos Aires, Argentina, S.A. C: **San Lorenzo March. Irregular 5-8 p.m.**

10.330 **ORK** Director de Communications, Brux-
29.04 elles, Belgium. I: Carrillion. O: **Towards The Future.** C: **Brabanconne.** Daily 1:30-3 p.m.

10.290 **DZC** Zeesen, Germany (see 17.760 mc.)
29.15 **Irregular.**

10.260 **PMN** Bandoeng, Java, D.E.I. (see PLP,
29.24 11,000 mc.) Weekdays 5:30-11 a.m. (Sat. 11:30 a.m.); 6-7:30 p.m.; 10:30 p.m.-2 a.m.; Sundays 5:30-11 a.m.; 7:30 p.m.-2 a.m.

10.230 **CED** Antofagasta, Chile (see CEC 10.670
29.33 mc.) Sat. and Sun. 7-7:20 p.m.

10.135 **CQN** Chief of Radio Station CQN, Post
29.60 Office Bldg., Macao (Portuguese) China. O: **Maria de Fonte.** C: **National—A Portugeuesa.** Mon. and Fri. 7-8:30 a.m.

10.042 **DZB** Zeesen, Germany (see 17.760 mc.)
29.87 **Irregular.**

9.940 **CSW** Lisbon, Portugal (see 11.040 mc.)
30.18 Daily 6-9 p.m.

9.925 **JDY** Dalren, Manchukuo, Japan. Daily
30.23 7-8 a.m.

9.860 **EAQ** P. O. Box 951, Madrid, Spain. O:
30.43 **La Verbena de la Paloma.** C: **Himno de Riego or Good Night Melody.** Sat. 1-3:30 p.m. Daily 5:15-9:30 p.m.

9.840 **COCM** Apartado 33, Havana, Cuba. Daily
30.49 8 a.m.-12 midnight.

9.750 **COCQ** Calle 25, No. 445, Havana, Cuba.
30.77 Weekdays 6:55 a.m.-1 a.m.; Sundays 6:55 a.m.-12:01 a.m.

9.685 **TGWA** Guatemala City, Guatemala, C. A.
30.98 (see 9.450 mc.) Evenings—Irregular.

9.685 Radio Martinque, P. O. Box 136.
30.98 Fort de France. Martinique, F.W.I. O-C: **"La Marseillaise".** Daily 6:30-7:50 p.m.

9.675 **DZA** Zeesen, Germany (see 17.760 mc.)
31.00 **Irregular.**

9.670 **TI4NRH** Apartado 40, Heredia, Costa Rica,
31.02 C.A. Daily 9-10 p.m.; 11:30 p.m.-12 a.m.; Sat. to 2 a.m.

9.666 **CR6AA** Caixa Postal 103. Lobito, Angola,
31.04 Portuguese West Africa. I: 3 notes on piano; A-C-B. Portuguese, French and English. Wed. and Sat. 2:45-4:30 p.m.

9.660 **LRX** Buenos Aires, Argentina, S. A. (see
31.06 LRU, 15.290 mc.) Daily 9:30 a.m.-11:30 p.m.

9.650 **CTIAA** Antonio Augusto de Aguair, 144 Lis-
31.09 bon, Portugal. I: Cookoo, 3 times. C:**A Portuguesa** (national anthem.) Tues., Thurs., Sat. 4-7 p.m.

9.645 **HH3W** P. O. Box A117, Port-au-Prince,
31.10 Haiti, W.I. S: 4 chime notes and siren each 15 min. before announcements. Daily exc. Sunday 1-2 p.m.; 7-8:30 p.m.

9.640 **CXA8** Director, Montevideo, Uruguay, S.A.
31.12 Daily 6 p.m.-12 a.m.

9.635 **2RO-3** Rome, Italy. Daily 12:30-6 p.m. Sat-
31.13 ◆ urdays off 5:30 p.m. Am. hours M., W., F. 6-7:30 p.m. So. Am. Hrs. T., Th., S. 6-7:45 p.m. (see 11.810 mc.)

9.630 **HJ7ABD** Bucaramanga, Colombia, S.A. Daily
31.15 8-11 p.m.

9.616 **HJIABP** P. O. Box 37, Cartagena. Colombia,
31.20 S. A. O-C: **Under The Double Eagle.** Daily 7-9 a.m.; 11 a.m.-1:20 p.m.; 6-11 p.m.

9.606 **ZTJ** Johannesburg, South Africa (see
31.23 6.097 mc.) 11:45 p.m.-12:45 a.m.

9.600 **RAN** Moscow, U.S.S.R. (see RKI, 15.040
31.25 mc.) Daily 7-9:15 p.m.

9.600 **XEYU** Universidad Nacional, Mexico, D.F.
31.25 Daily 7-10 p.m.

9.600 **CB960** Casilla 1342, Santiago, Chile, S.A.
31.25 O: **Babes in Toyland.** C: **Somewhere a Voice is Calling** (organ). Daily 11:30 a.m.-2 p.m.; 9:30 p.m.-12 a.m. **Veri Slow.**

9.595 **HBL** Geneva, Switzerland (see HBJ,
31.27 9.345 mc.) Irregular.

9.595 **YNLF** Calle, 15 de Set No. 206, Managua,
31.27 Nicaragua, C.A. Daily 8-9 a.m.; 1-3 p.m.; 6:30-10:30 p.m. **Veri—5c U. S. postage.**

9.590 **VK6ME** Amalgamated Wireless Ltd., Perth,
31.28 West Australia. (Address 47 York St., Sydney, Australia). Daily exc. Sun. 6-8 a.m.

9.590 **W2XE** Wayne, N. J. (see 21.520 mc.)
31.28 ◆

9.590 **W3XAU** 1622 Chestnut St., Philadelphia, Pa.
31.28 Daily 12 noon-8 p.m.

9.590 **VK2ME** Amalgamated Wireless, Ltd. 47
31.28 York St., Sydney, Australia. Clock strikes at hour, chimes ¼ hr. I: Kookaburra bird call. C: **God Save The King.** Sunday 1-3 a.m.; 4:30-8:30 a.m.; 9-11 a.m.

9.590 **HP5J** Apartado 867. Panama City ,Panama.
31.28 C. A. **News** 6:30 p.m. O: **Blackhorse Troop March. C: Discipline Honor and Abregacion.** Weekdays 12-2 p.m.; 5-10:30 p.m. Sundays 10:30 a.m.-2 p.m.; 8-10 p.m.

9.590 **PCJ** Hilversum, Holland. (see 15.220 mc.)
31.28 Sunday 2-3 p.m.; 7-8 p.m. Tues. 1:30-3 p.m. Wed. 8-10 p.m.

9.580 **GSC** Daventry, England (see 26.100 mc.)
31.32 ● Daily 9-11 p.m.

9.580 **VK3LR** Australian Broadcasting Commission,
31.32 ● G.P.O. Box 1686, Melbourne, Australia. O: Recording, song, **Australian Lyre Bird. C: God Save The King.** S—3 notes, gong; time signals and P.O. chimes. Sunday 3-7:30 a.m.; Mon. to Fri. 9:45 p.m.-2 a.m., 3:30-8:30 a.m.; Sat. 9:45 p.m.-2:30 a.m.; 3:30-9 a.m.

9.570 **WIXK** Westinghouse Electric and Mfg. Co.,
31.33 ● Boston, Mass. O-C: **Stars and Stripes Forever.** Weekdays 6 a.m.-1 a.m. Sunday 8 a.m.-1 a.m.

9.570 **KZRM** Manila, P. I. (see 11.840 mc.) Daily
31.33 4-10 a.m.

9.565 **YV3RB** Sr. Arturo Ramos Maggi, Prop.,
31.36 Barquisimcto, Venezuela. Daily 11:30 a.m.-12:30 p.m.; 5:30-9:30 p.m.

9.562 **OAX4T** Radio Nacional, Peruvian Govern-
31.38 ment, Av. Petiti Thouars 447, Lima, Peru. Daily 11:30 a.m.-1:30 p.m.

9.560 **DJA** Zeesen, Germany (see 17.760 mc.)
31.38 Daily 12:05 a.m.-11 a.m.; 4:50-10:45 p.m.

9.550 **XEFT** Av. Independencia 28, Veracruz, Mex-
31.41 ico. S: Chimes, bugle calls or cookoo horn. English at closing. O-C:. **Vals Poetico.** Weekdays 10:30 a.m.-4:30 p.m.; 7:30 p.m.-12:30 a.m.; Sundays 9 p.m.-12:30 a.m.

9.550 **YDB** Soerabaja, Java N.E.I. (see 15.150
31.41 mc.) Weekdays 5:30-10 a.m. (Sat. 11:30 a.m.) 6-7:30 p.m., 10:30 p.m.-2 a.m. Sun. 5:30-10 a.m. 7:30 p.m.-2 a.m.

9.550 **HI5E** Sr. H. Chavez, Ciudad Trujillo, Dom.
31.41 Rep., W. I: **Irregular.**

9.550 **OLR3A** Prague, Czechoslovakia (see 21.450
31.41 mc.) Daily 2:30-4:30 p.m.

9.545 **HH2R** Port-au-Prince, Haiti, W.I. (see
31.44 HH2T, 11.570 mc.) **Special programs irregular.**

9.540 **VPD-2** Amalgamated Wireless, Ltd., Suva,
31.45 Fiji Islands. C: **God Save the King.** Daily 5:30-7:00 a.m. No signals.

9.540 **DJN** Zeesen, Germany (see 17.760 mc.)
31.45 Daily 12:05 a.m.-11 a.m.; 4:50-10:45 p.m.

9.535 **JZI** Nazaki, Japan (see 21:520 mc.) 4:30-
31.46 7:30 a.m. **Irregular.**

9.530 **W2XAF** Schenectady, N. Y. (see W2XAD
31.48 15.330 mc.) Daily 4 p.m.-12 a.m.

9.530 **LKJ-1** Ministers du Commerce, Administra-
31.48 tor des Telegraphes, Oslo, Norway. I: Piano motif Grieg's **Sigurd Jorsalfar.** C: National—**Yes, We Love This Country.** Daily 5-8 a. m.; 11 a.m.-5 p.m.

9.525 **ZBW-3** Hong Kong Broadcasting Committee,
31.49 P.O. Box 200, Hong Kong, China. I-O-C: none. Weekdays 11:30 p.m.-1:15 a.m., Mon.-Thurs. 4-10 a.m., Tues., Wed., Fri., 3-10 a.m., Sat., 3-11 a.m., Sun. 9 p.m.-1:30 a.m., 3-9:30 a.m.

9.524 **FIQA** Tananarive, Madagascar (see 6.000
31.50 mc.) Daily 12:30-12:45 a.m.; 3:30-4:30 a.m.; 10-11 a.m. **simultaneously on 6.000 mc.**

9.523 **Radio** Stato Operai, 25 Liberte, Paris,
31.50 **Liberte** France. Daily 7-8 p.m. (see 7.380 mc.)

9.520 **OZF** Copenhagen, Denmark (see OXY
31.51 6.060 mc. Daily 2-6:45 p.m.

9.516.6 **HJ6ABH** Armenia, Colombia, S.A. O-C: **The**
31.52 **Spanish Soldiers.** S: Blows on Marimba. **News 7-10 p.m.** Weekdays 8-11 a.m.; 6-10 p.m. Sundays 7-10 p.m.

9.520 **YSH** San Salvador, El Salvador, C.A.
31.51 (see 11.710 mc.) Irregular.

9.520 **XEDQ** Apartado 107, Guadalajara, Jalisco.
31.51 Mexico. O-C: Mexican Dance—**Jarabe Tapatio.** Daily 12-4 p.m. 8 p.m.-12 a.m. **Occasional DX Sunday 2-4 a.m.**

9.510 **GSB** Daventry, England (see 26.100 mc.)
31.55 ● Daily 3:15-5:30 a.m.; 12:20-3:45 p.m.; 4-6 p.m.; 6:20-8:30 p.m.; 9-11 p.m.

