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# RADIO NEWS

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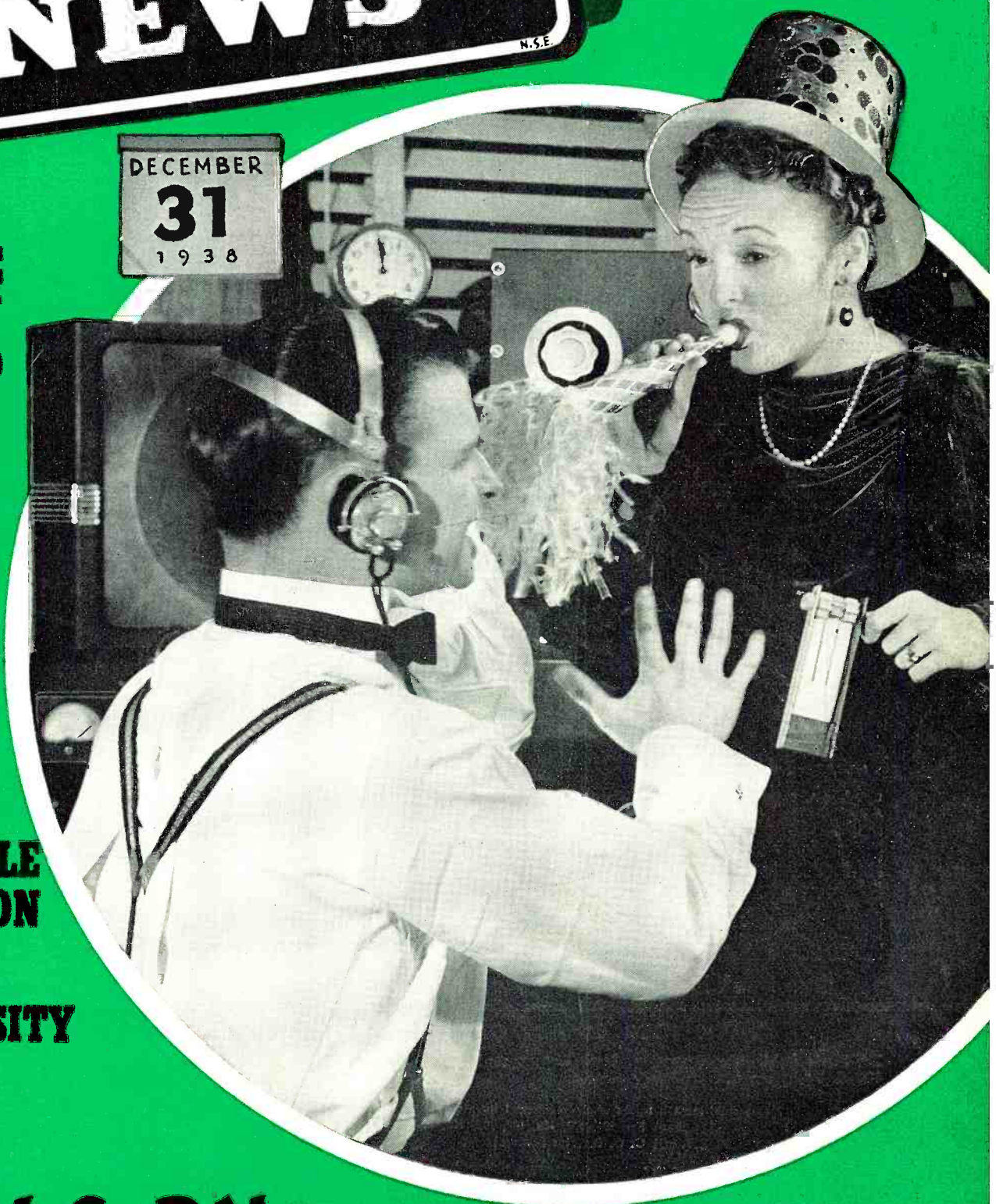


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FREQUENCY
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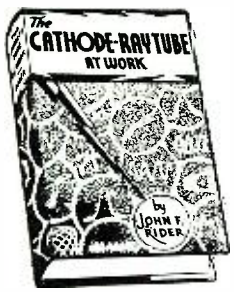


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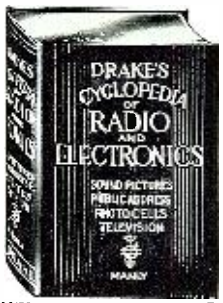


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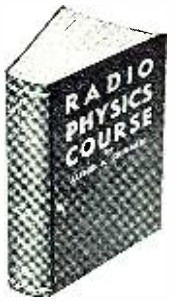


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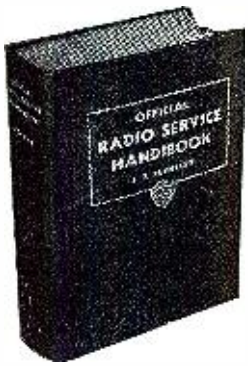


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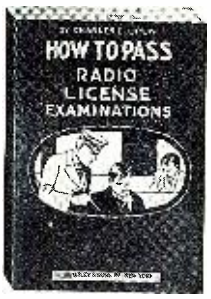


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**J. E. SMITH, President**
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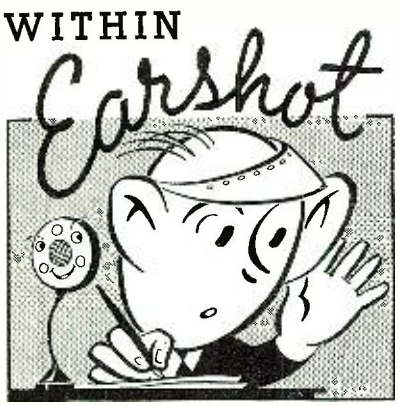



## OF THE EDITOR

WHEN we were poring over old musty issues of RADIO NEWS, recently, we ran across the following in the May 1925 issue:

"Above is shown the tentative radio set of 1935. Here we have radio television combined with radio broadcast. . . . Pressing one of the buttons, revolves the pointer slowly until you get the station you desire. . . . Releasing pressure on the button puts the station on the loudspeaker and a television apparatus begins to function at the same time. . . . Pressing the other button will bring in foreign stations located on the inner circle, using the same pointer, the operation being identical in all cases. . . ."

How much of that has become fact! We now have remote motor tuning, and silent between-station-selection. Certainly, foreign stations are brought in on the same dial using "the inner circle." Television, also, has become a part of the radio receiver of today, and if the prophet of 1925 guessed wrong by three or four years, still he was sufficiently accurate to be startling.

* * *

IN OTHER ways the RADIO NEWS of 1925 was quite wrong, and radio has developed entirely differently than was foretold. Witness the statement made then, that:

". . . in 1935 *all* broadcast stations will operate below 50 meters, possibly below 10 meters." [*Italics, ours. Ed.*]

". . . In 1935 a 10-watt station will be heard around the entire world. Under such conditions, with ultra-sensitive apparatus, the superpower system would create havoc . . . and probably not be used at that time . . ."