9.510 31.55	HJU	Buenaventura, Colombia, S.A. O-C: **Palmira.** English each 5 mins. Mon., Wed., Fri. 12-2 p.m.; 8-11 p.m.
9.510 31.55	HS8PJ	Bangkok, Siam (see 9.350-19.020 mc.) Mon. and Thurs. 8-10 a.m.
9.510 31.55	VK3ME	Amalgamated Wireless Ltd., 167-9 Queen St., Melbourne, Australia. S: chimes and striking on hour. C: **God Save the King.** Daily exc. Sun. 4-7 a.m.
9.505 31.56	HID	Director, Ciudad Trujillo, Dom. Rep., W.I. Daily 5:40 to 7:40 or 8:40 p.m.
9.504 31.57	OLR3B	Prague, Czechoslovakia, (see 21.450 mc.) Irregular (see 9.550-11.840 mc.)
9.501 31.58	PRF5	P.O. Box 709, Rio de Janeiro, Brazil, S.A. I: three-note gong. C: Brazilian National Anthem. (see PSE 14.935 mc.) Daily exc. Sun. 4:45-5:45 p.m.
9.500 31.58	HI5G	La Vega, Dominican Republic, W.I. Daily 6:40-8:40 a.m.; 10:40 a.m.-2:40 p.m.; 4:40-8:40 p.m.
9.500 31.58	XEWW	Apartado 2516, Mexico, D.F. Daily 9 a.m.-12 midnight.
9.490 31.65	EAR	P. O. Box 951, Madrid, Spain. Daily 6:30-8:30 p.m.; 10-11 p.m.
9.450 31.75	"Radio Fort de France"	Edouard Boullanger Fils, Fort de France, Martinique. Daily 11:30 a.m.-12:30 p.m.; 6:15-7:15 p.m.; 8-9 p.m.
9.450 31.75	TGWA	Radiodifusora Nacional, Guatemala City, Guatemala, C.A. Daily exc. Sun. 12-2 p.m.; 8-9 p.m.; 10 p.m.-12 a.m.; Sun. 12-2 p.m.; 12 a.m.-6 p.m.; **No I.R.C. necessary.**
9.440 31.78	HCODA	Guayaquil, Ecuador, S.A. Daily exc. Sunday 8-11 p.m. **Veri—5c U.S. postage.**
9.428 31.81	COCH	P.O. Box 41, Havana, Cuba. English each 15 mins. S: chimes 15 m. 2 blows gong adv. O-C: Organ: **Maria My Own.** Daily 8 a.m.-12 a.m.
9.350 32.09	HS8PJ	Bangkok, Siam (see 19.020 mc.) Thursdays 8-10 a.m.
9.350 32.09	COBC	Apartado 132, Havana, Cuba. Daily 7 a.m.-12:30 a.m.
9.345 32.10	HBL	Information Section, League of Nations, Geneva, Switzerland. Fridays 2:30-2:45 p.m.; 7:30-7:45 p.m.; 8-8:15 p.m.
9.340 32.12	OAX4J	Radio Internacional, Casilla 1166 Lima, Peru. C: Organ: **Good Night Sweetheart.** Daily 12.3 p.m.; 5 p.m.-1 a.m.
9.300 32.27	YNGU	Apartado 295, Managua, Nicaragua, C.A. Weekdays 12-2 p.m.; 5-6 p.m. Sun. 11 a.m.-12 noon. **Veri—5c U. S. Postage.**
9.200 32.61	COBX	San Miguel #194, Havana, Cuba. Daily 8 a.m.-11:30 p.m.
9.125 32.88	HAT-4	Budapest, Hungary (see HAS-3, 15.370 mc.) Sun. and Wed. 7-8 p.m.; Sat. 6-7 p.m.
9.030 33.32	COBZ	P.O. Box 866, Havana, Cuba. S-4 chimes. O-C: Record, **"Popular Melodies"** 7:45 a.m.-12:30 a.m. Sat. to 2 a.m.
8.840 33.94	ZMBJ	Wellington, N. Z. (see 13.600 mc.) Sun. 6:40-7 p.m.; daily 1-3 a.m.
8.831 33.97	HCJB1	Casilla 691, Quito, Ecuador, S.A. **O: March Patria I:** 4 blows on gong. **C: Ecuadorian National Anthem.** Daily exc. Mon. 7:30-8:45 a.m. 11:30 a.m.-2:30 p.m. 5-10 p.m. (to 7 p.m. on 4.107 mc.; after 7 p.m. on 4.107 and 8.831 mc.) **Veri—5c U. S. Postage.**
8.795 34.13	HKV	Ministerio de Guerra, Military Service, Bogota, Colombia, S.A. **Mon. and Thurs. news 7-7:30 p.m.**
8.665 34.62	COJK	Finlay No. 3, Altos, Camaguey, Cuba. S—3 tone gong, each ¼ hr. English Ann. Each ½ hr. O: **"Allegiance March"** C—None. Week days 10:30 a.m.-12:30 p.m. 7-10:30 p.m., Sat. 11 p.m., Sun. 10 a.m.-12:30 p.m.
8.580 34.97	YN1PR	A Mejewsky, Gerente, Managua, Nicaragua, C.A. Daily 1-2:30 p.m.; 7:30-10:30 p.m. **Veri—5c U. S. postage.**
8.404 35.70	HC2CW	Casilla 1166, Guayaquil, Ecuador, S.A. **O-C: Sangre Equatoriana.** Weekdays 11:30 a.m.-12:30 p.m.; 7-11 p.m. Sun. 3-5 p.m. **Veri—5c U. S. postage.**
8.110 37.00	ZP10	Radio Prieto ZP10, Asuncion, Paraguay, S.A. Daily 8-10 p.m.
7.894 38.00	YSD	San Salvador, El Salvador, C. A. (see 11.710 mc.) Daily 9-11 p.m.
7.854 38.19	HC2JSB	P.O. Box 805, Guayaquil, Ecuador, S.A. S: Gong. **O-C: El Corcovado** (Carioca fox). Daily 11 a.m.-2 p.m.; 4:30-11 p.m. **Veri—5c U. S. postage.**
7.797 38.49	HBP	Geneva, Switzerland (see 9.345 mc.) Irregular.
7.750 39.74	TI8WS	Apartado 75, Puntarenas, Costa Rica, C.A. Weekdays 5-7 p.m.; 8:30-10 p.m. Sun. 4-5 p.m.
7.520 39.89	RKI	Moscow, U.S.S.R. Daily 7-9:15 p.m. (see 15.040 mc.)
7.510 39.95	JVP	Nazaki, Japan (see 21.520 mc.) 3-7:30 a.m. **Irregular.**
7.411 40.48	HCICE	Apartado 485, Quito, Ecuador, S.A. Thursday 9-10 p.m. **Veri—5c U. S. postage.**
7.380 40.65	"Radio Liberte"	Paris, France (see 9.523 mc.) Daily 7-8 p.m.
7.380 40.65	XECR	Departmento Autonomo de Publicidad, Mexico, D.F. Sun 7-8 p.m. No signals or O-C selection.
7.211 41.60	EA8AB	Radio Club Tenerife, Apartado 225, Santa Cruz, Tenerife, C.I. O-C: **Lady of Spain.** English on Saturdays only. Mon., Wed., Fri., Sat. 3:15-4:15 p.m.
7.203 41.64	EAJ-8	San Sebastian, Spain. (see 10.370 mc.) Daily 3-4 a.m., 8-10 a.m., 1:30-4 p.m., 5-7 p.m.
7.200 41.67	YNAM	A. Majewsky, Gerente, Managua, Nicaragua, C.A. Daily 7-10 p.m. **Veri—5c U. S. postage.**
7.177 41.80	CR6AA	Lobito, Portuguese West Africa (see 9.666 mc.) Wed. and Sat. 2:45-4:30 p.m.
7.100 42.25	FO8AA	Radio Club Oceanien. Alfred T. Poria, Pres. Papette, Tahiti. Tues. and Fri. 11 p.m.-1 a.m.
7.030 42.67	EA9AH	El Coronel Jefe de Estado, de las Mayor de las Fuezas, Militares. Apartado 124, Tetuan. Spanish Morocco, Africa. Daily 4-4:25 p.m.; 12-2:30 a.m. Irregular.
6.975 43.01	HCETC	Apartado 134, Quito, Ecuador, S.A. Sat. and Mon. 7:45-9 p.m. **Veri—5c U. S. postage. Veri slow.**
6.900 43.48	HI2D	Associated cia Dominicana, Ciudad Trujillo, Dom. Rep., W.I. Daily 6:40-8:40 a.m.; 10:40 a.m.-2:40 p.m.; 4:40-8:40 p.m.
6.900 43.48	TI2RS	Sr. Rogella Sotela, Prop., San Jose, Costa Rica. Daily 8-10 p.m.
6.850 43.80	TIOW	P. O. Box 45, Port Limon, Costa Rica, C.A. Weekdays 10-11:30 p.m.; Sun. 2-3 p.m.
6.820 43.99	XGOX	Central Broadcasting Committee of Kuomintang, Nanking, China. Chinese except English 8:15 a.m. E.S.T. O-C No regular selections. Weekdays 5:30-8:30 a.m. Sun. 7-9 a.m.
6.800 44.12	HI7P	Calle Jose Reyes No. 35, Ciudad Trujillo, Dom. Rep. W. I. Weekdays 12:40-1:40 p.m.; 6:40-8:40 p.m.; Sun. 9:40-10:40 a.m.
6.788 44.20	PZH	Paramaribo (Suriname), Dutch Guiana, S.A. Weekdays 2:45-4:45, 5:45-9:45 p.m. Sun. 9:45-11:45 a.m. **Veri slow.**
6.780 44.25	HIH	San Pedro de Macoris, Dom. Rep., W.I. Daily 12:10-1:40 p.m.; 7:40-9 p.m. Sun. 5:10-6:40 p.m. **DX 2:40-3:40 a.m.**
6.750 44.44	JVT	Nazaki, Japan (see 21.520 mc.) 4:30-7:30 a.m. **Irregular.**
6.730 44.58	HI3C	Sr. Roberto Palli. B., La Romana, Dom. Rep., W.I. English announcements regular. Weekdays 12:10-2:10 p.m.; 6-10-11 p.m. Sun. 12:10-2:40 p.m.
6.720 44.64	PMH	Bandoeng, Java D.E.I. (see PLP. 11.000 mc.) Weekdays 5:30-11 or 11:30 a.m., Sundays 5:30-11 or 11:30 a.m., 9:30 p.m.-1:30 a.m.
6.690 44.84	TIEP	Apartado 227, San Jose, Costa Rica, C.A. Daily 7-11 p.m.
6.668 44.99	HC2RL	P. O. Box 759, Guayaquil, Ecuador, S.A. O-C: **Ecuadorian National Anthem.** English each 15 mins. Sunday 5:30-7:30 p.m.; Tues. 9-11 p.m. **Veri—5c U. S. postage.**
6.630 45.25	HIT	Apartado 1105, Ciudad Trujillo, Dom. Rep., W.I. O-C: **Anchors Aweigh.** English. Daily exc. Sun. 12:10-1:40 p.m.; 6:10-8:40 p.m. **DX 1st Sat. 11:10 p.m.-1:10 a.m.**
6.618 45.33	El Prado	Apartado 98, Riobamba, Ecuador, S.A. English ea. 15 mins. O: Bugle call. Thursday 9:15-11:15 p.m. **Veri—5c U. S. postage.**
6.580 45.59	"Radio Guardia Civil"	Tetuan, Spanish Morocco, Africa O: **March of the Caliph.** C: **Spanish National Anthem.** I and S: chimes. Daily 2-3 p.m.; 7-8 p.m.
6.575 45.63	HCIVT	Ambato, Ecuador, S.A. Mon., Wed., Fri. 8-10:30 p.m. **Veri 5c U. S. postage.**
6.550 45.81	TIRCC	Apartado 1064, San Jose, Costa Rica, C. A. S: 4 notes on gong O-C: **The Lost Chord—Organ.** Tues., Thurs., Sat., 6-7 p.m. Religious Sundays 10 a.m.-7 and 8 p.m.; Thurs. 8 p.m.
6.545 45.84	YV6RB	Apartado, 34, Ciudad Bolivar, Venezuela, S.A. Daily 7:10 p.m.; Sun. 3-6 p.m.
6.535 45.91	YNIGG	Managua, Nicaragua, C.A. Daily 6-10 p.m.; **Veri—5c U. S. postage.**
6.520 46.01	YV4RB	Valencia, Venezuela, S.A. C: Bugle call, taps and off. Daily 11 a.m.-1:30 p.m.; 5:30-9:30 p.m.
6.500 46.15	HIL	Apartado 623, Ciudad Trujillo, Dom. Rep. W.I. Daily 12-2 p.m.; 6-8 p.m.
6.500 46.15	YV1RN	Maracaibo, Venezuela, S.A. Daily 6-9:30 p.m.
6.482 46.28	HI4D	Ciudad Trujillo, Dom. Rep. W.I. Mon. & Sat. 11:55 a.m.-1:40 p.m.; 4:40-7:40 p.m.
6.480 46.30	EDR-4	Radio Poste, Palma de Mallorca. Balearic Islands. Daily 4:30-5:15 p.m.
6.479 46.30	HI8A	Apartado 1312, Ciudad Trujillo, Dom. Rep., W.I. English each 15 mins. O-C: **March General Alvaro Obregon.** S: 2 strokes of bell. Daily 8:40-10:40 a.m.; 2:40-4:40 p.m.; Sat. 9:10-10:40 p.m.
6.450 46.51	HI4V	Santiago Francisco de Macoris, Dom. Rep., W.I. Daily 11:40 a.m.-1:40 p.m.; 6:40-9:15 p.m.
6.445 46.55	YVQ	Gobierno do Venezuela, Maracay, Venezuela, S.A. 8-9 p.m. Saturdays.
6.430 46.66	HI1S	P.O. Box 112, Santiago de los Caballeros, Dom. Rep., W.I. Daily 11:40 a.m.-1:40 p.m.; 5:40-7:40 p.m.
6.420 46.73	YV6RC	Ciudad Bolivar, Venezuela, S.A. Daily 10:30 a.m.-1:30 p.m.; 4:30-9:30 p.m.
6.410 46.80	TIPG	Apartado 225, San Jose, Costa Rica, C.A. O-C: **Parade of the Wooden Soldiers.** Daily 7:30-9:30 a.m.; 12-2 p.m.; 6-11:30 p.m.
6.400 46.88	YV5RH	Apartado 1931, Caracas, Venezuela, S. A. Weekdays 11 a.m.-1:30 p.m.; 4:30-9:30 p.m.; Sun. 9:30 a.m.-1:30 p.m.; 5-7:30 p.m.
6.375 47.10	YV5RF	Apartado 983, Caracas. Venezuela, S.A. C: Organ: **Blue Danube.** Daily 6:30-7:30 a.m.; 10:30 a.m.-1:30 p.m.; 4:30-10:30 p.m.
6.360 47.17	YV1RH	P. O. Box 261, Maracaibo, Venezuela, S.A. O: **Jealusie.** C: **Er Weicht der Sonne Nicht—march** Weekdays 5:45-6:45 a.m.; 10:30 a.m.-1:30 p.m.; 3:30-10:30 p.m. English 10-10:30 p.m. Sunday 8:30 a.m.-2:30 p.m.
6.351 47.24	HRPI	Sr. Manuel E. Escota, Director, San Pedro Sula, Honduras, C.A. Weekdays 12-2 p.m.; 7:45-10 p.m. **Veri—5c U. S. postage.**
6.340 47.32	HI1X	Ciudad Trujillo, Dom. Rep., W.I. (see 15.280 mc.) Weekdays 12:10-1:10 p.m.; Tues. and Fri. 8:10-10:10 p.m.; Sun. 7:40-10:40 a.m.
6.330 47.39	JZG	Nazaki, Japan (see 21.520 mc.) **Irregular.**
6.330 47.39	COCW	Apartado 130, Havana, Cuba. Daily 7 a.m.-12 midnight.
6.325 47.43	YNLG	Sr. Benjamin J. Guerra, L, Managua, Nicaragua. Daily 8-10 a.m., 1-3 p.m., 6 p.m.-12 a.m. **Veri—5c U. S. postage.**
6.315 47.51	HIZ	Apartado 1092 and 771, Ciudad, Trujillo, Dom. Rep., W.I. Weekdays 11:10 a.m.-2:10 p.m.; 4:40-9:40 p.m. Sundays 11:40 a.m.-2:40 p.m.
6.310 47.54	TG2	Director General of Electrical Communications, Guatemala City, Guatemala, C.A. **Irregular.** 11 p.m.-2 a.m. **No I.R.C. required.**
6.300 47.62	YV4RD	Sr. Luis Croquer, Prop., Maracay, Venezuela, S.A. Weekdays 11:30 a.m.-12:30 p.m.; 5:30-9:30 p.m.
6.280 47.77	COHB	P. O. Box 85, Sancti-Spiritus, Santa Clara, Cuba. Weekdays 9-10 a.m., 12-10 p.m. Sun. 10 a.m.-10 p.m.
6.280 47.77	HIG	Av. Jose Trujillo No. 20, Ciudad Trujillo, Dom. Rep., W.I. Daily 7:10-8:40 a.m.; 12:40-2:10 p.m.; 8:10-9:40 p.m.
6.275 47.81	OAX4G	Avda, Abancay, 915-923, Lima, Peru, S.A. C. **Good Night Sweetheart.** Daily 7-11:30 p.m.
6.270 47.85	YV5RP	P. O. Box 508, Caracas, Venezuela, S.A. Daily 6-11:45 p.m.
6.250 48.00	YV5RJ	Sr. Edmundo Suegart, Prop., Caracas, Venezuela, S.A. Daily 5:30-9:30 p.m.
6.243 48.05	HIN	Calle Arzobispo Merino #97, Ciudad Trujillo, Dom. Rep., W.I. English each 15 mins. (see 12.500 mc.) Weekdays 11:40 a.m.-2:40 p.m.; 7:10-9:10 p.m. Sun. 11:10 a.m.-3:40 p.m.
6.240 48.08	HI8Q	Julio O. Garcia Alardo, Ciudad Trujillo, Dom. Rep., W.I. Daily 10:40 a.m.-1:40 p.m.; 4:40-8:40 p.m.
6.235 48.11	HRD	Sr. Tulio Castaneda, Director, La Ceiba, Honduras, C.A. English on the hour. **O: Solo Tuyo. C: Intermezzo No. 1.** Piano 10:58 p.m. **Good Night Melody.** No signals. Daily exc. Sun.8-11 p.m.
6.230 48.15	YV1RG	Radio Valera, Valera, Venezuela, S.A. S: 1 bell O-C: Local March. Daily 11 a.m.-12:30 p.m.; 5:30-9:30 p.m.
6.210 48.31	YV1RI	Radio Coro, Coro. Venezuela, S.A. S: 4 marimba notes. Spanish Ann. each 15 m. **O-C: March — The Three Colors.** Daily 7:30-9:30 p.m.
6.200 48.39	COKG	Apartado 137, Santiago, Cuba. Daily 5-6 p.m.; 9:30-10:30 p.m.; Sundays 12:01-1 a.m.
6.200 48.39	XEXS	Secretaria de la Economia Nacional, Mexico, D.F. Daily 7-11 p.m.

6.190 HIIA
48.47
P. O. Box 423, Santiago de los Caballeros, Dom. Rep. W.I. I: Gong C: **Anchors Aweigh.** Daily 6:40 a.m.-4:40 p.m.; Thurs. and Sundays, 7:40-9:40 p.m. Band concerts.

6.160 VPB
48.70
Radio Club of Ceylon and So. India. P. O. Box 282, Colombo, Ceylon. S: Time on hour. 6 pips. I: Bow Bells, infrequently. Daily 6:30-11:30 a.m. Saturdays 12:30 p.m.

6.158 YV5RD
48.72
Radio Venezuela, Caracas, Venezuela, S.A. I: 5 strokes of bell. O-C: **Triunfo Aereo.** Weekdays 6:30-7:30 a.m.; 10:30 a.m.-1:30 p.m.; 3:30-10 p.m. Sun. 8:30 a.m.-10:30 p.m.

6.150 CJRO
48.78
Winnipeg, Manitoba, Canada (see CJRX, 11.720 mc.) Weekdays 6 p.m.-12 a.m. Sundays 5-10 p.m.

6.150 HI5N
48.78
Moca, Dom. Rep., W.I. Daily 6:40-8:40 a.m.; 10:40 a.m.-2:40 p.m. 4:40-8:40 p.m.

6.150 OAX1A
48.78
Sr. J. Carlos Montjoy D., Casilla No. 9, Chiclayo, Peru. Daily exc. Sat. 8-11 p.m.; Sat. 8 p.m.-12 a.m.

6.145 HJ4ABE
48.82
Medellin, Colombia, S.A. I: Morse-letter "M" S: 4 chimes. Daily 9:30 a.m.-1 p.m.; 5-11:30 p.m.

6.140 W8XK
48.86
Pittsburgh, Pa. (see 21.540 mc.) Daily 10 p.m.-1 a.m.

6.140 ZEB
48.86
Bulawayo, Rhodesia, South Africa (see ZEC, 5.800 mc. for address). Sun. 3-5 a.m.; Tues. and Thurs. 1:15-3:15 p.m.

6.138 HJ4ABD
48.88
Sr. Luis Emiro Mejia, Gerente, Medellin, Colombia, S.A. O-C: Part **4a William Tell** (see 5.900-5.780 mc.) Weekdays 10 a.m.-2 p.m.; 4-11 p.m. Sun. 11 a.m.-3 p.m.; 7-11 pm. **Veri slow.**

6.137 CR7AA
48.88
P.O. Box 594, Lourenco Marques, Portuguese East Africa. O: **A Maria de Fonte.** C: **A Portuguesa.** Weekdays 12:15-1 a.m.; 4:30-6:30 a.m.; 9:30-11 a.m.; 12:30-4 p.m. Sundays 5-7 a.m.; 10 a.m.-12:30 p.m.; 2-4 p.m.

6.133 XEXA
48.91
Mexico, D.F. (see 11.880 mc.) Weekdays 8:30-11 a.m.; 2:30-4:30 p.m.; 7 p.m.-12 a.m. Sunday 7 p.m.-12 a.m.

6.130 VP3BG
48.94
Crystal Broadcasting Co., Philharmonic Bldgs., Georgetown, British Guiana, S.A. O: **Serenade.** C: **Good Night My Love and God Save The King.** Week-days 10:15-11:15 a.m. 3-7:45 p.m. Sundays 6:45-8:45 a.m.; 4:45-6:45 p.m. **Veri slow.**

6.130 ZGE
48.94
Kuala Lumpur, Malaya States, S.S. Sun., Tues., Fri. 6:40-8:40 a.m.

6.130 LKJI
48.94
Jeloy, Norway (see 9:530 mc.) Daily 11 a.m.-5 p.m.

6.130 COCD
48.94
P.O. Box 2294, Havana, Cuba, English each 15 mins. O: **In a Clock Store:** C: **Good Night.** Weekdays 9 a.m.-1 a.m. Sundays 10 a.m.-8 p.m. **(DX 1-3 a.m.)**

6.130 VE9HX
48.94
P.O. Box 998, Halifax, N.S., Canada. O-C: **Oh Canada.** Chimes 15 min. periods. Sun. 12 noon-10:45 p.m. Mon. to Fri. 7 a.m.-10:45 p.m. Sat. 11 a.m.-10:45 p.m.

6.125 CXA4
48.98
Mercedes 823, Montevideo, Uruguay, S.A. Daily 8 a.m.-12 noon; 2-10 p.m.

6.122 HP5H
49.00
Voice of the People, Panama City, Panama, C. A. Daily 7-10 p.m.

6.122 HJ3ABX
49.00
Apartado 26-65, Bogota, Colombia, S.A. Weekdays 10:30 a.m.-2 p.m.; 5:30-11:30 p.m. Sundays 12-1:30 p.m.; 6-11 p.m.

6.120 XEFT
40.02 ◆
Veracruz, Mexico (see 9.550 mc.)

6.120 W2XE
49.02 ◆
Wayne, N. J. (see 21.520 mc.)

6.120 XEUZ
49.02
F. J. Stavoli, Chief Engr.' Radio Nacional, Mexico, D. F. S: 5 bells (chimes) O-C: **Marcha Dragona.** Daily 10 a.m.-1 p.m.; 7 p.m.-2 a.m. **DX 1-2 a.m.**

6.115 OLR2C
49.06
Prague, Czechoslovakia (see 21.450 mc.) S: Bells. **Irregular** (see 9.550-11.840 mc.)

6.110 GSL
49.10 ● ◆
Daventry, England (see 26.100 mc.)

6.110 XEGW
49.10
Enrique Arzamendi, Gen'l. Mgr., Mexico, D.F. O-C: **Vail a dolid Aztec**—march. Daily exc. Mondays 11 a.m.-4 p.m.; 7 p.m.-12 a.m. Mondays 9 a.m.14 p.m.

6.109 VUC
49.10
1 Garstin Place, Calcutta, India. S: none. C: **God Save The King.** Daily 8 a.m.-12:30 p.m. 11 p.m.-12:30 a.m.

6.105.1 HJ6ABB
49.14
Apartado 175, Manizales, Colombia, S.A. Daily 11 a.m.-1 p.m.; 5-8 p.m. **Veri slow.**

6.100 YUA
49.18
Director, Bureau Central de Presse, Belgrade, Yugoslavia. S: Short tune on flute. O-C: National Anthem. Daily 12:45 a.m.-6 p.m.

6.100 W9XF
49.18
20 N. Wacker Drive, Chicago, Ill. O-C: **Star Spangled Banner.** Daily 6-9:05 p.m.-1:05-2 a.m.

6.100 W3XAL
49.18
Bound Brook, N. J. (see 17.780 mc.) Daily 9 p.m.-1 a.m.

6.097 ZTJ
49.20
African Broadcasting Co., Inc., P.O. Box 4559, Johannesburg, South Africa. Physical session. O: **Bugles—Reveille. C: Cook. House.** I: chimes. C: **God Save The King.** Sun. 4-5 a.m.; 12-15-3:15 p.m. Weekdays 12-12:45 p.m.; 3:15-5 a.m. and 9 a.m.-4 p.m. Daily 11:45 p.m.-12:45 a.m.

6.095 JZH
49.22
Nazaki, Japan (see 21.520 mc.) **Irregular.**

6.090 CRCX
49.26 ●
Rural Route No. 4, Bowmansville, Ont., Canada. Weekdays 7:45 a.m.-5 p.m. Sunday, 10:45-5 p.m.

6.090 ZWB-2
49.26
Hong Kong, China (see 9.525 mc.)

6.090 XEBF
49.26
Insurgentes 34, Jalapa, Mexico. Daily 7-11 p.m.

6.085.7 HJ5ABD
49.30
Cali, Colombia, S.A. Daily 11 a.m.-2 p.m.; 6-11 p.m.

6.082 VQ7LO
49.33
P.O. Box 777, Nairobi, Kenya, Colony, Africa. English used. C: **God Save The King.** Time signal 6 pips on hour. Daily exc. Sunday 5:30-6 a.m. Daily 11:15 a.m.-2:15 p.m. Tues. and Thurs. 8:15-9:15 a.m.

6.082 OAX4Z
49.32
Lima, Peru (see OAX4T, 9.562 mc.) Daily 7-11:30 p.m.

6.080 W9XAA
49.34
Chicago, Ill. (see 17.780 mc.) Weekdays 7:30-9 a.m., 6 p.m.-1 a.m. Sun. 11 a.m.-1 p.m., 6 p.m.-1 a.m.

6.080—ZHJ
49.34
Penang Wireless Society Headquarters, 40 Perak Road, Penang, S.S. O: **Chimes,** Vocal song, **"Land of Hope and Glory". C: "God Save the King".** Weekdays 6:40-8:40 a.m.

6.080 VE9CS
49.34
743 Davie St., Vancouver, B.C., Canada. O: **O Canada: C. God Save The King.** S: 3 strokes gong. Sun. 12 noon-1:30 a.m. Mon., Thurs., Sat. 9:30 a.m.-8:30 p.m. Tues., Wed., Fri. 9:30 a.m.-2:30 a.m.

6.080 HP5F
49.34
Hotel Carlton, Colon, Panama, C.A. Weekdays 11 a.m.-1 p.m.; 7-10 p.m.; Sun. 10:45-11:30 a.m. 7-10 p.m.

6.080—XEWW
49.34
Apartado 2516, Mexico D.F. Irregular (see 9.500 mc.)

6.079 DJM
49.35
Zeesen, Germany (see 17.760 mc.) **Irregular.**

6.075 XECU
49.38
Hidalgo 579, Guadalajara Jal., Mexico. O-C: **Ojos Tapatious.** I: Train in motion. Daily 9-11 a.m.; 1.4 p.m.; 8-11 p.m. or 12 a.m.

6.072 OER-2
49.41
Wien, Austria. (Alternates days with 11.801 kc.) Weekdays 9 a.m.-5 p.m. Sat. to 6 p.m.

6.070.5 HJ3ABF
49.42
Apartado 317, Bogota, Colombia, S.A. C: **Good Night Sweetheart.** Daily 11 a.m.-2 p.m. 6-11 p.m.

6.070 YVIRO
49.42
P. O. Box 100, Maracaibo, Venezuela, S. A. Daily 8 p.m.-12 a.m.

6.070 VP3MR
49.42
16, Robb and Hincks Sts., Georgetown, British Guiana, S.A. S: Time signals, studio clock. O: **The Bond of Friendship. C: Ted Lewis' Goodnight Melody and God Save the King.** Veries—I.R.C. or coin. Weekdays 4:15-8:15 p.m. Sundays 7:45-10:45 a.m.

6.070 CFRX
49.42
37 Bloor St., West, Toronto, Ontario, Canada. Week days 7:30 a.m.-12 midnight. Sunday 10:30 a.m.-12 midnight.

6.065 XEXR
49.46
Departmento Autonomo de Propaganda y Publicidad, Mexico, D. F. Daily 6-11:30 p.m.

6.065 SBO
49.46
Motala, Sweden (see 11.705 mc.) Daily 4-5 p.m.

6.060 W8XAL
49.50
Crosley Radio Corp., Cincinnati, Ohio. Daily 6 a.m.-8 p.m., 10 p.m.-2 a.m.

6.060 W3XAU
49.50
Philadelphia, Pa. (see 9.590 mc.) Daily 8-11 p.m.

6.060 OXY
49.50
Statsradiofonien, Helbergsgade 7, Copenhagen, Denmark. O: one gong stroke. C: **There is a Winsome Land.** .Weekdays 1-6:30 p.m. Sun. 11 a.m-6:30 p.m.

6.054.3 HJ6ABR
49.55
Pereira, Caldas, Colombia, S. A. No English. Official March—**El Hombre** Payaso. C: Overture — Chorus Voices. No signals. Daily 9:30 a.m.-12 noon; 6:15-10 p.m.

6.050 GSA
49.59 ● ◆
Daventry, England (see 26.100 mc.)

6.050 XEXF
45.59
Secretaria de la Economia Nacional, Mexico, D. F. Daily 8 p.m.-12 a.m.

6.045 XETW
49.62
Francisco I. Madero, 10, Tampico, Mexico. Daily 7 p.m.-12 a.m.

6.042.3 HJ1ABG
49.65
Apartado 674, Barranquilla, Colombia S.A. S: 1 gong with chimes ea. ¼ H. **O-C: National Anthem.** Daily 11 a.m.-11 p.m.; Sun. 11 a.m.-9 p.m.

6.040 YDA
49.67
Tandjong Priok, Java N. E. I. (see 15.150 mc.) Daily 7:30 p.m.-2 a.m.

6.040 W4XB
49.67
Herald Bldg., Miami, Fla. Schedule not known.

6.040 WIXAL
49.67
Boston, Mass. (see 21.460 mc.) Daily exc. Sat. 7-9 p.m.

6.030 OLR2B
49.75
Prague, Czechoslovakia (see 21.450 mc.) **Irregular.** (see 9.550-11.840 mc.)

6.030 HP5B
49.75
P.O. Box 910, Panama City, Panama, English and Spanish. O-C: March, **Panama.** No signals or bells. Daily 11:30 a.m.-1 p.m.; 5-10 p.m.

6.030 VE9CA
49.75
Toronto General Trust Bldg., Calgary, Alberta, Canada. C: **Lights Out.** S: None. Weekdays 9 a.m.-1 a.m. Thurs. to 2 a.m. Sun. 12 noon-12:30 a.m.

6.030 XEBQ
49.75
Astillero 35, Mazatlan, Mexico. Daily 8-11:30 p.m.

6.020 DJC
49.83
Zeesen, Germany (see 17.760 mc.) Daily 1030 a.m.-4:30 p.m.; 4:50-10:45 p.m.

6.020 XEUW
49.83
Av. Independencia 98, Veracruz, Mexico. S: Marimba. O: March **Victoria.** C: **La Golondrinas.** Daily 8 a.m.-12 midnight.

6.015 HI3U
49.88
Apartado 23, Santiago de los Caballeros. Dom. Rep., W.I. O-C: **Organ Maria My Own.** Weekdays 7:10-8:40 a.m.; 10:40 a.m.-1:40 p.m.; 4:40-9:40 p.m. Sun. 10:40 a.m.-1:40 p.m. only.

6.015 XEWI
49.88
Mexico, D.F. (see 11.900 mc.) **Irregular.**

6.010 VK9MI
49.92
M. V. Kanimbla, Sydney, Australia (see 11.710 mc.) 11 p.m.-8 a.m. and later.

6.010 COCO
49.92
P.O. Box 98, Havana, Cuba. English and Cuban. Daily 8 a.m.-10 p.m.

6.010 OLR2A
49.92
Prague, Czechoslovakia (see 21.450 mc.) **Irregular** (see 15.230-11.840 mc.)

6.007 Radio Burma
49.94
Burma Independent Wireless, Rangoon, Burma C: **God Save the King.** Daily 9:10-9:40 a.m.

6.005 HP5K
49.96
P.O. Box 33, Colon, Panama, C.A. S: 3 chimes, ea. 15 m. O-C: **Merry Widow Waltz.** Daily exc. Sun. 7-9 a.m.; 11:30 a.m.-1 p.m.; 6-11 p.m. Sun. 10 a.m.-12 a.m.