As we look back, we can see reason for the prophecy, but the author then did not figure with short-wave propaganda, dictators, and the terrific amount of short-wave communications which prohibit the use of the bands below fifty meters for *all* broadcasters. In addition to that, there are too many persons in these United States who are still using the older types of receivers—some even of 1925 vintage. It would not be advanta-

*(More Earshot on page 48)*


# RADIO NEWS

Including Articles on POPULAR TELEVISION

*The Magazine for the radio amateur experimenter, serviceman & dealer*

VOL. 21 NO. 1


# Contents for January, 1939

## FEATURES

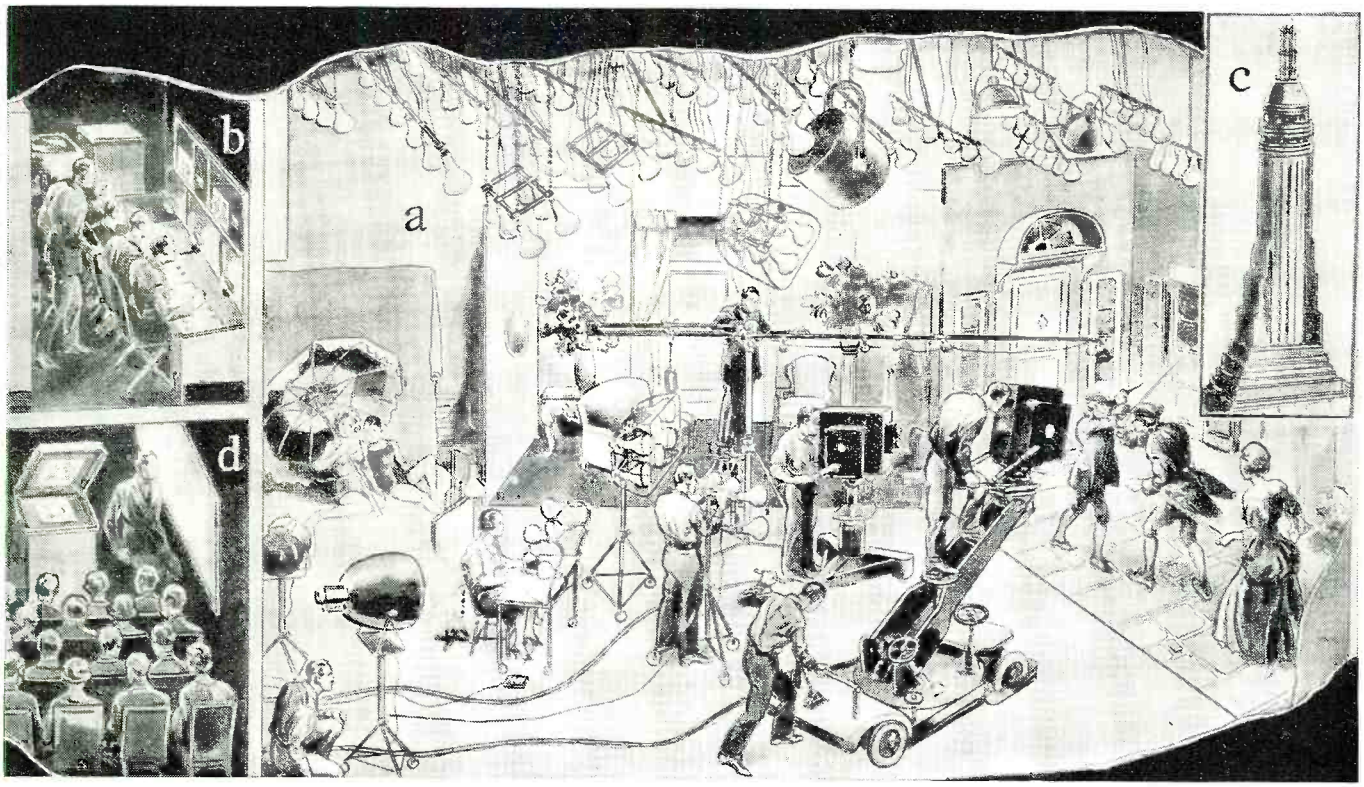


## DEPARTMENTS






RADIO NEWS is published monthly by the Ziff-Davis Publishing Company at 608 S. Dearborn St., Chicago, Ill. William B. Ziff, Publisher; B. G. Davis, Editor; Karl A. Kopetzky, W9QEA, Managing Editor; Oliver Read, W9ETI, Technical Associate; E. Stanton Brown, Associate Editor; Herman R. Bollin, Art Director; John H. Reardon, Circulation Director; S. L. Cahn, Advertising Manager. New York Office, 381 Fourth Ave. Subscription $2.50 per year; single copies, 25 cents; foreign postage $1.00 per year additional, except Canada. Entered as second class matter, March 9, 1938, at the Post Office, Chicago, Illinois, under the Act of March 3, 1879. Contributors should retain a copy of contributions. All submitted material must contain return postage. Contributions will be handled with reasonable care, but this magazine assumes no responsibility for their safety. Accepted material is subject to whatever revisions necessary to meet requirements. Payment will be made at our current rates upon acceptance and, unless otherwise specified by the contributor, all photographs and drawings will be considered as constituting a part of the manuscript in making payment.

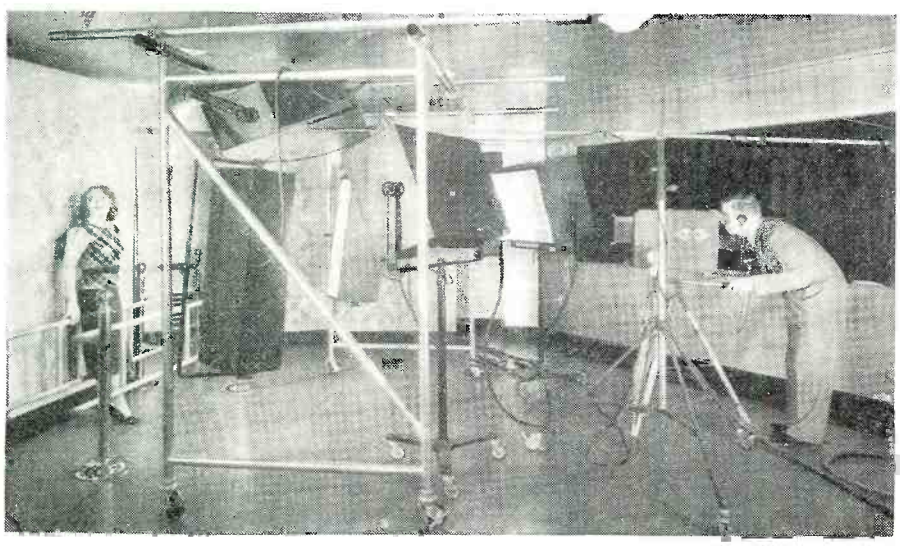



The above shows the operating technique which will be used in putting on the Television Show this spring.