6.005 CFCX
49.96
P.O. Box 1090, Montreal, Quebec, Canada. Weekdays 7:44 a.m.-1 a.m. Sundays 9 a.m.-11:15 p.m.

6.005 VE9DN
49.96
Montreal, Quebec, Canada (see CFCX, 6.005 mc.) Sat. 11 p.m.-12 a.m. Fall, winter and spring.

6.000 CXA2
50.00
Rio Negro, Montevideo, Uruguay, S.A. O: **Voluntary Trumpeter.** C: **Good Night Melody.** Daily 10:30 a.m.-10:30 p.m.

6.000 HJ1ABC
50.00
St. Rafel Valencia Ibanez, Quibdo, Colombia, S. A. O-C: March, **Relator.** S: 2 blows Chinese gong. Sun. 3-5 p.m. Wed., Sat. 5-6 p.m. Daily 6-9 p.m.

6.000 XEBT
50.00
P.O. Box 79-44 Mexico, D.F. I: 3 blasts on cookoo horn. Siren near closing. O: **Las Mananitas.** C: **Lieberstraum.** Daily 10 a.m.-12:15 a.m.

6.000 FIQA
50.00
Director of Posts and Telegraphs Tananarive, Madagascar. Daily 12:30-12:45 a.m.; 3:30-4:30 a.m.; 10-11 a.m.

6.000 RV59
50.00 ◆
Moscow, U.S.S.R. (see RKI, 15.040 mc.) **No I.R.C. required.**

5.980 HJ2ABD
50.17
Calle 2 No. 1205, Bucaramanga, Colombia, S.A. Daily 11:30 a.m.-12:30 p.m.; 6-10 p.m.

5.977 Radio Renascenca
50.19
Rua Capelo, 5, Lisbon, Portugal, OC: **Our Lady of Fatima.** I: none. Daily 2:30-4:30 p.m. Sunday and Thursday 6-7 a.m.

5.969 HVJ
50.26
Vatican City (see 15.121 mc.) 2-2:15 p.m. Sun. 5-5:30 a.m.

5.955 HJN
50.35
Minister of Education Nacional, Bogota, Colombia. Daily 11 a.m.-2 p.m.; 5-10:30 p.m.

5.940 TG2X
50.51
De la Policia Nacional, Guatemala City, Guatemala, C.A. Daily 4-6 p.m. Mon., Thurs., Sat. 10-11:30 p.m. Sundays 1-2 p.m. **No I.R.C. required.**

5.930 PJCI
50.59
Curacaoscbe Radio Vereeniging, Willemstad, Curacao, N.W.I. O: Electrical gong, 4 strokes and repeat 5 mins. O-C: National anthem. Weekdays 6:36-8:36 p.m. Sun. 10:36 a.m.-12:36 p.m.

5.930 YVIRL
50.59
P.O. 247, Maracaibo, Venezuela, S.A. Weekdays 11 a.m.-1 p.m.; 4:30-9:30 p.m. Sun. 8:30 a.m., 2:30 p.m.

5.910 YV4RH
50.76
Valencia, Venezuela, S.A. Daily 8-11:30 p.m.

5.910 HH2S
50.76
Port-au-Prince, Haiti, W.I. (see 11.570 mc.) Daily 7-10 p.m.

5.905 TILS
50.80
P.O. Box No. 3, San Jose, Costa Rica, C.A. S: none. O: **Washington and Lee Swing. C: Adios Mi Chapparrita.** Weekdays 12-3 p.m.; 6-11 p.m. Sundays irregular.

5.900 ZNB
50.84
Government Engineer, Mafeking, South Africa. Mon. to Fri. 1-2:30 p.m. Sun. 1:30-2:30 p.m.

5.900 50.85	HJ4ABD	Medellin, Colombia, S.A. (see 6.138-5.780 mc.) Weekdays 10 a.m.-2 p.m.; 4-11 p.m. Sun. 11 a.m.-3 p.m.; 7-11 p.m. **Veri slow.**
5.885 50.98	HI9B	P.O. Box 95, Santiago de los Caballeros, Dom. Rep., W.I. O-C: Piano Solo—**Vals Evocation.** Weekdays 7:25-8:40 a.m.; 11:55 a.m.-2:10 p.m.; 4:55-7:40 p.m. Sundays 11:40 a.m.-2:40 p.m.
5.880 51.02	YV3RA	Barquisimeto, Venezuela (see YV3RB, 9.565 mc.) Daily 11:30 a.m.-12:30 p.m.; 5:30-9:30 p.m.
5.875 51.11	HRN	Tegucigalpa Honduras, C.A. C: **Good Night Melody (Ted Lewis)** Daily 7-10 p.m. **Veris—10c U. S. cash. Veri slow.**
5.865 51.15	HIIJ	Apartado 204, San Pedro de Macoris, Dom. Rep., W.I. O-C: **Waltz, Sweet Remembrance.** English very seldom. S: none. Daily 11:40 a.m.-1:40 p.m.; 5:40-9:40 p.m.
5.850 51.28	YV1RB	P.O. Box 37, Marcaibo, Venezuela, S.A. English and Spanish. O-C: **Strike Up The Band.** Daily exc. Sun. 10:45 a.m.-12:45 p.m.; 4:45-9:45 p.m. Sun. 8:45 a.m.-9:45 p.m.; Mon., Wed., Fri. 5:45-8:15 a.m. Tues., Thurs., Sat. 5:45-9:45 a.m.
5.830 51.46	TIGPH	Apartado 800, San Jose, Costa Rica, C.A. C: **Good Night Melody** (Ted Lewis). Weekdays 8-11 p.m.
5.813 51.61	TIGPH-2	Apartado 800, San Jose, Costa Rica, C.A. C: **Good Night Melody.** Daily 7-11 p.m.
5.800 51.72	YV5RC	P.O. Box 2009, Caracas, Venezuela, S.A. I: 4 chimes. O-C: Official **IBB March.** Bugles, whistles before closing. Weekdays 7-8 a.m. 10:30 a.m.-1:45 p.m. 3:45-10:30 p.m. Sundays 8:30 a.m.-10:30 p.m.
5.800 51.72	ZEC	P.O. Box 792, Salisbury, Rhodesia, South Africa. Sun., 3-5 a.m.; Tues. and Fri. 1:15-3:15 p.m.
5.780 51.90	OAX4D	All American Cables, Ltd., Casilla 2336, Lima, Peru, S.A. Signs on and off Morse code. No signals. English and Spanish. Wed., Sat. 9-11:30 p.m.
5.780 51.90	HJ4ABD	Medellin, Colombia, S.A. (see 6.138-5.900 mc.) Weekdays 10 a.m.-2 p.m.; 4-11 p.m. Sun. 11 a.m.-3 p.m.; 7-11 p.m. **Veri slow.**
5.758 52.10	YNOP	Radio Bayer, Managua, Nicaragua, C.A. Weekdays 8:30-10:30 p.m. **Veri—5c U. S. Postage.**
5.755 52.13	YV2RA	San Cristobal, Venezuela. English each 15 mins. S: 6 strokes gong. O-C: March, **El Capitan.** Weekdays 11:30 a.m.-12:30 p.m.; 5:30-9 p.m. Sun. 5:30-10 p.m.
5.725 52.40	HCIPM	P.O. Box 664, Quito, Ecuador, S.A. O-C: **La Marcha de Aida.** Saturdays 9-11 p.m.
5.713 52.51	TGS	Casa de Presidencial, Guatemala City, Guatemala, C.A. Sun., Wed., Fri. 6-8 p.m. **No. I.R.C. necessary.**
5.146 58.30	PMY	Bandoeng Radio Society, Nillmy Bldg., Bandoeng, Java, N.E.I. O: March, **Le Rene Passe.** C: On chimes, **Good Night and National Anthem.** Sun. 6:30 p.m.-1:30 a.m. 4-10:30 a.m. Mon. to Fri. 5:30 p.m.-2:30 a.m. 4-10:30 a.m. Sat. 5:30 p.m.-2 a.m. 4-11:30 a.m.
4.900 61.22	HJ3ABH	Apartado 565, Bogota, Colombia, S. A. I: 3 chime notes. Weekdays 11:30 a.m.-2 p.m. 6-11 p.m. Sunday 12-2 p.m.; 4-11 p.m.
4.880 61.48	HJ4ABP	Emisora Claridid, Medellin, Colombia, S. A. Daily 8 a.m.-11 p.m.
4.860 61.73	HJIABE	Apartado 31, Cartagena, Colombia, S. A. O: Organ—**Song of the Islands.** English each hour; clock strikes the hour. C: **Aloha Oe.** Weekdays 11 a.m.-1 p.m. 6-10:30 p.m. Sun. 9 a.m.-3 p.m.
4.841 61.97	HJ3ABD	Apartado 715, Barranquilla, Colombia. **O: Pari Ti Rio Rita. C: Rio Rita and National Anthem.** Weekdays 9 a.m.-2 p.m., 6 p.m.-12 a.m., Tues and Thurs. to 3 p.m. Wed. and Fri. begin 5:30 p.m.
4.810 62.37	YDE2	Solo, Java, N.E.I. (see 15.150 mc.) Daily 5:30-11 a.m.; 5:45-6:45 p.m.; 10:30 p.m.-2 a.m.
4.790 62.63	HJ2ABC	Sr. Pompilio Sanchez, Prop., Cucuta, Colombia, S.A. Daily 11 a.m-12 noon, 6:30-9 p.m.
4.780 62.76	HJIABB	Apartado 715 Barranquilla, Colombia, S.A. I: 3 chimes. S: 1 chime between advertisements. **C: La Golondrina** 7-9 a.m. 11-1 p.m., 5:30-10 p.m.
4.740 63.29	HJ6ABC	Ibague, Colombia, S.A. Daily 6-11 p.m.
4.660 64.38	HJ2ABJ	Santa Marta, Colombia, S.A. Daily 11:30 a.m.-2 p.m.; 5:30-10:30 p.m.
4.600 65.22	HC2ET	P.O. Box 824, Guayaquil, Ecuador, S.A. I: 12 chimes, Wed. and Sat. 9:15-10:45 p.m. **Veri—5c U. S. postage.**
4.420 67.87	ZMBJ	Wellington, N. Z. (see 13.600 mc.)
4.273 70.21	RV15	Radio Committee. Khabarovsk, U.S.S.R. English, 2 a.m., EST and at announcements. Daily exc. 6th 12-18-24-30th 3 p.m.-8 a.m. On 6-12-18-24-30th 7:10 p.m.-8 a.m. English programs start at 2 a.m. **No I.R.C. necessary.**
4.107 73.05	HCJB-2	Quito, Ecuador, S.A. (see 8.831 mc.)
4.002 75.00	CT2AJ	Ponta Delgada, Island of St. Michael, Azores. Wed. and Sat., 5-7 p.m.
3.750 80.00	HCK	Quito, Ecuador, S.A. Mon. 8:30-10:30 p.m. **Veri 5c U. S. postage.**
3.040 98.68	YDA	Batavia, Java, N.E.I. (see 15.150 mc.) Weekdays 5:30-10 a.m. (Sat. 11:30 a.m.) 6-7:30 p.m., 10:30 p.m.-2 a.m. Sun. 5:30-10 a.m., 7:30 p.m.-2 a.m.

TOOLS FOR THE HOME WORKSHOP

(Continued from page 625)

ployed. Use a solder with a minimum of rosin in the core for best work. Both Kester and Berry's solder have been found satisfactory. Where the surfaces to be soldered cannot be tinned with rosin-core solder a dab of Nokorode soldering paste on the joint will do the trick. This is usually the case when wires are soldered into the prongs of coil forms.

Short-Nose Pliers: These are indispensable to the constructor in wiring, also in many other operations. They can be used to skin the insulation off many types of wire and will bend the wire into any desired shape to fit the wiring requirements. Also, when a wire is being soldered into place it should be held near the joint with these pliers. This will not only aid in securing a solid joint but will eliminate burnt fingers.

Diagonal Pliers: These are used for removing certain kinds of insulation from wire that cannot be easily removed with the pliers. A little experience will indicate which tool to use for skinning a particular piece of wire.

One valuable use of these "side cutters" is in snipping off the small ends of wire left after a wire is soldered into place. An ordinary pair of cutting pliers will not get into many places that a pair of side cutters will. The experienced wirer uses them continually for this purpose.

Knife: A knife is a tool of many uses in radio construction work. It is used, chiefly, in skinning and cleaning insulated wires, in conjunction with either the pliers or side cutters. A knife is also useful in drilling operations. It will cut aluminum burrs off cleanly and easily. It will, as a matter of fact, even cut steel burrs. If you don't spend over a quarter or so for the knife you won't mind nicking it up a bit.

Adjustments

Several tools are useful in making various adjustments when the receiver or other piece of equipment is completed and under test. Most useful, perhaps, are the various sizes of screw drivers. Most intermediate-frequency transformers, for instance, are adjusted with this tool.

When the adjustment is made by means of a nut the Spintite type of wrench is generally necessary. There is, incidentally, a type of Spintite wrench, not illustrated, which will go "around corners." It is constructed the same as the type shown but has the end bent at right angles to the handle.

Insulated Adjuster: These are usually known as "neutralizing" tools. In certain types of adjustments the metal mass of an ordinary screw driver will, by its capacity to the hand, make it almost impossible to attain the proper adjustment. The "neutralizing" tool consists of a long insulating rod with only a very small piece of metal in the end. Thus the effect of the tool and hand on a "hot" adjustment screw is negligible.

"Resonator": This handy gadget, put out by Aladdin, is not, strictly speaking, a tool. It consists of a length of flexible rubber. In one end is inserted a small iron core, while a brass core is inserted in the other end. Inserting the iron end into the field of a coil will raise its inductance, while the brass end will lower it. In this way the experimenter may determine which way to adjust a receiver coil in order to make it "track" with other coils. In cases where no trimmer condensers are employed across the coils that is the only way in which the tuning of the circuit may be checked for resonance.

All the above tools are procurable at any hardware store, or radio supply house. Sometimes an auto accessory or "5-and-10" store will provide the best "buys" in some of these tools, as in the case of the open-end wrenches.

Vise Advice

An accessory that is very useful in conjunction with these tools is the vise. A small one can be purchased for around half a dollar or so which will clamp easily to any projection and is large enough for radio construction work. Don't clamp it on a good piece of furniture, however, unless you wish to start a domestic war. The appearance of these tools in any location other than the cellar will probably invoke such a conflict, anyway, so you might as well make it worth while.

Backwash

COMMERCIAL CODE

Editor: Just a line to inform you how much your magazine is appreciated here in Vancouver.

Was much interested in the letter by A. Shaw in "Backwash," October issue. Believe me, there are more fellows interested in logging commercial c.w. than is popularly supposed. I took up this phase of radio DXing a couple of years ago but owing to the lack of station addresses was unable to send reports and secure verifications. I do believe you would be encouraging a worthwhile side of the SWL game should you decide to devote a page a month to readers' c.w. reports and station addresses.

Incidentally, with the new "Code Reader" on the market, I am of the opinion that it would be to your advantage to publish such a list. I am certain you would not be at a loss for reports as many readers would be only too glad to cooperate.

At the present time I am minus a receiver, a situation which must be remedied at all costs; hi! Will be pleased to give you any possible assistance with this new department as soon as I can get an s.w. receiver on the air. Have been an enthusiastic SWL for several years; am Canadian correspondent for "West Australia Wireless News" and ex-member of ISWC and BSWL. Before closing allow me to express my appreciation of the articles by Mr. Hinds. I have had the pleasure of several interesting chats by letter with this gentleman, and a more accurate authority on s.w. matters would be hard to find.