# Television in New York

by SAMUEL KAUFMAN
New York City

**Television preparations have reached fever heat in New York, with plans to have regular schedules by next spring.**



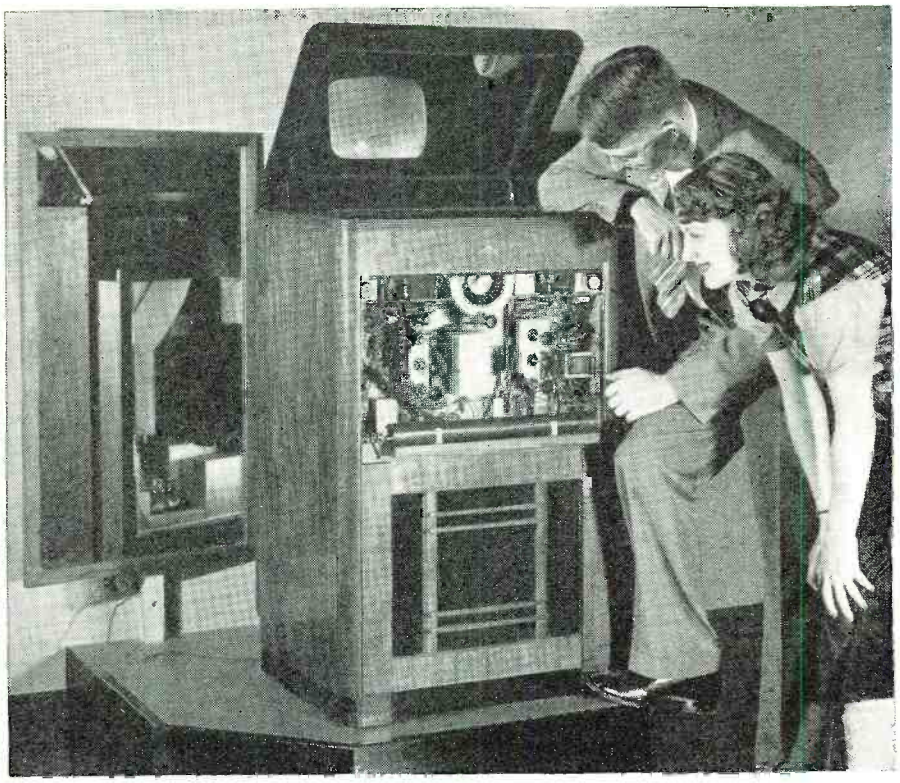
A mock setup for television which was demonstrated at the public NBC tour.

AMERICAN television, dormant as far as the public was concerned for a considerable period, has burst forward with a tremendous surge in recent weeks. New York is the scene of great television activity. NBC and CBS report much sight-and-sound program progress; parts, tube and set manufacturers are being heard from regarding their active participation in the newest branch of radio and, all in all, indications are that the way is being paved towards the early introduction of television on a mass scale to radio enthusiasts in many parts of the U.S.A.

Still in the fore of the American television scene are the broadcasters. NBC recently resumed New York transmissions for a one-month period prior to shutting down again for the final overhauling that will prepare the Empire State Building video station for the gala sight-and-sound programs planned for the period of the New York World's Fair starting in the Spring of 1939. The recent experimental transmissions revealed great progress in program technique although technical details of the image were virtually unchanged from the previous period of activity a few months before.

The big new television step of the network, however, was not so much the on-the-air tests as the launching of a television "tour" available to Radio City visitors at a nominal fee.

How your television set might look.



A television receiver for use by home groups. It uses 9" C.R. tube.

The importance of this phase of video activity, of course, is contained in the significance of its educational possibilities in showing the public how truly advanced the television art is.

CBS, long silent on its activities of installing a television transmitter atop the Chrysler Building, New York, suddenly proclaimed its progress and completion of the installation is expected early in 1939, also in ample time to tie-in with the much-ballyhooed World's Fair. A race for television program supremacy between NBC and CBS is anticipated and both companies believe that such competition will lead to a high program standard.

The long delay in CBS television activity was caused by considerable technical difficulties in getting the massive and heavy transmitter equipment to the seventy-second and seventy-third floors of the skyscraper. Also, it was explained that some constructional changes had to be made in the tower to accommodate the bulky sight transmitting equipment.

Arrangements have also been completed for the laying of a coaxial cable between the tower transmitter and the nearby Grand Central Terminal video studios. It was revealed that the CBS television transmitter will cost $650,000, including installation charges.

A new type of antenna consisting of sixteen independent dipoles—eight for sound radiation and eight for visual images—will be used. The aerial system will be heated during the winter under thermostatic control so that no ice will form on exposed surfaces.

A power supply of 1,500,000 watts will be available. Of this, the transmitter will use about 300,000 for sending out the 441-line image signals. It was explained that the additional power supply provides protection against circuit failures.

Call letters of the new CBS video station will be W2XAX, the same as the present experimental station in the CBS headquarters building on Madison Avenue.

The NBC television "tour" arrangement at Radio City has no technical connection with W2XBS, the Empire State transmitter, or the Radio City studio which feeds it with image programs. Visitors are informed by lecturer-guides of the fundamental principles of the video art and are shown working equipment. Highlight of the tour is the opportunity of visitors to be televised to the group behind them.

RCA sight receivers are shown in operation but are not yet for sale. David Sarnoff, president of RCA, though, announced that sets will be sold by next spring.

The New York NBC and CBS video stations are of especial importance to all communities despite their limited direct service areas. This is due to the fact that the two "key city" transmitters will set the pace for other heavily-populated zones. The entire industry is observing the New York tests with keen interest knowing that other cities, on short notice, will be able to duplicate the technical set-ups of W2XBS and W2XAX.

The two New York video stations are licensed for transmission on the frequency group bands. "B" and "C" (42,000-56,000 kilocycle band, or the 60,000-86,000 kilocycle band.)

Standards of transmission and reception have already been established by the R.M.A. at Washington, D. C.

Mr. Sarnoff recently told the Radio Manufacturers Association Board of

*(More information on page 52)*

As a television show will appear on your C-R screen.

# 1ST. PRIZE WINNER

## "AN INEXPENSIVE FREQUENCY STANDARD"

by CURTIS C. SPRINGER
W9EMR
Indianapolis, Indiana

**HERE is the winning article of the recent RADIO NEWS Receiver Contest. It is particularly appropriate because these "standards" are now required by the new F.C.C. Regulations.**

★

**Mr. Springer's article was unanimously chosen by the judges because of the extreme care and design that went into its writing.**

☆

**OTHER WINNERS:**

★ 2nd Prize Winner: Edward Caldicott, New York City.

★ 3rd to 12th Prize Winners: William Breedon, Los Angeles, Cal.; H. J. Glunz, Hicksville, L. I., N. Y.; Ray E. Morrow, Seattle, Washington; Ernest J. Vogt, Hialeah, Florida; Russell C. Lunn, Los Angeles, Cal.; Jorman Koski, Staten I., New York; Edward Lovick, Jr., Falls City, Neb.; Louis K. Sandor, Piqua, Ohio; George W. Brooks, Laconia, N. H.; R. O. Goettmann, Pittsburgh, Pa.

THE frequency meter to be described is capable of quite high accuracy over a long period of time, and can nearly always be rechecked on a moment's notice. Electrically it is simplicity itself, containing no trick circuits and only four tubes including the rectifier. Mechanically, it is simpler than most receivers, mainly, because no two tubes operate on the same frequency, thereby eliminating the necessity for internal shielding. It is, however, important that the unit as a whole be solidly constructed and enclosed in a rather rigid metal box to prevent external objects from affecting the frequency.

The biggest advantage this meter offers over the customary heterodyne meter is the presence of several "reference points" of known frequency, generated internally. These points may be referred to at any time at the flip of a switch, to determine how far the calibrated oscillator has drifted, if any. The dial is calibrated directly in kilocycles, and the reference points always appear at definitely known frequencies. Therefore, if the reference points drift away slightly from the proper place on the dial, it is then known that the calibration is off. Two trimmer condensers on the panel can be used to correct this condition to extreme accuracy.