BOB MORRISON,
VANCOUVER, B. C., CANADA

(You win, along with the many others who have expressed a desire to see space devoted to commercial code stations; we are reviewing the subject and will have something definite to offer in the very near future. A list will be forthcoming at any rate—possibly a department devoted to code stations.—Editor.)

◆

CODE LISTENERS

Editor: The readers' letters and your comments on commercial c.w. in the October number of your magazine interested me very, very much. It would please me greatly to see you devote an entire page to commercial c.w. and the various aspects of c.w. reception throughout the entire radio spectrum. You would be the "one and only" magazine giving the non-transmitting listener a real "break."

HAROLD BLINN,
ARKANSAS CITY, KANS.

(Okay—we'll give you a "real break." But it would seem advisable to prepare the way for the potential code listener with an article dealing with the ins and outs of commercial radio telegraphy, lest some poor soul gets "the law" on him for "divulging the contents of messages."—Editor.)

◆

MORE ON C.W.

Editor: I noticed in Backwash of the October AWR that other SWLs are interested in commercial c.w. I am 15 years old and own a Sky Buddy receiver. My speed in code is about 10 words per minute. I think it would be great if you would have a separate page for this c.w. commercial list.

One of the main things we are interested in is whether these commercials will verify or not. It is important to me and other SWLs, I guess, to have the wall papered with QSL cards.

I would like to know something about these commercials; what they are good for. All I ever hear is "V.V.V. de" and the call. They all come in fine and they are real DX. So how about some dope on the commercials?

EDWARD WESTCOTT, W11M1,
NASHVILLE, TENN.

(A commercial c.w. station list, or something amounting to the same thing, is forthcoming. As a rule commercial c.w. stations do not verify reception reports, unless the transmitter is used for occasional broadcasting as well. The stations you hear using their V-wheels do handle traffic, which you'll discover if you listen long enough. More on this in a forthcoming article.—Editor.)

◆

PAGE MR. BOUCK!

Editor: Month after month I have picked up copies of AWR and read through them with pleasure, more or less. First of all, I want to congratulate you on such an interesting publication. I fully agree with everyone who requests a commercial c.w. station list; a fairly complete one would be more than appreciated. Mr. J. B. L. Hinds' column is the backbone of the magazine from my viewpoint, a DXer's. Ray La Rocque's department couldn't be omitted, but Zeh Bouck's wouldn't be missed if omitted.

Personally, I imagine he is a crank, grouch and pessimistic critic. Never a word is mentioned about the excellence of some programs but condemnation reigns over all he listens to.

Working on a recollection, I dug through radio magazines until my search stopped at an October 1934 issue of *Short-Wave Radio*. Now, if you'd care to follow me, get the May 1937 issue of AWR; open it to "Channel Echoes" and read, in the third column, Mr. Bouck's discourse on his personal opinion concerning "veries." He makes it clear he isn't interested in veries, has never written for one, and wouldn't pay a cent for one. So much for the 1937 version of Bouck.

Referring back to J. B. L. Hinds' column in the '34 magazine we find, under the caption "Page Mr. Bouck," an item that is very interesting. It seems that Mr. Bouck wrote a rather good article in the New York *Sun* on his interest in radio and verification cards. Mr. Hinds is obliging enough to divulge the contents of said article, naming Bouck's own reasons, among which was "his interest in receiving veries." (Perhaps it never passed that stage and remained only an interest.) But if Mr. Bouck can write so convincingly on verifications that Mr. Hinds is impressed (imagine!) as he states himself, then just three years later emphatically deny ever being interested in veries, we're inclind to turn our thumbs down and the page over.

Perhaps his vehement criticisms have something to do with his memory. We wouldn't doubt it. We sincerely hope this self-appointed nemesis of putrid advertising and advertisers would pass on to other material, anything! Perhaps the literary angle of servicing.

JOSEPH A. PIECHUTA, W3G14,
MERIDEN, CONN.

(That ought to hold Bouck, unless he has a good comeback—which he usually has. Come on, W8QMR, Zeh it!—Editor.)

◆

AWR AT SEA

Editor: Am a commercial operator and enjoy your magazine very much. It helps me to keep abreast of modern radio, even during the days that I am at sea.

BYRON L. FRIEND,
RADIO OPERATOR, S. S. SANDCRAFT,
NEW YORK, N. Y.

(Pleased to know AWR meets your requirements. We have heard it is seen in the radio rooms of numerous ships docking at New York.—Editor.)

◆

WORLD S.W. STATION LIST

Editor: Hinds has done it again! The World Short-Wave Station List in its new form is the best that exists today. It could be no better as far as material is concerned.

You might do one thing, however—place markers in for the various bands. A line, or bold-face type, would suffice.

C. M. WHELAN,
MEMPHIS, TENN.

(When ALL-WAVE RADIO *was first published the various bands in the short-wave station list were marked much in the manner you suggest. Readers didn't seem to like the idea, so we dropped it. What is the opinion now?—Editor.)*

SUPER CONVERSION

(Continued from page 623)

first audio stage so that the bias can be adjusted above the cut-off point. When handling traffic from stations having an S8-S9 signal the bias can be adjusted so that background noise drops out. Weak signals or static below the threshold level of the first audio stage are not amplified and consequently annoying frying sounds are largely eliminated—the set simply goes dead between the dots and dashes. It is best to use a high-mu tube for this application in order to secure a sharp cut-off with low bias. In this circuit we used half of a 53 tube (6.3 v. equivalent is the 6A6 or 6N7) which proves to be more than satisfactory. The other half of the 53 is reserved for the beat-frequency oscillator.

Beat-Frequency Oscillator

In making a receiver conversion there is one tube which must always be added—the beat-frequency oscillator. There being no extra socket space on the chassis, we used a 53 dual triode and killed two birds with one stone. One-half of the 53 serves as the b.f.o. tube, the other as the high-mu triode for the first audio stage. Other than combining two tubes in one envelope there is no particular advantage or disadvantage to this combination.

The beat-frequency oscillator transformer, B.F.O., consists of a single tapped coil and is intended to be used in an electron-coupled oscillator circuit. In this application it is necessary for the cathode of the dual triode tube to be grounded, so that a series Hartley circuit is used instead. A .0001 mfd. mica condenser is connnected across the b. f. o. coil, so that with the added capacity, the b.f.o. tunes to one-half the intermediate frequency, or 232 kc. By using the second harmonic to provide the beat note all tendency towards interlocking is eliminated, and the higher "C" oscillator circuit provides remarkable stability and freedom from drift.

Coupling between the beat-frequency oscillator and the diode second detector is accomplished by means of a "gimmick" — a small capacity formed by twisting two pieces of hook-up wire together. This capacity should be adjusted for best results — insufficient capacity will result in a poor beat-note on strong signals, while excessive capacity will lower the sensitivity of the receiver. About ¾" of twisted length will give very satisfactory results.

I. F. Selectivity

For broadcast reception a broad-nosed frequency response curve is desirable to secure reasonable fidelity of reproduction. This broad-nosed effect is usually obtained by over-coupling the coils. Therefore one of the first steps to take in converting a broadcast superheterodyne for communication work is to check the selectivity of the i. f. transformers. The easiest way of doing this is to line up the receiver, using an oscilloscope, oscillator and frequency wobbler.

If after being lined up the response curve is broad-nosed, or double-humped, increase the separation of each pair of coils in the i. f. transformers by ¼", realign and try again. The gain will not go down much (it may actually increase) and the selectivity will improve considerably. To increase the spacing of the coils will require dissembling the i. f. units. In some instances the coils are wound directly on a wood dowel, while in other cases the winding is made on a cardboard tube which is slipped over the center dowel. When a cardboard tube is used, sever the section between the coils with a sharp knife or razor blade. Then hold the coil assembly close to the hot end of an electric soldering iron until the wax softens. When the coils are mounted directly on a wooden dowel rod, there are two ways by which the coils can be loosened. One way is to drill a hole lengthways into the dowel, insert a piece of copper rod, and heat the end of this until the impregnation softens. Or, the dowel rod can be cut in two between the coils and a small spacer added. Use a wooden pin to hold this in place—a brass or iron screw will increase the losses of the circuit.

Voltage Distribution

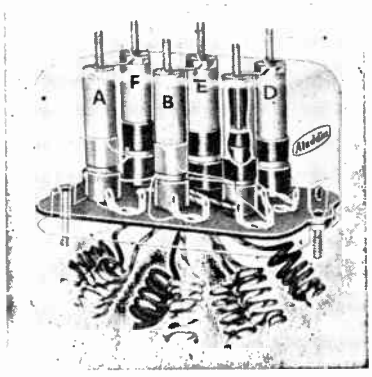
In making a superheterodyne conversion it may be practical to leave the present voltage distribution system intact. In many instances, however, it will be found that the resistors have aged so that they are noisy and their resistance values are no longer accurate. Also if B– is not off ground potential by 15 or 20 volts it will not be practical to install the manual squelch system for suppressing background noise. Consequently an outline of the voltage distribution system used in our receiver will be given.

The filter circuit consists of a condenser input filter, C24, of 16 mfd. plus a choke in the positive lead of the power supply. This is followed by C25, a second 16 mfd. condenser, and the speaker field in the negative lead. By placing the speaker field in the negative lead the voltage drop through this may be utilized to supply the various bias voltages required by the receiver. The output of the filter is terminated by a third 16 mfd. condenser, C26. While the capacities indicated are considerably larger

ON THE MARKET

ALADDIN "PRE-TUNED" OSCILLATOR UNIT

RECOGNIZING THE potential demand for pre-tuned units for automatic tuning in radio receivers, Aladdin Radio Industries, Inc., have developed a multiple oscillator, aligned with Polyiron cores, and contained in a compact housing, measuring 3" wide, 2" high and 2" deep.



The unit will accommodate six pre-selected stations. There are six separate coils, each having its own iron core, adjustable from the top, as shown in the accompanying illustration. The following ranges are obtained with the individual coils which cover the standard broadcast band:

A coil	1520 to 830 kc.
B coil	1520 to 830 kc.
C coil	1250 to 670 kc.
D coil	1220 to 670 kc.
E coil	870 to 580 kc.
F coil	770 to 540 kc.

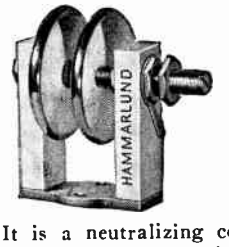
The stability afforded by the Polyiron method of alignment, as against the usual compression type trimmer condenser method, makes this composite coil invaluable in those systems where oscillator frequency drift is a critical factor.

The coil unit is designed for use with an i.f. amplifier peaked at 465 kc. ALL-WAVE RADIO.

✦

NEW HAMMARLUND NEUTRALIZING CONDENSER

ANOTHER NEW condenser for transmitting has just been developed in the laboratories of the Hammarlund Manufacturing Company, Inc. It is a neutralizing condenser and is called the "N-10." This newest addition to the Hammarlund transmitting condenser family is exceedingly compact and designed for horizontal adjustment.



It has heavy aluminum round edged plates, polished over all surfaces, which are mounted on a pair of strong Isolantite bars. These bars are so mounted that they will not shift or pull out of position. The movable plate of this condenser is controlled by a finely threaded screw, allowing micrometer control. A positive locking nut permits extremely accurate settings. The special design of the adjusting screw prevents any possibilities of plate touching or short circuits. The capacity range of the "N-10" is from 2 to 10 mmfd., while the air gap can be varied from 1/16" to 5/8". At the minimum spacing, the peak voltage rating is 3000. The base is drilled for 2-hole base mounting. The condenser is only 2 5/8" high x 1 13/16" deep. ALL-WAVE RADIO.

✦

NEW HICKOK SIGNAL GENERATOR

THIS NEW HICKOK Instrument—Model PSG-15—has the output calibrated in microvolts. This calibrated output together with power level meter gives more measurements than any other signal generator now available, it is said. Sensitivity, gain per stage and selectivity are standardized by a self-contained vacuum-tube voltmeter.

Output ranges are as follows: R.F.—1/2 microvolt to 100,000. A.F.—0 to 2.0 volts.

There are three decibel ranges: —10 to +6; +6 to +22; +22 to +38.

Radio-frequency ranges are calibrated directly, from 85 kc. to 28 mc.

Complete built-in power supply consists of transformer, rectifier and filter system.

Case is 13" x 10" x 7"—made from steel with etched aluminum panel.

The many other features of this instrument may be learned from the maker, The Hickok Electrical Instrument Co., Cleveland, Ohio. ALL-WAVE RADIO.

✦

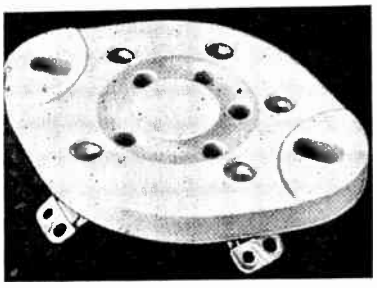
BRUSH VIBRATION PICKUPS

THE BRUSH DEVELOPMENT Company recently announced its complete line of vibration pickups. These devices are of typical piezo-electric Rochelle salt crystal design, and are applicable to the study of noises and vibrations in various industrial applications. Three types known as VP-1, VP-5 and DP-1 are now available. Characteristics of the various pickups are such that they cover the complete frequency range. Literature describing these crystal devices is available upon request. ALL-WAVE RADIO.

✦

JOHNSON TRANSMITTING TUBE SOCKETS

WAFER-TYPE sockets molded from Alsimag 196, and especially designed for use in transmitter tube positions, are new items produced by the E. F. Johnson Co., Waseca, Minn.



Contacts are of cadmium-plated phosphor bronze, recessed in the form to prevent movement. All metal parts are countersunk to permit mounting on metal surfaces without shorting.

The sockets are 1 5/8" wide and 2 3/8" long. Mounting holes are slotted to permit mounting centers between 1 11/16" and 1 27/32" inclusive.

The sockets are available in the following types: 4, 5, and 6-prong; 7-prong small and large; octal, and acorn. ALL-WAVE RADIO.

✦

SWEEP-EXPANDING AMPLIFIER

THE WAVE-EXPANDING feature as incorporated in the latest DuMont 5-inch all-purpose oscillograph, is valuable in the study of complex waves where it is desirable to spread a small portion of the wave for detailed study. Furthermore, it allows expansion of waves of much higher frequency than the fundamental frequency of the sweep. Million cycle waves can be observed with good detail, and the return trace eliminator, a regular television principle, permits the waves to appear only on the forward linear portion of the sweep.

The action of the sweep-expanding amplifier is quite startling. Four 1000-cycle waves, for instance, may be normally packed closely together, occupying the center section of the cathode-ray screen. A slight adjustment of the sweep-expanding control and these waves instantly spread

(Continued on page 660)

than commonly used for filter circuits, the added cost for the extra capacity is amply compensated for by the extreme quietness of operation.

Voltage distribution is made by means of two adjustable vitreous resistors, R18-R19, of the 50-watt size. Resistors of this rating are not necessary for the application, but are used to provide sufficient linear length so that intermediate voltage adjustments will not be excessively critical.

Circuit Isolation

The schematic diagram Fig. 4 shows a total of five r. f. chokes. Whether or not these may be required for your particular conversion can only be determined by experiment. For those not familiar with the action of the described circuit, it should be stated that the r. f. choke on the first detector screen lead, and the r. f. choke in the oscillator plate supply were necessary to prevent an apparent interlock between the sensitivity and regeneration controls. The addition of these chokes stopped all tendency of the i.f. amplifier to oscillate when the first detector regeneration control was advanced excessively. The balance of the r. f. chokes were necessary to secure complete stability of the i. f. amplifier.

Selection of Components

In choosing the components for your receiver, select the best quality tuning condensers for the detector and oscillator. The tuning condensers should be of rugged construction and preferably should have ceramic insulation to prevent r. f. losses and to insure the absolute rigidity to prevent oscillator drifting. Some losses can be tolerated in an i. f. amplifier since this merely means a loss of gain, but losses in a detector circuit cannot be made up by subsequent amplification. The i. f. amplification is limited by the tube noises which are generated in the first detector circuit.

Filter condensers and paper r. f. bypasses should also be selected with care. Avoid so-called bargain condensers — nothing is harder to locate than trouble caused by a poorly constructed paper bypass condenser or a high power factor electrolytic, and a single defective condenser will ruin the performance of the best receiver.

Mounting Parts

To eliminate the necessity of taping joints, and to provide support for resistors and condensers, the little Mallory AO16 Terminal Connectors were used throughout the conversion. This terminal connector consists of a small strip of bakelite upon which are fastened three double soldering lugs and a mounting bracket. In addition to improving the appearance of the wiring, constructors will find the AO16 is a real time and effort saver.

Coil Specifications

Standard large size 4-prong coil forms, 1½" diameter and 2⅞" long (Hammarlund SWF-4), were used for winding the 160, 80 and 40 meter coils. Midget coil forms 1" in diameter and 1½" long (National XR-1) were used for the 10-meter coils. The 20 meter coils were made on both sizes of forms, and exactly equivalent results were obtained. The Coil Specification Table lists both types. The use of smaller forms for the higher frequency bands permit a greater number of wire turns to be used.

(Continued on page 661)

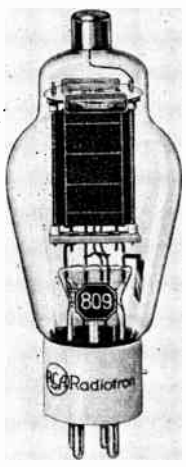
out to fill the entire screen. A further adjustment and just one complete cycle is left on the screen, greatly stretched out for critical study.

The new feature is included, among other standard and novel features, in the 5-inch all-purpose Type 168 DuMont oscillograph now offered by the Allen B. DuMont Laboratories, Inc., of Upper Montclair, N. J. ALL-WAVE RADIO.

◆

RCA TYPE 809 TRANSMITTING TUBE

RCA RADIOTRON has announced the RCA-809, a three-electrode tube of the high-mu type for use as a radio-frequency amplifier, oscillator, or Class B modulator and a.f. amplifier. Because of its high perveance, the 809 can be operated at high plate efficiency with low driving power.



The plate connection is brought out through a separate seal at the top of the bulb to provide high insulation. The internal structure of the tube permits operation at the maximum ratings at frequencies as high as 60 megacycles. The maximum plate dissipation is 25 watts for Class C telegraph and Class B services. A ceramic base is used.

The filament is operated at 6.3 volts and draws 2.5 amperes. The amplification factor of the tube is 50. Grid-plate capacity is 6.7 mmfd., grid-filament, 5.7 mmfd., and plate-filament, 0.9 mmfd. Maximum plate voltage is 750. ALL-WAVE RADIO.

◆

HARDWARE ASSORTMENTS

A COMPLETE LINE of small-hardware assortments, intended for electrical, radio and automotive service shops and for home use by amateur craftsmen, has been brought out by the Insuline Corporation of America, 25 Park Place, New York, N. Y. The parts are supplied in indestructible flat metal boxes having hinged lids and twelve individual compartments, the following assortments being available: master screw and nut assortment, all purpose radio hardware and equipment, insulated washers and grommets, and master miscellaneous assortment, consisting of rivets, lugs, washers, etc.

Insuline also announces a line of square-type glass jars with screw caps, filled with individual hardware items such as screws, nuts, washers, rivets, etc. A total of 81 different items is available. These jars stack neatly on shelves and keep their contents clean and free of dust. For counter display purposes, dealers are furnished gratis with a decorative metal rack holding 36 of these jars. ALL-WAVE RADIO.

◆

NEW RAYTHEON DATA CHART

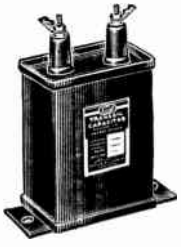
OFF THE PRESS last week, was Raytheon's 11th edition of their tube characteristic data chart. More complete than ever before, the new edition contains all and every characteristic data necessary to the interests of good servicing—facts that will be extremely valuable to distributor's salesmen, dealers, and servicemen. A free copy can be obtained from a Raytheon jobber or by writing direct to Raytheon Production Corp., 420 Lexington Avenue, New York City. ALL-WAVE RADIO.

◆

SOLAR TRANSMITTING CAPACITORS

SHOWN IN THE accompanying illustration is one of the new line of "Transoil" Capacitors recently placed on the market by the Solar Mfg. Corp., 599-601 Broadway, New York, N. Y.—a rugged oil capacitor for special use in transmitting services.

The complete family consists of "Transoil," "Transmica," and "Solarex," each line of the highest quality and designed to be "reliable in every climate," to quote the manufacturer.



For the benefit of amateurs, engineers and servicemen, and the Solar distributors, this company has published a complete catalog, No. 2-X, describing its lines of Transmitting Capacitors in full. Copy available if you write Solar. ALL-WAVE RADIO.

◆

YAXLEY MATCHED DIAL PLATES

IT IS NO LONGER necessary to laboriously make and hand-calibrate dial plates. You can purchase Matched Dial Plates for all standard Yaxley Controls, Rheostats and Potentiometers which will insure the accuracy of your equipment and give that desired expensive, professional appearance.

These new Dial Plates are marked in 100 divisions of the active rotation, and are calibrated numerically from 1 to 10. The rotation covered by the terminals and the switch short out is clearly marked so that it is easy to set the plates in their proper position on the panel. The new Yaxley Matched Dial Plates are 2¼" in diameter and are finished with polished aluminum markings against a satin black background.

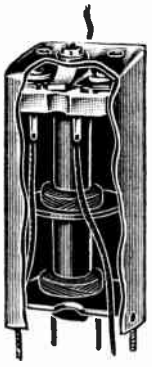
If the control is of the linear type (Yaxley No. 4 taper), a setting of "5" on the Matched Dial Plate indicates that one-half of the resistance is in the circuit. A setting of "1" indicates that one-tenth of the resistance is in the circuit, etc. When a Yaxley Matched Dial Plate is used with a tapered Control (Yaxley No. 1 or No. 2 tapers) in the proper circuit, the calibration is in proportion to the audible intensity of the signal—thus a setting of "5" would indicate 50% volume as heard by the ear.

You can obtain Yaxley Controls, Rheostats and Potentiometers with Matched Dial Plates from your most convenient Mallory-Yaxley Distributor. ALL-WAVE RADIO.

◆

"WIDE RANGE" I.F. TRANSFORMERS

A NEW LINE of standard i.f. double-tuned transformers has recently been placed on the market by the Meissner Mfg. Company. They are known as the "Wide Range" line.



The unusual feature of these transformers is the wide range that the transformers can be tuned to. A serviceman can with only four standard wide-range transformers tune to any i.f. frequency required from 121 to 650 kc. without skip. They are available in either air-core or iron-core types. 1500-kc. and 3000-kc. units are also available for the amateur. ALL-WAVE RADIO.

◆

NEW PRECISION RESISTORS

OHMITE MANUFACTORING Company announces the new Riteohm "71" a vitreous enameled 1% accurate, precision resistor of 1-watt rating. Riteohms are ideal for use as voltmeter multipliers, in laboratory equipment, radio and electrical test sets and in many similar applications.

By this achievement, it is said, Ohmite thus brings, for the first time, the permanent protection of vitreous enamel against moisture and atmospheric corrosion to all except the highest resistances in the compact 1 watt, 1% accurate, precision re-

(Continued on page 672)

Notes Regarding Oscillator Coils

(Continued from page 659)

If because of the availability of other wire sizes it is desired to alter the coil constants indicated in the Coil Specifications Table, the following suggestions will be of help:

1. The number of tickler turns (L3) should be just sufficient to insure strong oscillation with the condensers tuned to the lowest frequency of the coil range. Excessive tickler turns will cause a motor-boating effect at the high-frequency end of the band, apparently caused by the oscillator trying to operate simultaneously as a T. P. T. G. and Armstrong circuit.
2. The use of small diameter wire for the tickler coil is recommended since the use of such wire will give the tickler coil a poor "Q" and lessen the effect described in the preceding paragraph.
3. The wire size of the grid tank (L2) may be increased somewhat, but should not be decreased, or the efficiency of the coils will suffer.

MB-100 XMTTR

(Continued from page 641)

lator, making possible break-in operation on one's own frequency. This is highly desirable, and was of course necessary in operating on the AARS net frequency. The keying is instantaneous, even at high speeds, and chirpless. Clicks and thumps are equally conspicuous by their absence. In other words, the Proving Post definitely approves of this transmitter, and recommends it to lid and OT alike—to the impecunious and the opulent ham.

NIGHT-OWL HOOTS

(Continued from page 638)

greatest number of programs of the week. IDA programs of the week are marked (IDA) in the DX Time Table.

Our jeers again have to go to the Canadian Broadcasting Commission. Perhaps they shouldn't be tossed very strongly as this offense is not a serious one. We merely cannot understand why Canada cannot abide by the international agreement and use calls which are within its own assignment. Canada's calls are supposed to commence with a prefix between VAA and VGZ or CFA and CKZ. Instead they are now to use a prefix rightly belonging to Chile for their new network stations—CB. Formerly

they were using a prefix assigned to Portugal—CR, and still farther in the past they used CN which was assigned to Morocco. It seems sort of silly that the Commission should go into some other country's assignment for calls when there are plenty of available combinations in Canada's assignment to accommodate many times the number of stations existing in that country today.

Address all communications for this department and for the Championship DX Contest to Ray La Rocque, *note address change,* 28 Aetna St. Worcester, Mass.

WIDE-RANGE NOTES

(Continued from page 650)

creasing the gain of earlier stages in the amplifier. However, there is sufficient overall gain in the original Wide-Range system, and in the circuit accompanying this article, to make up for the slight loss in gain in the power stage.

By the same token, inverse feedback will reduce or eliminate hum which may be present in the amplifier or introduced into the circuit from an external source. Moreover, poor power-supply regulation has less effect on amplification when inverse feedback is employed.

The application of inverse feedback in an output stage—and particularly when beam power tubes such as the 6L6G are used—also tends to reduce the effective a.c. resistance of the tubes so that, though they still function with the desirable characteristics of the pentode, are given the desirable low plate-resistance characteristics of the triode. The application of inverse feedback therefore permits adequate damping of the loudspeaker which eliminates what is commonly referred to as "speaker hangover."

Automatic Tone Compensation

The inverse feedback circuit also provides a highly efficient means of compensating for tone deficiencies present in an amplifier, or for accentuating certain audio frequencies to compensate for aural deficiencies. In other words, bass or treble can be boosted at will and without any difficulties from phase shift. And the compensation can be made to function automatically!

In order that you may appreciate this method of attaining automatic tone compensation, let us first examine the manner in which inverse feedback is applied to the Wide-Range amplifier. Referring to the accompanying circuit diagram, the feedback circuit for the upper 6L6G tube is composed of R22, C15, and R19, and for the lower 6L6G, R23, C16 and R20.

These may be looked upon as voltage-divider circuits, and the degree of inverse audio voltage developed across the resistors R19 and R20 is at the same time the amount of inverse voltage impressed on the grids of the 6L6G tubes.

Generally speaking, the percentage of feedback voltage impressed on the grids of the 6L6G tubes is dependent upon the values of R22 and R19 in the one case and R23 and R20 in the other case. Since the same percentage of inverse feedback is desired for both tubes, the respective values for the four resistors are identical. In this case R22 and R23 are 50,000 ohms, and R19 and R20 are 5,000 ohms.

However, we are dealing with audio voltages, and therefore the value of the condensers C15 and C16 also have a bearing on the percentage of feedback. If the reactance of these condensers to a given frequency is high, the percentage of feedback will be reduced, whereas if their reactance is low the feedback voltage developed across the resistors R19 and R20 will be high.

A bit of speculation on this point will make it clear that if condensers of comparatively high capacity are used in the inverse feedback circuits, their reactance to both low and high frequencies will be comparatively low and the percentage of feedback will be substantially uniform over the entire frequency range. On the other hand, if C15 and C16 are of low capacity—say in the vicinity of .05 mfd. or less—their reactance to low frequencies will be substantially greater but still be small to the higher frequencies. The result is, in this instance, that the percentage of inverse feedback at the higher frequencies will be substantially greater than at the low frequencies, and since the greater the percentage of feedback the less the gain in the power stage, it stands to reason that bass notes will be amplified to a greater extent than the treble—and the action will be entirely automatic.

The action is similar to volume expansion in the sense that the gain of an amplifier stage is automatically controlled, but in this instance the control factor is the frequency of the signal rather than its relative amplitude.

The degree of bass boost that can be obtained in this manner is limited by the gain differential created by the introduction of inverse feedback, but is sufficient for most purposes. The Wide-Range amplifier has adequate bass response without such compensation, and for that reason the condensers C15 and C16 are given a value of 0.1 mfd. If more boost is desired, these values may be reduced to as low as .01 mfd. or less, but the best way to determine values suitable to your own requirements is by experiment.

If you wish to control the amount of automatic bass boost to meet varying pro-

gram or record response, it would be a simple matter to employ banks of condensers, controlled by a dual switch, so that the proper values for any condition could be thrown into circuit.

If high-frequency boost is desirable, this may be obtained automatically by shunting low-capacity condensers of equal value across the grid resistors R19 and R20. These would have high reactance to low frequency voltages but comparatively low reactance to high-frequency voltages. Consequently such condensers would reduce considerably the high-frequency voltages developed across R19 and R20 but have little effect on the low-frequencies—result: less high-frequency inverse voltage impressed on the 6L6G grids and therefore greater gain.

Obviously, one can take advantage of both bass and treble boost in the manner outlined, but we doubt the value of the latter in the Wide-Range amplifier. High level treble can be downright objectionable, but for those who wish to try it we suggest values from .0001 mfd. to .0005 mfd. or higher for the two condensers used to shunt the resistors R19 and R20.

With the inverse feedback arrangement in use, we suggest the addition of a bypass condenser across the cathode resistor R24. This condenser, labeled C17 in the diagram, is a 25-mfd., 25-volt electrolytic. It is not necessary, but tends to equalize a mismatch of the output tubes, should it exist.

Conclusion

The diagram accompanying this article suggests the best arrangement where volume expansion for recorded music is not desired, which is the case with many of our readers who wish the equipment for radio program reproduction only. Even so, there is sufficient gain available for full output from a good phonograph pickup feeding the input control grid of the 6C8G. This tube, incidentaly, should be shielded, unless 6L6s are used in place of the 6L6Gs. The latter develop a strong field and are apt to cause motor-boating in the amplifier if the 6C8G is not protected.

ULTRA-HIGH

(Continued from page 629)

frequency, to aid their observations. Address: Albert S. Sise, Milton, Boston, Mass.