Boiled down to an outline, the frequency meter functions as follows: One oscillator operates on exactly 100 kc., the accuracy of which is maintained by occasionally checking for zero beat between its seventh harmonic and WLW on 700 kc., or any broadcast or frequency standard station whose wave length is a multiple of 100 kc. A second oscillator operates in the neighborhood of 7000 kc. The output of each oscillator is fed into the grid of a pentode output tube wired up as a grid-leak detector. The external signal, whose frequency is to be checked, is fed into the same point. When the high frequency oscillator is tuned to 7000 kc., for example, the 70th harmonic of the 100 kc. oscillator beats with the H.F. oscillator and a fairly strong beat note appears in the headphones which are in the output of the detector. Similarly, a note is heard in the phones each time the H.F. oscillator crosses any harmonic of the 100 kc. oscillator, giving a reference point every 100 kc. on the calibrated dial which controls the H.F. oscillator. Similarly, when the second harmonic of the H.F. oscillator passes any 100 kc. harmonic, a somewhat

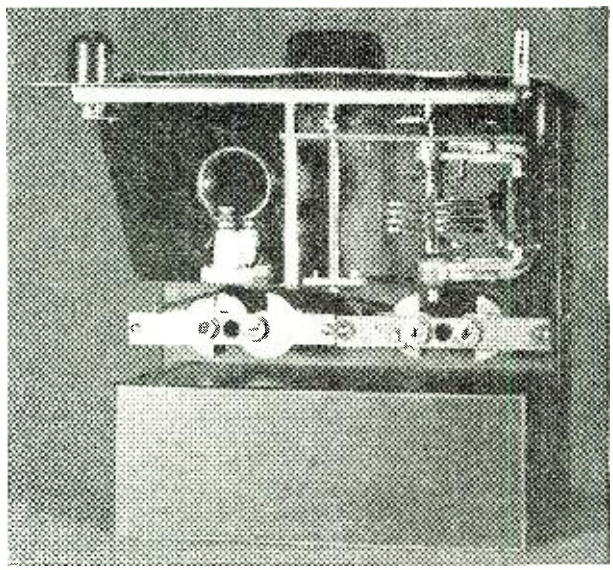
RADIO NEWS

weaker beat is heard. For example, when the oscillator is on 7050, its second harmonic (14,100 kc.) beats against the 141st harmonic of the 100 kc. oscillator. The third harmonics of the H.F. oscillator also produce rather weak beats in the phones when they cross harmonics of 100 kc.

For example, 7233⅓ kc. × 3 equals 21,400 kc., which beats against the 214th harmonic of the L.F. oscillator, and 7166⅔ × 3 equals 21,500 kc. which beats against the 215th harmonic. Thus, we have, within the unit, not only a calibrated oscillator, but a simple means of checking its accuracy every 33⅓ kc. throughout its useful range. By increasing the coupling between the two oscillators the 4th and 5th harmonics could be utilized to give reference points every 25 and 20 kc., respectively, but too many points are likely to cause confusion. The 100 kc. standard oscillator is used only for calibrating the H.F. oscillator and is normally oscillating only when its own accuracy is being checked, or the accuracy of the calibrated oscillator.

After the high frequency oscillator has been checked against the low frequency one, the 100 kc. oscillator is turned off, and the transmitter checked against the high frequency one.

Since the author is interested only in amateur frequencies, the meter covers only these bands. In checking frequencies in the 160 and 80-meter bands, the calibrated oscillator heterodynes the 4th or 2nd harmonics, respectively, of the signal to be checked. On 40 meters, of course, the fundamental frequencies produce the heterodyne. On 20, 10 and higher frequency bands, the respective harmonics of the calibrated oscillator heterodyne the fundamental frequency of the external signal to give the desired beat. It should be mentioned here that this meter gives no assurance against accidentally operating the transmitter on the wrong harmonic of the crystal oscillator, since the odd harmonics (3rd, 5th, etc.) of the calibrated oscillator can produce beats as well as the even ones.

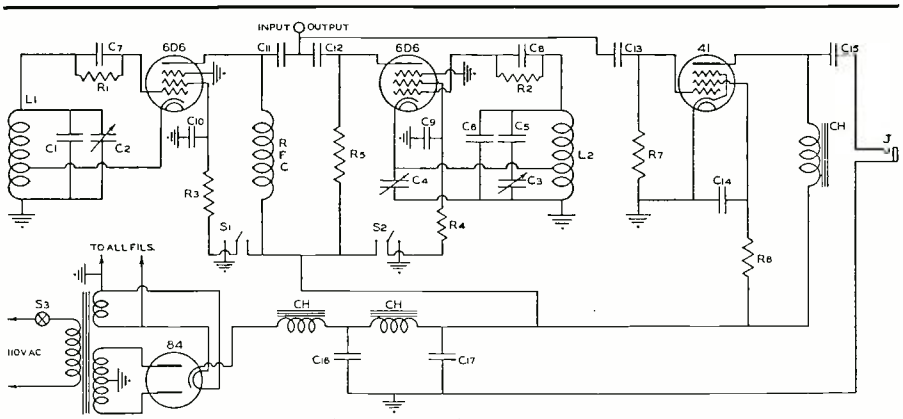


Main tuning condenser at the right, padding condenser to the back, insure proper connector lengths.

The dial itself was turned out by the author on the lathe from a sheet of 16 gauge steel, and is nine inches in diameter. A commercially manufactured dial may be used instead. The knob and dial bushing are the remains of an old *Rembler* 4 inch dial (1924 vintage). Many of these, including geared condensers and dials, are still to be found around ham shacks and radio shops, particularly those specializing in used equipment. The condenser is of no interest to us in making a frequency meter, as there usually is too much "play" in its bakelite gears to make it useful as a precision instrument. However, if one were found without "play" it would make the installation of additional gears unnecessary.

The indicator, by which the dial is read is a shadow rather than the customary pointer. A small panel light (Yaxley No. 330) is installed on the front panel, throwing a beam about ⅛" wide toward the center of the dial. As this light, as it comes from the dealer, is not capable of throwing a narrow beam, so a ½" piece of ¾" O.D. brass tubing with a single hacksaw cut laterally is fitted snugly inside the assembly, permitting light to come out only through the hacksaw cut. A needle point projects through the front panel out slightly past the edge of the dial, directly in the center of the light beam. The shadow of this needle falls on the white dial calibration sheet. Thus the dial may be mounted on the shaft so that it is 3/16" or so away from the panel, and still we have an indicator which allows no error due to parralax, even though the dial plate is not perfectly flat.

If the tuning (calibrated) condenser should really be geared, then the selection of gears becomes a matter of importance, and especially the installation. The author went to a local hardware store and selected a pair of




Schematic diagram of the frequency standard.

*$C_1$—800 mfd. air dielectric, semi-fixed*
*$C_2$—30 mfd. air dielectric, variable*
*$C_3$—100 mfd. or larger (see text) air dielectric*
*$C_5$—200 mfd. or larger air dielectric, semi-variable*
*$C_6$—200 mfd. semi-variable*
*$C_7$—30 mfd. air dielectric, variable*
*$C_8$—1,000 mfd. (.001) fixed mica*
*$C_9$—1,000 mfd. (.001) fixed mica*
*$C_{10}$—.01 mfd. mica, 400 v.*
*$C_{11}$—¼ mfd. paper, 400 v.*
*$C_{12}$—50 mfd. mica*
*$C_{12}$—Two one inch by three-quarter inch brass plates separated 1/16 inch*
*$C_{13}$—50 mfd. or less mica dielectric*
*$C_{14}$—8 mfd. 450 v. electro.*
*$C_{15}$—¼ mfd. 400 v. paper*
*$C_{16}$—8 mfd. 450 v. electro.*
*$C_{17}$—8 mfd. 450 v. electro.*
*$R_1$—20,000 ohms, ½ w.*
*$R_2$—20,000 ohms, ½ w.*
*$R_3$—100,000 ohms, ½ w.*
*$R_4$—100,000 ohms, ½ w.*
*$R_5$—20,000 ohms, 1 w.*
*$R_6$—20,000 ohms, 1 w.*
*$R_7$—1½ meg. ½ w.*
*CH—30 Henry, 30 MA chokes*
*P. T.—110 v. pri., one 6.3 v. 1½ amp. sec. and one 500 v. center tapped HV winding*
*J—Open circuit jack*
*$S_1$—S.P.D.T.*
*$S_2$—S.P.D.T.*
*$S_3$—S.P.D.T.*
*$L_1$—330 turns No. 26 SCC enameled on 1⅜ inch winding form. (Six layers of about 60 turns each.) Tapped 120 turns from start for cathode.*
*$L_2$—12 turns No. 8 hard drawn copper wire, 1⅜ inch inside dia., 2¼ inch long. Tapped three turns from ground end for cathode connection.*

*Bostons;* No. G-142 (one inch dia., 50 teeth) and No. G-150 (three inch dia., 150 teeth). The small gear has a ¼" hole at the center, but the large one comes with a 5/16" hole and must be provided with a bushing unless the condenser chosen happens to have a shaft larger than the usual ¼". Set screws are provided on the gears.