Television Stations

As there are no television receivers on the market, in the United States, the listener will probably be more interested in the sound portions of television transmissions than in the sight portions. There is listed below ten stations that are making the most progress and are most frequently heard, exclusive of foreign stations.

W2XAX	New station under construction, to be installed in the Chrysler Building, New York. Power 30,000 watts.
W6XAO	The Los Angeles, Don Lee station. Uses 150 watts on 45.0 mc. for sound.
W3XPF	The new Philo-Farnsworth station at Philadelphia, Pa. Power 1,000 watts. 66.0 mc. sound, 62.75 mc. sight.
W9XAL	The First National Television station at Kansas City, Mo. Uses 300 watts on sight and 150 watts on sound.
W2XBS, W2XF	RCA, New York station. Uses 12 kilowatts on 49.75 mc. for sight and 15 kilowatts on 52.0 mc. for sound.
W3XE	The Philco station at Philadelphia, Pa. Uses 250 watts on 54.25 mc. for sound.
W2XDR	Radio Pictures, Inc., of Long Island City, New York. Uses 500 watts for sound.
W3XEP	The RCA station at Camden, N. J. Operates on 46.0 mc. with 30 kw.
W8XAN	Sparks-Withington station at Jackson, Mich. Uses 100 watts for both sight and sound.

There are a number of other stations in operation but at present we have no information as to their progress.

RCA recently demonstrated a new high-speed facsimile circuit between New York and Philadelphia. The system is a multi-channel one and engineers are very anxious to increase power, install new filters, and automatic typewriters able to carry 12,000 words per minute in both directions. The circuit uses four stations to bridge the gap between the two cities. They operate on six different frequencies; 89,500 kc., 90,000 kc., 94,500 kc., 95,000 kc., 99,500 kc., and 104,000 kc. As the range of each station is virtually quasi-optical they are selected to provide a distant horizon. In New York and Philadelphia, therefore, the antennas are located atop tall buildings which have a 30 and 25 mile horizon respectively, leaving only 36 miles between Arneys Mount, N. J. and New Brunswick, N. J. The equipment itself is a modern marvel, making ultra-high-speed facsimile a sensation on the u.h.f.

Also doing notable work on facsimile is W9XAF, 41.0 mc., The Journal Co., and W2XBH, 86.0 mc., Radio Pictures Inc.

A little surpassing the advances in American television are the foreign performers. In England, France, Germany, and Holland receivers are being marketed so that many a family now spends a quiet evening by the televisor.

In England, Baird and Marconi-E.M.I. are broadcasting from the Alexandra Palace, London. Frequencies employed are 45.0 mc., for sight and 41.5 mc. for sound. In the Netherlands, The Philips Co. are experimenting in the 43.0-mc. channel. In Germany, the powerful Berlin transmitters operate on 43.0 and 44.0 mc. French receivers are being widely publicized as in the near future a 30,000-watt transmitter will be put in operation.

Mutual Telephone Co. Stations

These stations are the real pioneers in ultra-high-frequency work, as several years ago they were installed for inter-island communication. The six stations listed below employ 200-watt transmitters.

Station	Location	Frequency
KGXC	Oahu, T. H.	37.4 mc.
KGXJ	Ulupalakua, T. H.	40.7 mc.
KGXO	Kapela, T. H.	46.2 mc.
KGXB	Manawahua, T. H.	47.3 mc.
KGXK	Waikii, T. H.	49.5 mc.
KGXH	Ulupalakua, T. H.	48.4 mc.

Police Radio Stations

If you are looking for the extraordinary in police reception, the four ultra-high-frequency bands are the places to try. Already a dozen new stations have been put in operation since the publication of the police lists in the August, 1937 issue of ALL-WAVE RADIO. Unfortunately these lists are very misleading as only headquarters stations are included, district stations and portable units being absent. As a matter of fact, two-way transmission between five radio cars is the average. So the u.h.f. stations have the short-wave police radio stations outnumbered three to one.

Police Notes: Philadelphia will probably drain off all of the W3 experimental call letters when its fifty cars and substations are commissioned. They have been testing lately on 40.1 mc.

W3XIZ, 37.1 mc., Pleasantville, N. J., operating in conjunction with W3XF, 37.1 mc., and W3XEB, 37.1 mc., have installed two-way units in their respective dog catcher trucks! (*Calling car 28, calling car 28—pick up dangerous pekingnese at 2-- Fra---- St.*)

W6XMW is using its fifty watts on 33.1 mc.

Also reported, or heard here, on 33.1 mc. are: W6XEH, W5XB, W8XAU, W4XAN, W4XR, W4XI, W3XBD, W3XBP, and W6XHE. Heard here on 30.1 mc. were W6XFE, W8XGY, and W2XEM. Operating on 40.1 mc. is W9XEC which is experimenting with concentric feeders. The above stations state that they have only "local coverage" but already several stations have interferred with each other though they were 2,500 miles apart.

Amateur Phones

If you want to hear the stations that you generally wouldn't hear on other bands, the ten-meter amateur band is the place to listen.

After the moving of the American phone band to 28,500-30,000 kc., it leaves the foreign phones in a separate band 28,000-28,500 kc., but following the American moving day many of the foreign stations also changed frequency, putting our lists temporarily in a cloud.

Knowing ten meters as we do, we are sure many of the stations listed below will return to the new band and bring others with them.

Country	Calls	Time Heard (E.S.T.)
Alaska	K7PQ, K7FDE	11:00 am.-7:00 pm.
Argentina	LU9AX, LU7BC, LU7AZ	4:00-7:30 pm.
Australia	VK3YP, VK7KV, VK4WH, VK2GU, VK2XP	10:30 pm.
Bermuda	VP9R, VP9G	1:00-5:00 pm.
Canal Zone	NY2AE, K5AG, K5BJ, K5AT	2:30-6:00 pm.
Cayman Islands	VP5PZ	3:30 pm.
Colombia	HK1JB	7:15 pm.
Dominican Rep.	H15X, H17G	8:00 am.-4:00 pm.
Egypt	SU1RO, SU1SG	7:45 am.-4:30 pm.
France	F8MG, F8RR, F8VS, F3HL	7:55 am.
Germany	D3AAN, D3LSR, D4DLC, D4KPJ, D5AF, D6MV	3:45-4:30 pm.
Great Britain	G2HX, G2QB, G2ZY, G5DJ, G5RI, G5BM, G5BJ, G5QF, G5RH, G5KH, G5JW, G5SY, G5WP, G5AU, G6GS, G6BW, G6GF, G6LK, G6WN, G6GO, GM6RG, GW2UL, GM5KF	7:30 am.-4:00 pm.
Hawaii	K6MVV, K6OGS	10:00 am.-6:30 pm.
Honduras	HR4AF	6:30 pm.
India	VU2CQ, VU2AU, VU2EB	9:55 pm.
Ireland	EI2L, EI2J, EI7F	8:00 am.-3:45 pm.
Japan	J2CF, J2CB, J2IN, J2DC, J2LU, J2IS, J3FK, J3FJ, J3FZ	10:30-11:20 pm.
Jugoslavia	YT7MT	7:45 am.
Latvia	YL2BB, YL2CD	8:00 am.-3:00 pm.
Martinique	FM8AA	9:00 am.
Mexico	XE2N, XE2AG, XE1GE, XE3R	12:00-4:30 pm.
Morocco	CN8AM, CN8AB	12:45-2:00 pm.
Malaya	VS2AJ	6:45 am.
New Zealand	ZL1CD, ZL4SW, ZL4AL	10:00-11:30 pm.
Porto Rico	K4DDH, K4SA, K4EJF, K4EPO, K4EIL, K4ETP	7:30 am.-6:00 pm.
Portugal	CT1KH	1:00 pm.
South Africa	ZU6P, ZU1C, ZE1JR, ZE6AJ, ZT2G, ZT6Y, ZT2U, ZE1JJ, ZE1JU, ZT6AY	10:00 am.-4:00 pm.
Reunion	FR8VX	12:30 pm.

Jottings

As the listener can easily determine from this article, definite reform was needed on the ultra-high frequencies. Consequently, beginning October 13 1938, the F.C.C. will place all of the ultra-high frequencies under control and reassign frequency channels.

For the police 75 channels between 41,020 kc. and 43,980 kc. will be allotted. For the broadcast relay stations 16 channels between 30,830 kc. and 39,820 kc. will be allotted. The television stations will be given frequencies between 44,000 kc. and 108,000 kc. For airport traffic control, the commission made provision for 6 channels between 129,000 kc. and 130,000 kc. and 11 channels for radio telephone service with aircraft in service flights between 132,000 kc. and 144,000 kc. For persons authorized to carry on research work the Commission assigned frequencies between 30,000 kc. and 40,000 kc., and between 132,000 kc. and 140,000 kc. (to be shared).

We wish to extend our thanks to those who have helped to make this article possible. We especially appreciate the letters of R. V. Hamilton and Ben S. McGlashan.

We will render all assistance possible

in relation to inquiries of a technical or non-technical nature. (The author conducted several tests last winter with various types of receiving antennas, and will gladly send a summary of the results to those who may wish it.) Address all letters to Perry Ferrell Jr., Linwood, New Jersey, enclosing a stamped self-addressed envelope if you desire a reply.

GLOBE GIRDLING

(Continued from page 634)

they have no veri cards on hand and have not been advised that cards will be supplied at some future date. This in answer to a request for information, the report being received that cards were to be printed for CRCX.

It is reported that the Canadian Broadcasting Corporation have under active consideration the proposal for the erection of a powerful 50-kilowatt short-wave transmitter, with equipment which will enable the Dominion to participate in world broadcasting. No definite plans have been made as yet, however.

Amateur Phones

The following is a list of 20-meter amateur phone stations not previously reported or listed:

Country	Frequency	Calls	Time Heard
Australia	LF	VK2ADT-AFQ	7 & 1:24 a.m.
Australia	HF	VK3XJ	2 a. m.
Australia	LF	VK5DC	8 a. m.
Azores	HF	CT2AB	5 p. m.
Belgium	HF	ON4PV	8 p. m.
Belgium	LF	ON4MD	7:20 p. m.
Chile	LF	CE3CO	7:28 p. m.
Cuba	LF	CO8JB	8:33 a. m.
Cuba	LF	CO2HF-2RF	6:07&7:18 p.m.
England	LF	G6RH	3:20 a. m.
France	LF	F3NF-3LR	2-3 a. m.
Java	LF	PK3GD	7 a. m.
Jamaica	LF	VP5PZ	6:20 p. m.
Labrador	HF	VO6JO	9 p. m.
Mexico	LF	XE1DT	8 p. m.
Portugal	LF	CT1QG	6:30 p. m.
Trinidad	LF	VP4TH	7 a. m.
Uruguay	LF	CX1AA	**6 p.m.**
Venezuela	LF	YV4RX-5AK	6:53&7:26 a.m.

Moscow reports UPOL, 14410 kc., Soviet air base near North Pole on the air daily 2 to 9 p.m. except those days when no winds prevail in the polar basin. Short-wave listeners should report reception to Central Council of Aviation and Chemical Defense Society, U.S.S.R., Moscow. Prizes will be awarded for the best reports, it is stated.

OX2QY, 14368 kc., Reindeer Point, Greenland, MacGregor Arctic Expedition. Steamer frozen in for the winter. Radio operator is A. G. Sayre, W2QY, whose address is Storm King School, Cornwall-on-Hudson, New York. Reception reports should be sent to latter address. Station operates with 400 watts power. Reindeer Point is near Etah, 40 miles from Ellsmere Island and 600 miles from North Pole.

It is noted that the reportings for the 20-meter section are decreasing and some of those reporting are not giving sufficient information. This block was started upon the request of many interested listeners, and it is our desire to maintain it if enough are still interested. In reporting kindly send stations heard which have not been listed, and for each station show the date received, time of day or night received, location, whether on the low-frequency end or high-frequency end of American band, marking each station "LF" or "HF" as the case may be. If within the limits of the American band please mark "AB".

It affords us much pleasure to acknowledge and thank the many readers for their numerous letters and reports, for it is by these reports that we are enabled to improve the section. Each one, therefore, can assist by sending information of value to the readers, such as new stations heard, changes in frequencies, time schedules, and items of interest.

It is always our pleasure to reply to your inquiries and assist wherever possible with regard to the identity of unknown stations, reception and station matters in general and to exchange information with all.

Address your letters to Mr. J. B. L. Hinds, 85 Saint Andrews Place, Yonkers, New York, enclosing self-addressed stamped envelope if you desire reply.

All questions of a technical nature should be forwarded to Queries Editor, ALL-WAVE RADIO, 16 East 43rd Street, New York, N. Y.

R.S.S.L. NEWS

(Continued from page 642)

as the case may be, indicate the country in which the Monitoring Station is located. The numbers and letters immediately following the prefix provide the key to the exact location of a Monitoring Station. We have at headquarters a series of large maps each of which is broken up into square areas representing approximately 100 miles in each direction, or 10,000 square miles. Each intersection is represented by a letter or a number, similar to a road map, and it is therefore possible to locate with considerable rapidity any R.S.S.L. Monitoring Station.

This system is required in analyzing signal surveys, although experience along these lines indicates that a given survey would be accurate enough for all purposes were we to employ larger subdivisions—say states and provinces only, or possibly radio districts.

In any event, our methods of operation are sufficiently flexible that alterations

can be made in Monitoring Station Identifications if the majority of members approve. It should be practical, for instance, to use standard prefixes indicating country and area—such as W4 or VE3, etc., followed by a single letter to indicate a state or province, and two numbers for a headquarters key. W5L62 as an example.

If any such change is to be made, it should be done immediately, as membership renewal cards will be issued beginning the first of the year. Consequently we request that all present members let us have their opinions and suggestions at the earliest possible moment. Jot them down on a postcard today and mail to headquarters.

Membership Renewals

The new R.S.S.L. Official Membership cards for the year 1938 have reached us from the printer. The new card is a buff color and the printing in black. Otherwise it is similar to the 1937 card.

Letters will go forward to all present members before the first of the year regarding the manner in which renewals can be obtained. However, no 1938 cards will be issued until it has been determined what form of station identification is to be used in the future.

New members will receive 1938 cards, so if you recently applied for membership in the R. S. S. L. please be patient. It is too near to the end of the year to issue any further 1937 cards.

QUERIES

(Continued from page 647)

be used for this second oscillator. However, as this frequency falls within the broadcast band, complications would necessarily result.)

Question No. 46: I have heard that an ordinary loudspeaker can be used as a microphone and should like to know how to connect it up for this purpose.—*R.O.N., San Juan, Porto Rico.*

Answer: Yes—a loudspeaker of the magnetic type can be used very readily as a microphone. It is only necessary to connect the leads to the grid circuit of the detector tube—when the detector circuit is suitable. This, however, is not usually the case in modern receivers employing

diodes and double diodes. Obviously there is no grid available in some of these detectors. A variety of possible connections is suggested in Fig. 2. In the instances of the 55, 6R7, 85, 2A6, 6Q7, 75, 1F6, 2B7, 6B7 and 6B8, it will usually only be necessary to remove the grid cap and connect the speaker between the control grid and ground or chassis. In other tube arrangements, where the control grid (or single grid in the case of a triode) is brought out to a base prong, a connection will have to be broken.

Where a receiver is equipped with a jack or posts for phonograph connection, it will often be possible to operate the magnetic speaker as a microphone merely by connecting it to this circuit—exactly as you would a phonograph pickup. The volume will usually have to be turned up a bit higher than when using the phono pickup.