One complete revolution of the large dial turns the condenser 120 degrees. By means of additional capacities in parallel and in series with the calibrated condenser, the desired frequency coverage of the meter is made to fall in exactly this 120 degrees rotation of the calibrated condenser. Anything over 120° is used for "exploring."

The condenser is mounted solidly upon a brass strip. The maximum capacity should be 100 mmfd. or more, since a semi-fixed capacity in series with it limits the frequency coverage. Many well designed condensers taken from obsolete broadcast receivers will satisfy the requirements. It is desirable, though not necessary, that the condenser have "straight line capacity."

Since it was desired to have the meter complete within itself the power supply was included as an integral part of the affair. All the heat-generating parts, including the power transformer and all four tubes, are mounted on top at the rear of the chassis and covered on all sides except the rear with a steel box, which has a few holes adjacent to the tubes, allowing hot air to escape.

The chassis is made from No. 18 gauge steel, 4" high by 8¾" square. The front side is left open, except for a ⅜" flange to which the front panel is secured with 6-32 machine screws. The front panel is 12" high and 9⅝" wide, and of the same material. Two gusset plates fastened between the upper 8" of the panel and the front half of the chassis, along opposite sides, serving to make the panel and chassis rigid with respect to each other.

The H.F. oscillator series and parallel padding condensers mount between the rear bearing support and the box which covers the tubes. Two 100 mmfd. midgets in parallel are used for each to obtain the desired maximum 200 mmfd. They take up little space and the old type *Hammarlunds* have a locking feature. Each pair of these mounts on a separate brass strip ½" x 4" x ⅛", which mount on the top of 3" studs made from ¼" brass rod. These studs are screwed to the top of the chassis with 6-32 machine screws. The pair of series condensers must be insulated from ground, and this is accomplished by means of bakelite washers between the strip on which the condensers mount and the 3" studs. The parallel condensers need not be insulated.

### Power Supply

The power supply features a type 84 rectifier tube, which does not require a separate filament winding on the transformer, helping that much to reduce heat. It is rated at 50 ma. plate current and the drain of the entire frequency meter is only about 30 ma. The filter consists of two very small 30 henry 30 ma. chokes and an 8 mfd. condenser on each side of the second choke. The input choke is not necessary, but it adds something to the filtering and reduces the output voltage which is unnecessarily high with condenser input.

### Detector

The type 41 pentode audio output tube was chosen for the detector, but a triode will work satisfactorily. Gridleak detection offers good sensitivity, and the rather high plate current of a pentode output tube connected in this manner makes a bleeder across the power supply unnecessary. The screen voltage is reduced to keep the plate current down to a safe level with a 20,000 ohm resistor in series with the screen, by-passed at the tube end. The plate current is rather high to be fed through headphones, so another small 30 henry choke is used to carry the plate current, and the headphones are coupled to the plate through a coupling condenser. The quality of the detector's output is of no importance, so the obvious mismatch in the plate circuit does not matter. The gridleak, connected between the grid and ground, determines to a large extent the detector's sensitivity and should be at least one megohm. Capacitive coupling is used between the detector grid and both oscillator plates, and also to the input-output binding post on the front panel.

### 100 Kc. Oscillator

A 100 kc. crystal oscillator might definitely be desirable in a meter of this type. However the unit is designed to work without one. Almost any hour of the day or night there is at least one broadcast station within range operating on some harmonic of 100 kc. These stations are required to keep their frequencies within 50 cycles of their assigned frequencies. Here we have, at the flip of a switch, a frequency standard closer probably than the average 100 kc. crystal, unless the latter is temperature controlled. Our self-excited 100 kc., with the constants indicated, provides strong harmonics every 100 kc. down to several megacycles, any one of which may be checked against the most convenient station operating on any harmonic of 100 kc. An air dielectric condenser (a two gang affair purloined from an old broadcast receiver) and a home made coil make up the 100 kc. tuned circuit. The coil is made of 330 turns (6 layers of about 60 turns each) on a bakelite form 1⅜" dia. and 3" long. The wire is No. 26 enameled single cotton covered. The coil is tapped 120 turns from the start for the cathode connection. The inside connection goes to ground and the outside to the grid of the tube, through the grid leak and condenser.

The cathode connection is somewhat further from ground than is customary, but the additional excitation provided in this manner gives added strength to the higher harmonics. All coils should be mounted as far away from the metal as possible.

The r.f. choke in the plate circuit requires special attention. It must have high impedance at 7000, 14000, 21,000 and 28,000 kc. so that the harmonics in this range will not be "squelched." It must have sufficient impedance through the broadcast band so that the harmonics in this range will have sufficient strength for heterodyning broadcast stations, but must have low impedance at 100 kc. If the plate choke has sufficient impedance to allow much of the fundamental frequency to develop across it, changing the length of pickup wire or touching the output binding post will change the frequency of our standard oscillator.

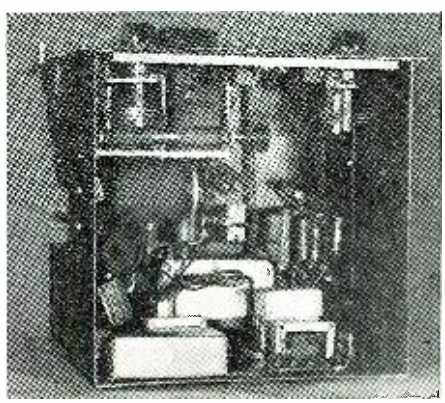
This is not much of a problem since the familiar lattice-wound chokes usually have high impedance at high frequency, and if it is also too high at 100 kc., a third to a half of the turns may be removed without making the impedance too low at the other frequencies. This is what the author did to an old 2½ mh. choke with satisfactory results.

A 30 mmfd. midget condenser on the front panel, in parallel with the 800 mmfd. tank condenser, serves to readjust the oscillator to exactly 100 kc. when necessary. It is sufficient to give a change of about 1½ kc. at the fundamental frequency. The main tank condenser is equipped with a set screw in one bearing to lock it at the right capacity, and is mounted under the chassis, along with its associated coil.

### High Frequency Oscillator

The high frequency oscillator operates in the 40 meter band, plus a little on each side. This band was chosen because no frequency within the range of the meter will produce more than one harmonic in any of the ham bands down to 2½ meters. If the oscillator operated in the 80 meter band, for instance, an oscillator frequency of 3500

(*Check frequency further on page* 62)



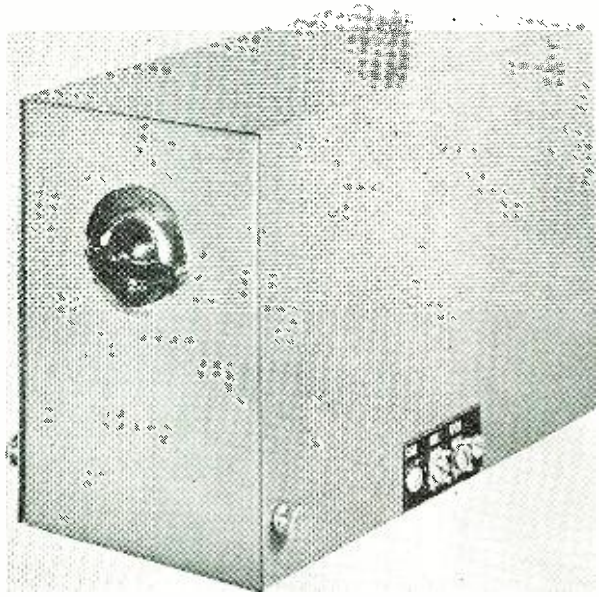
Underside of the chassis shows careful arrangement of all parts for efficiency.

# The Diversity Coupler

**Having described the theory last month, the author shows how the diversity coupler is built and how it is connected to a receiver.**

The author.

**By McMURDO SILVER**
Amateur Radio Div., E. I. Guthman & Co.
Chicago, Illinois



The single control is for sensitivity.

IN the last issue of RADIO NEWS appeared the first and exclusive review of the new invention named the *Diversity Coupler,* which added to any good superhet receiver will, upon the addition of a small second antenna, practically eliminate fading of received signals, and in so doing also eliminate the noise which invariably accompanies the downward fading signal. In that article was given the theory of diversity reception, the only known means of effectively counteracting fading, as well as any explanation of the principle of operation of the *Coupler.* To aid the new reader in understanding what follows, it seems well to briefly summarize the principles involved.

Most fading is due to the arrival of a single desired signal over not one atmospheric path, but its simultaneous arrival over two or more paths due to absorption and reflection of the signal by the *Heavyside* layer of the atmosphere. As a rule transmitted signals are radiated over a general direction in a circle around a transmitting antenna, or in a beam. Either way some of the signal travels up towards the *Heavyside* layer, while the other bounces along the ground. There may be several signals propagated sky-wise. Thus two or more,—instead of only one,—identical signals reach the receiving antenna, because the unequal path lengths cause the signal to arrive before, with and after itself.

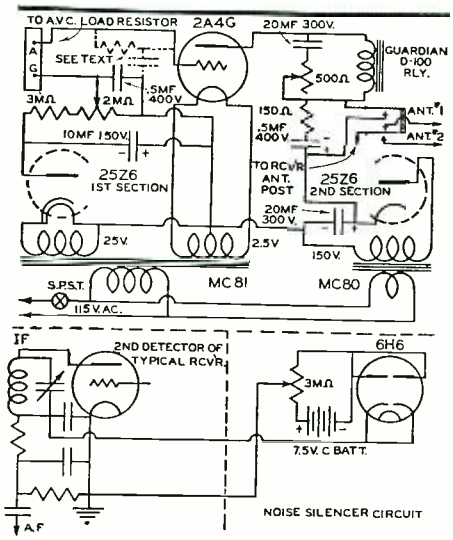


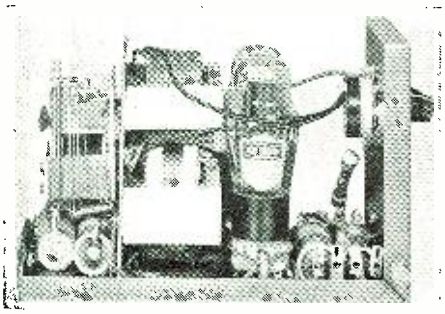

Diagram of the diversity coupler.

This phase shift, or lag and lead, causes what was originally one signal to appear at the receiver as two or more identical signals of slight time difference. These signals are identical as to audio modulation, but lead and lag each other as to carrier frequency. When all arrive exactly simultaneously, they add, and this is the "top" of a fading cycle. When they lag or lead one another, they are out of phase and tend to cancel out. The extreme "bottom" of a cycle, corresponding to a completely faded out signal, is when the phase difference is such as to result in cancellation.

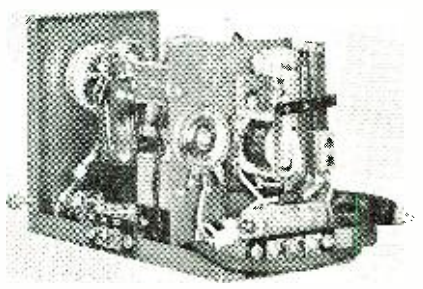
The means of eliminating fading lies in the fact that it does not occur for a given signal simultaneously in direction in two different antennae. Thus, two antennae act like a see-saw, for when the signal has faded down in one, it has faded up in the other. Obviously, the answer is to combine the same signal as received in two different antennae so as always to listen to the strong signal. This cannot be done by simple interconnection of the two antennae, because the phase shift which causes the fading prevents the additive combination of the signals at radio-frequency. Thus a dual-diversity receiver must be very complicated in that it must be two complete receivers with a common audio amplifier only. A common a.v.c. system must be used to squelch the weak-signal receiver so that it may not contribute noise when its signal fades.

The new sytem devised by the au-

(*Please fade in page* 57)



Compactness is a good feature.



The change-over relay is at rear.

# 5 watt Marine Xmtr.

A simplicity, compactness and ruggedness are this installation's features.

THE amateur radio operator or constructor who builds his own equipment will find much of interest in the following description which covers the construction of one of the popular commercial transmitters designed by TEMCO to meet stringent application found in the installation of marine type telephone equipment. Such a set calls for extreme mechanical ruggedness and this transmitter is a good example of this type of construction.

One of the first requirements in any equipment which is to be used near salt water is the consideration given to the metal parts. If these are not protected, corrosion, rust, etc. will set in. It is a well-known fact that rust and corrosion tend to make high resistance connection in wiring circuits, and if this condition is allowed to exist the performance of the transmitter can be seriously affected. It is, therefore, necessary that all control cables be adequately bonded together and that all "ground" connections be thoroughly made by means of lock washes directly to the chassis in addition to the common "ground bus" which is found in a modern transmitter. Shielding also plays an important part and applies particularly to the r.f. circuit. Next in order of importance is the simplicity of the circuit itself, and reference to the schematic will show that much thought has been given to making it not only practical but fool-proof.

Looking at the front view of the transmitter, the number of controls has been reduced to an absolute minimum. There are two pilot lights on the front top part of the panel to indicate whether or not the receiver or transmitter, or both, are in operation. In the center, between these two pilot lights, is the switch which turns on the transmitter filaments. Directly below is the main station selector knob which selects the proper channel on which the transmitter it to be operated.

It is interesting to note that provision has been made for four channels, any one of which may be selected by this station selector switch. Only one r.f. coil is used in the modulated amplifier, which adds to the simplicity of design. Inasmuch as the frequencies used are very closely related, it is only necessary to use four different capacities across the tank coil, and these are pre-set to the frequencies used. The change-over from transmitter to receiver is by no means of a "push-to-talk" switch located in the telephone hand-set. This switch is normally open and the receiver is normally on. In order to transmit, it is necessary only to depress the push-to-talk switch, which automatically throws the relay to the transmit position, and automatically changes all circuits to that position.