In cases where a magnetic speaker may not be available, fairly good results can be obtained by using a single head phone. Quality may not be quite so good and more amplification will be needed. If a dynamic speaker is used it will be necessary to employ a transformer. A regular output-to-voice-coil transformer will be satisfactory. Connect the voice coil to the usual terminals. If the transformer is designed for push-pull tubes, disregard the center tap.

In Fig. 2 we show a variety of possibilities. A, B and C are respectively a magnetic speaker, headphone and dynamic speaker. (If the last named is of other than the permanent magnet type, field supply must be provided.) Terminals X and Y should be connected to the phono pickup jacks or to the circuits indicated in D, E and F—respectively a grid leak detector, bias detector and duplex diode.

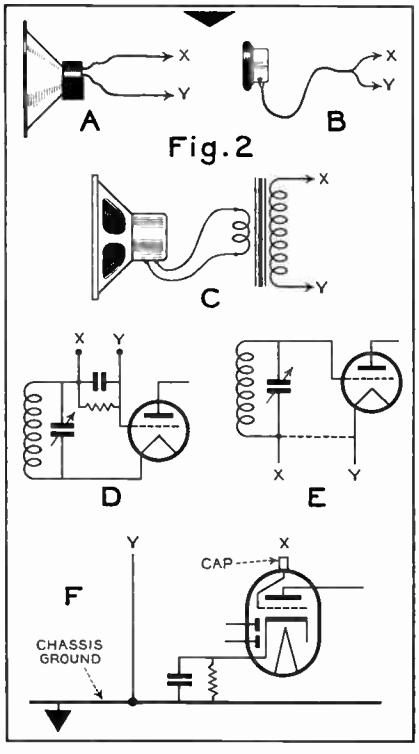


Fig. 2. Showing various ways of using loudspeakers or headphone as microphones. The easiest way is to connect in place of a phonograph pickup.

Wright DeCoster makes a microphone designed on these principles and which can be used in the circuits shown. Improved sensitivity and quality will be had with this device than with the average speaker.

Question No. 47: My friend and I live on different floors of an apartment house. We both have superheterodyne receivers, and we have discovered that when tuned a certain way we can both hear a squeal from the other's receiver. We are very much interested in code and would appreciate it if you could tell us how to insert a key in the receiver circuit so that we could communicate with each other by means of the "squeal."—*R. E. B., Portland, Me.*

Answer: This would be a very easy thing to do—but supplying you with the information might render us an accomplice and make us both liable to two years in a federal penitentiary plus a ten thousand-dollar fine. Your receiver can squeal all it wants to and radiate to the other end of the earth—and there is no law against it. But if you key that squeal, for the transmission of intelligence, even though only to the floor above, it is a violation of our Basic Communications Act, and the violator is liable to the penalties mentioned above. Besides you would probably be transmitting off-frequency which would make you liable to an additional $500 fine for each day of offense.

Better get a license and a crystal-controlled transmitter on an amateur band!

HAMFEST

(Continued from page 639)

As will be observed, the receiver at W2AD is a Hammarlund Super Pro. AD's present QTH is Hartsdale, N. Y., but he expects to move the rig to New York City as soon as the power company runs in the special lines for the Temco.

✦

INCIDENTALLY, PHOTOS of ham rigs are always welcome in this department. Following publication we'll be glad to make the rig owner a present of the cut, which can be used on QSL cards, *stationery,* etc. Which brings up the subject of QSL cards, and we protest mildly against the stereotyped character of the vast majority of these vehicles of acknowledgment. Ninety-nine out of a hundred consist mainly of the station call letters sprawled out across a piece of

QSL card with pictorial note, from U.S.S.R.

cheap cardboard—a work of art completely minus one iota of originality.

We're looking for original—different—QSL cards, and shall be glad to publish outstanding examples in this column. While the accompanying Russian card, recently received at W8QMR, is pretty well standardized in the U.S.S.R., it has a pictorial note that could well be adapted over here. The printing is in red and black on buff. VO1Y, St. John's, Newfoundland, acknowledged a QSO with a distinctly original card, bearing appropriately a half-tone reproduction of a Newfoundland dog. Carrying out the barnyard theme, W8QCQ's card sports a crowing rooster. Any more animal crackers?

✦

W1IGN is the first feminop we've worked who can really handle the bug. Her name is Doris—which shortens quite relevantly to "Dot." Grease up the cans some night and give her a buzz. Her QRG is 3670 kc.

✦

ONE OF THE MAIN thoughts behind our recommendation of a couple of months ago that all transmitters be taxed (read the September and October issues before you jump on us!) was that part of the funds so collected could be turned over to the FCC so that they could render some sort of service other than determining what time the sun sets in Kalamazoo. It is practically impossible for the individual amateur to secure even vital information from the FCC. Half the time you will receive no answer at all. At other times your letter will be returned with a notation that refers you to some section in the rules and regulations. But the unfortunate fact is that at present the full rules and regulations cannot be bought, stolen or borrowed from the FCC or the Government Printing office! It is simply out of print, and so far as we have been able to find out it has not been available for many moons.

And if the FCC ever does get around to answering a question without referring you to something you can't get hold of, they go the Delphic oracle considerably better. We actually did elicit a response from the Commish a few weeks back replying to a very simple question. Boiled down to its essentials, the answer was "yes and no."

✦

THE INCREASING practice of sharing QSOs is an excellent idea. It saves a lot of CQs, insures a lot more dx—and last but not least, it is a friendly gesture. The system is simple and merely consists of inviting some other station to participate in a dx schedule. For example, the other night, when working W2PF on our regular 1000p sked, he mentioned that he had a schedule with VE1ER in Nova Scotia at eleven and asked us if we'd care to hang around. We said yes, and PF gave us the VE's freq. When he finished with VE1ER, PF gave him our frequency. We clicked perfectly, and a half minute later had established a QSO that would have taken a month of CQs to set up.

✦

FOR THE BENEFIT of some second-district station who may care to check his log (and anyone else whom the shoe fits), we tell a sad tale. At 1217a, October 28th, we sent a short CQ. This second-district station came right back, and we tried to bk him—but to no avail. While he was calling we jotted down his RST as 569x, looked up his QTH, lit a cigarette, let the cat out, lit another cigarette. We pulled the switches and made our final entry in the log—"Called too long—couldn't wait."

(Continued on page 670)

WHICH BRINGS US to an old friend — "Dear QMR: What's the idea of ur mag telling everyone tt they've got to hv a license to transmit regardless of pwr and dx? Tts hooey. Do incinerators need licenses? . . . diathermy machines? . . . smoke precipitators? Naw, Why? Because they don't transmit intelligence. Out of the 47,000 hams, 30,000 don't need tickets. Yrs — HI."

CHANNEL ECHOES

(Continued from page 635)

The Rye-Krisp program featuring Marion Talley isn't much better. Luckies are kind to the throat and Rye-Krisps are "kind to your waist-line" — but as radio programs they're both of a kind — kinda punk.

✦

ALSO FROM THE letter box — G. L. S., of Grosse Point Farms, Mich., writes: "About the Louis-Farr fight broadcast . . . Knowing that the B. B. C. would carry the festivities, it didn't take much ballyhoo to make me switch from a local to London short waves. An English commentator reported the fight in a matter-of-fact way—even apologizing for excessive enthusiasm and possible prejudice in favor of Farr. His opinion tallied with the verdict given later, and he seemed dumbfounded by Louis's being booed, because he thought the decision was just. Quite refreshing to get away from all the ballyhoo and hysterics!"

✦

JAPAN, ACCORDING to a recent announcement by the Nippon Hoso Kyokai, now broadcasts in six different languages. Well — we suppose that comes in handy when one has a lot of explaining to do.

✦

THE SHORT-WAVE channels are replete these days with unlisted broadcasting stations as well as listed stations well off the usual broadcasting bands. The large majority of these stations broadcast only in foreign tongues and must be identified by checking against an accurate frequency list. (Listings of new stations will usually appear in AWR shortly after they first make their appearance on the ether). Of course, for stations located within a few dial divisions of the more popular bands—15 mc., 11-12 mc. and 9.5-9.6 mc., an unknown station can often be correctly located in reference to frequency by a precise check on the dial against a known station. The number of dial divisions between two fairly adjacent known stations (not more than two hundred kc. apart) should be accurately measured, and this figure divided into the kc. separation. This will give you the kc. variation per dial

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of ALL-WAVE RADIO Magazine, published monthly at New York, N. Y., for Oct. 1, 1937.
State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Edwin W. Lederman, who, having been duly sworn according to law, deposes and says that he is the Business Manager of ALL-WAVE RADIO Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Manson Publications Corp., 16 East 43rd St., New York, N. Y.; Editor, Maurice L. Muhleman, 300 Gramatan Ave., Mt. Vernon, N. Y.; Managing Editor, Maurice L. Muhleman, 300 Gramatan Ave., Mt. Vernon, N. Y.; Business Manager, Edwin W. Lederman, 12 East 86th St., New York, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Manson Publications Corp., 16 East 43rd St., New York, N. Y.; Edwin W. Lederman, 12 East 86th St., New York, N. Y.; Maurice L. Muhleman, 300 Gramatan Ave., Mt. Vernon, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is ——. (This information is required from daily publications only.)

EDWIN W. LEDERMAN,
Business Manager.

Sworn to and subscribed before me this 28th day of September, 1937.
(Seal.) EDWARD H. SNYDER,
Notary Public.
(My commission expires March 30, 1938.)

division. It is then an easy and obvious matter to determine the frequency of an unknown station by measuring the number of dial divisions separating it from the nearest station of known frequency. This is best done only when the known station is on the air — rather than from its previously logged position — because the calibration of the receiver will vary considerably at different temperatures. Of course the shift can be checked against any known station (logged when the receiver was thoroughly warmed up). It goes without saying that all stations used as markers should be logged after the receiver has been on for several hours, excepting when a practically simultaneous check is going to be made on an unknown station.

Unfortunately when hunting is best for unknown DX stations, convenient marker stations are not available. Also, as we have mentioned, many unknown stations are too far away from known stations to determine the frequency accurately by reference to the marker station. This is due to the fact that the rate of kilocycle change per dial division is not the same over different portions of the dial. For instance, on our own receiver, W3XAL, 17780 kc. is located at exactly 143 on the dial — at which point frequency changes at the rate of 30 kc. per dial division, and the dial can be read to tenths of one division. An unknown Spanish-speaking station was located at 169.4. As W3XAL was the nearest station on our log, this was used as a marker, which placed the unknown at 26.4 degrees higher up. At 30 kc. per degree, this made a difference of 792 kc., or placed the unknown at 18572 — or 18570 kilocycles. However, suspecting the accuracy of this long-distance check (over 26 dial degrees) we checked against a crystal-controlled oscillator and found that the correct frequency of the unknown was 18630 kilocycles — 60 kc. higher. (So far we have not seen this station listed.)

The serious short-wave fan should equip himself with a piezo-electric calibrator. It is really essential for accurate logging twenty-four hours out of the day and on isolated portions of the dial. A commercial model can be had for less than thirty dollars, and supplies harmonics, 100 kilocycles apart, way down to about ten meters. In addition, there is a marker signal every 1000 kilocycles. The accuracy is better than 100 cycles at 15 mc., which is better than seven ten-thousandths of one per cent.

✦

RAY E. CHESHOLM, RSSL Station W10-H2 of Jackson, Michigan, writes concerning an interference problem recently discussed in the *Queries Department*— concerning interference caused by a

smoke precipitator at a smelting plant. Mr. Chesholm asks can the FCC do anything about it.

We've had a bit of one-sided correspondence with the FCC lately, and have been unable to secure an answer from them—let alone a commitment—to our letters. But as far as we have been able to find out, the Federal Communications Commission can do nothing about interference unless the interferring signal is conveying intelligence. It is for this reason that the FCC has been unable to take action against diathermy machines, x-rays and other radiating devices. So long as there is no intelligence concerned it seems to be quite okay—which is probably the reason the FCC can't do anything about our average commercial broadcast programs.

ON THE MARKET

(Continued from page 660)

sistor field. Riteohms up to 50,000 ohms are only 1¼" x ⅜" and 7/16" x 2" up to 100,000 ohms.

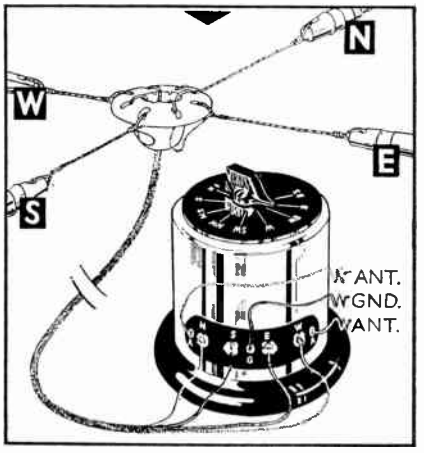
The Riteohm "71" is single-layer wound with special alloy wire, on a ceramic tube. The ends of the wire are mechanically locked and brazed to the copper lugs providing permanent connection. Easily soldered tinned copper wire leads make installation convenient. The resistor is covered with special Ohmite vitreous enamel, which rigidly holds, insulates and protects the accurately space-wound wire.

Because of their small size, single-layer construction and relatively few turns, the resistors have low inductance and distributed capacity. They are very conveniently used in many kinds of circuits.

Bulletin 108 describing the Riteohm "71" and other precision resistors may be had from the Ohmite Manufacturing Company, 4835 W. Flournoy Street, Chicago, Ill. ALL-WAVE RADIO.

SELECTIVE BEAM ANTENNA

THE TECHNICAL APPLIANCE CO., 17 East 16th St., New York, N. Y., announces a recently developed multi-directional receiving antenna.



The antenna employs two separate doublets, 90 degrees apart, special down lead, selector switch box and coupling transformer, all in a handy kit. The antenna is "beamed" in any desired direction by merely turning the selector switch to any point of the compass. ALL-WAVE RADIO.

◆

NEW JEFFERSON TRANSFORMER CATALOG

TO FACILITATE easy selection of radio transformers and chokes, Jefferson Electric Company, Bellwood, Illinois, has just published a complete catalog of 16 pages—augmented also by a similar number of pages on public-address system amplifiers, diagrams and equipment. This catalog—No. 372-R contains data on all types of transformers, and filter, swinging and plate chokes. Tables are included also giving dimensions for radio replacement power transformers with a guide giving transformer requirements for nearly 2000 receiver sets. Copies of the catalog are free to those interested in radio. ALL-WAVE RADIO.

INDEX TO ADVERTISERS

The NATIONAL NC-80X

See the new National NC-80X at your dealers. It embodies basic new improvements that for the first time make it possible to design a high-performance communication receiver at a low price. A new crystal filter circuit provides continuously variable selectivity from 400 cycles to 5 kilocycles, and wide phasing range. By its use, noise and interfering signals are reduced enormously. A high IF frequency (1560 KC) separates image frequencies by so great a span that they are readily rejected. These features make it practical to eliminate preselector stages. Use of new tubes designed for very low plate voltages allow AC-DC operation without sacrifice in performance. Thanks to such refinements, it has been found possible to engineer this new receiver with the high quality of the NC-100X, including the famous Movable Coil Tuning Unit, and yet achieve the remarkably low price of $88.00 Net, complete with speaker, tubes, and power supply. Two models are available, the NC-80X with coverage from 550 KC to 30 MC, and the NC-81X Amateur Model (illustrated) covering five amateur bands with extreme bandspread. The new National Catalogue No. 270 describes this fine receiver in detail.

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