### The R. F. Unit

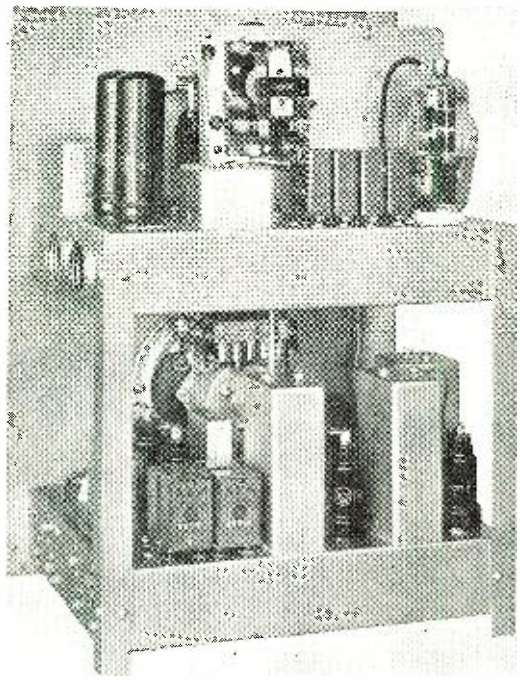
The top chassis contains the complete r.f. section of the transmitter-receiver, and the tube line-up is as follows: An 807 is used in the Pierce type oscillator which requires no tuned-tank circuit. The frequency is determined by the crystal, which is placed in the grid circuit and is automatically selected by means of the front panel switch so that the proper crystal is used. Other than that there are no tuning adjustments needed for the oscillator section of this transmitter. The output of the 807 oscillator feeds directly into another r.f. stage also using the type 807 tube. This circuit is simplicity itself and it consists chiefly of the tube and its component parts, together with the output tank coil and its associated condensers, which are semi-variable. These condensers are set to the frequencies used by the particular transmitter and once adjusted need not be further changed unless the transmitter frequencies are changed. The output of the tank coil is capacity-coupled to the antenna and taps are provided on the output circuit so that proper loading to the amplifier may be realized. These taps are also pre-set and it is not necessary for the operator to make any further adjustments. The r.f. output is transferred to the antenna through the change-over relay. It will be noted that the antenna used is common to both the transmitter and receiver, and is shifted by means of the switch located on the relay. The other section of the switch is used to transfer the high voltage coming from the power supply cable to either the transmitter or the receiver. This relay is normally in the "receive" position and the B+ is normally connected down through the cable to the receiver. When the button on the hand telephone set is depressed the B+ automatically shifts to the transmitter and the receiver is dead.

It is interesting to note the complete lack of meters on the transmitter, as there is really no necessity for their use as long as the circuits cannot be changed by the operator himself. Therefore, there is no resonance to indicate, etc. Sufficient leaway is provided in the design of the various units so that in no case is any circuit overloaded to the extent where the power supply would not be able to take care of excessive drain. The control cables come in at one end of the r.f. chassis, and the other end of

# [illegible] Sh[illegible]'s Re[illegible]ve[illegible]

By OLIVER READ, W9ETI
Technical Associate, RADIO NEWS

**The constructor of up-to-date radio equipment may well follow the example set forth in the design of this neat unit.**

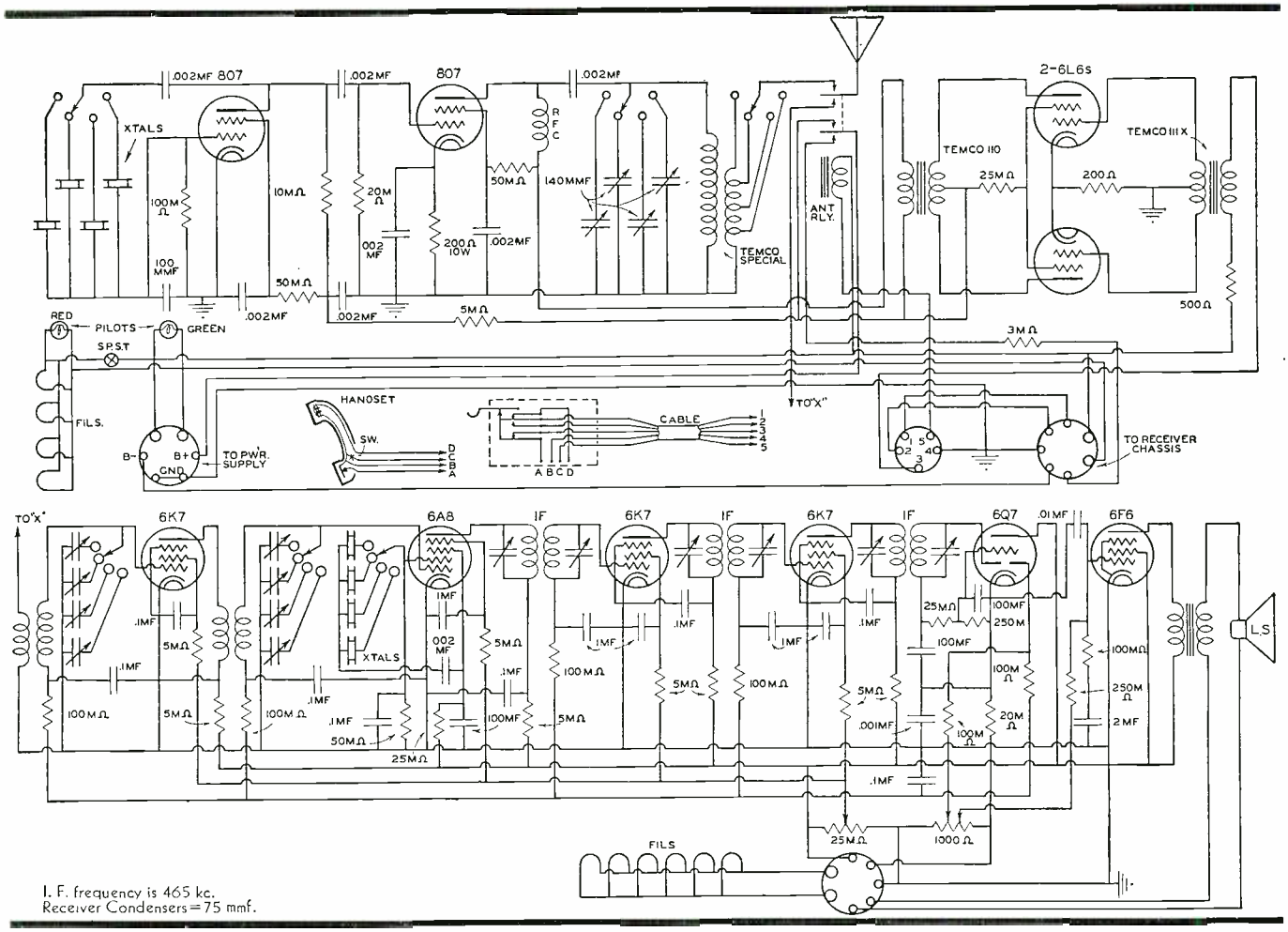


Note 4 crystals each in transmitter and receiver.

these cables, of course, connect to the various types of power supply. By standardizing cables and plugs it is possible to use various supplies, including not only one for 110 volt a.c. operation, but also for 6, 12, 32 or 110 d.c. In the latter case a motor-generator is supplied which furnishes all necessary plate voltages.

At the back of the r.f. chassis are the four crystals in their respective holders mounted side by side next to the oscillator tube. The connections are very short and high stability is naturally the result. The relay is directly in the center. Behind the baffle shield is the r.f. tank coil and its associated tube and semi-fixed, tuning condensers. These are mounted along the top on an insulating strip and very short leads are provided to the tank coil circuit. The left-hand portion, looking from the rear of the chassis, is devoted en-

(*Further analysis on p.* 46)




I. F. frequency is 465 kc.
Receiver Condensers = 75 mmf.

# ☆ WIN ☆ A CASH PRIZE

## You must be very proud of that new instrument that you have just built. Win a prize with it!

**ATTENTION! Servicemen, Experimenters, Short Wave Listeners, Radio Engineers, Amateurs, Tinkers and Gadgeteers! Here's a chance for you to win some prize money with a photograph, diagram, parts list and description of your favorite piece of apparatus, instrument, transmitter, receiver, antenna, gadget, or what have you. Here is an opportunity for those who build their own to tell the world about it and, at the same time, win a prize!**

Have you sweated hours and hours designing a pet instrument? When you have finished it, have you been very proud of the results? Well, you might win and we would pay prize money for a photograph, diagram, parts list and description of that pet of yours.

If you are not a photographer, you may have someone else take the picture for you. He may be either an amateur of a professional. You may enter the contest singly, or you may enter in the name of yourself and your photographer. To enter the Contest, here is what you have to do.

Procure a picture or a series of pictures on that pet instrument, article or gadget. Photographs must be at least 2¼"x3¼" in size, must be clear as to detail and must be on a contrasty glossy print. Name of the photographer must be clearly inscribed in the margin. A sufficient number of pictures to clearly illustrate what you have built must be included.

After you have taken the pictures, draw an electrical diagram of the apparatus. This should be done on white paper, not smaller than 8½"x11" and should be drawn in ink. Each diagram should have your name and address in the upper right-hand corner. Use the recognized electrical symbols.

Next, prepare a parts list of each and every part that went into the construction of your favorite piece of apparatus. This parts list should be neatly typewritten, or written in ink, on one side of white paper the same size as the diagram, and your name and address should appear in the upper right hand corner of each one of your parts list sheets. Parts lists should be complete; however, you may omit nuts, bolts, wire, etc. It should be complete enough, however, for any other person to build exactly what you have built. All sizes of panels, chassis, and set bases must be given as well as the sizes of holes.

Next, take a separate sheet of paper, the same size as the diagram, and describe the article that you have built, what it is used for, how you constructed it, and what its best points are. This description must not be over 500 words and should be typewritten and doublespaced, or written in ink sufficiently legible for anybody to read.

In awarding the prizes, photographs will count 35%; the diagram, 25%; the parts list 15%; and the description 25%.

First Prize will be $100.00 in cash. Second Prize will be $25.00 in cash, Third to Twelfth Prizes will be $5.00 in cash, ten Honorable Mention Prizes of $2.00 each and a Booby Prize for the silliest article and description of $5.00.

The decision of the judges will be final. All non-winning entries accompanied by return postage will be returned. No correspondence can be entered into with any of the entrants.

The deadline for the contest will be January 31, 1939 and no entries post marked after that date can be considered as entered in this contest.

Entrants may use the entry blank furnished, or may make up a reasonable facsimile. Be sure to answer all of the questions on the entry blank or, in making up the facsimile be sure to give all the information requested of you.

One thing is certain, in order to be in "the running" it is necessary to comply with all of the rules and regulations of this contest.

Well, fellows! What say? Let's see those builders' articles, and Good Luck!

## CONTEST RULES

1. This contest is open to anybody except the employees of Ziff-Davis Publishing Company or their families. Two or more contestants may enter jointly.
2. Address your entry to the CASH PRIZE CONTEST EDITOR, c/o RADIO NEWS, 608 S. Dearborn Street, Chicago, Ill., and use the Entry Blank below or a reasonable facsimile thereof.
3. The entry shall consist of five units as follows:
   (a) A properly filled out entry blank, or reasonable facsimile.
   (b) One or more pictures not smaller than 2¼"x3¼" finished in contrasty glossy finish, fully showing the article which the entrant has built.
   (c) One or more electrical diagrams, on white paper 8½"x 11", drawn in ink.
   (d) A complete parts list specifying manufacturers' parts by name, wherever they have been used, and giving the correct electrical values of each component part. Nuts, bolts, wire

(*Further Rules on page* 49)

## ON THE COVER WE HAVE . . .

A PICTURE of what is probably happening, or has happened in many an amateur's home on New Year's Eve. The gentleman, despite the entreaties of his very charming lady who might be his girl friend or wife, insists on operating his rig at the very zero hour of New Year's Eve.

The picture was taken in the studios of Henry F. Kroeger, Jr. of Chicago, Illinois, and the equipment was furnished through the courtesy of The Hallicrafters, Inc., who furnished an SX-17 Receiver, and Wholesale Radio Service Co., Inc., who furnished one of their Lafayette 40 Watt Transmitters. After the Art and the Photographic Dept. had finished, only a small part of either instrument shows.

The earphones which the gentleman is wearing will probably come in for a considerable amount of curiosity. They are a pair of 16000 ohm S. G. Brown earphones manufactured in England some 20 years ago and are the pet property of the Managing Editor.

For those radio men who are interested in photography, the picture was taken with an 8 x 10 studio camera with an *f* 6.3 lens. Over 6000 watts of illumination were used, excluding the 5000 watt arc spotlight.

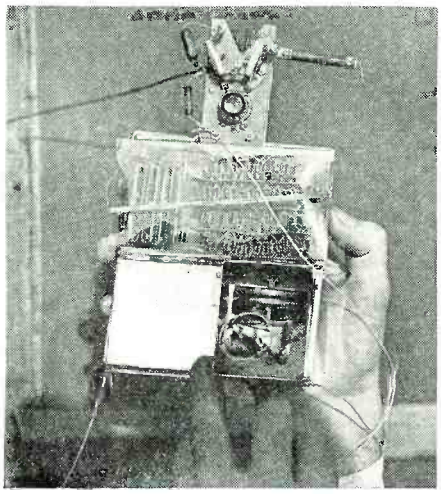
The editors have long felt that among the readers there must be a great number of good photographers. Using this type of a picture as a model, we would be most happy to have these photographers submit their pictures for a cover picture.

The picture should tell a complete story in itself. Proper care should be taken that the print submitted is large enough and contains sufficient contrast for adequate reproduction.

What say, you readers? How about submitting some pictures for the cover? Those accepted will be paid for at our usual rates.

—30—

W2AL is no exception. He passes the time trying to contact them on 5 from his car.



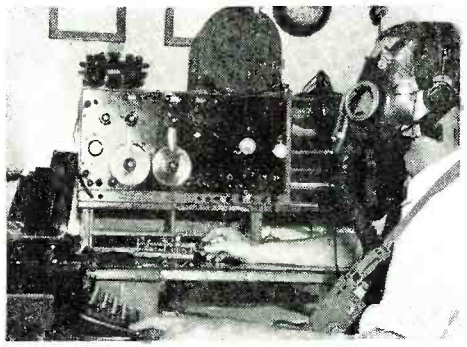
A 1 lb. transmitter costing $30 which is used by the Weather Bureau for soundings.

Using the old type flat-top antenna, this mobile broadcast unit gives f.b. results.

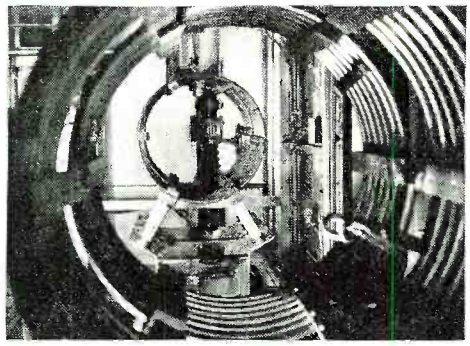
DX-Listener W. L. Chappen whose layout shows that he's an O.T.

# RADIOPIX

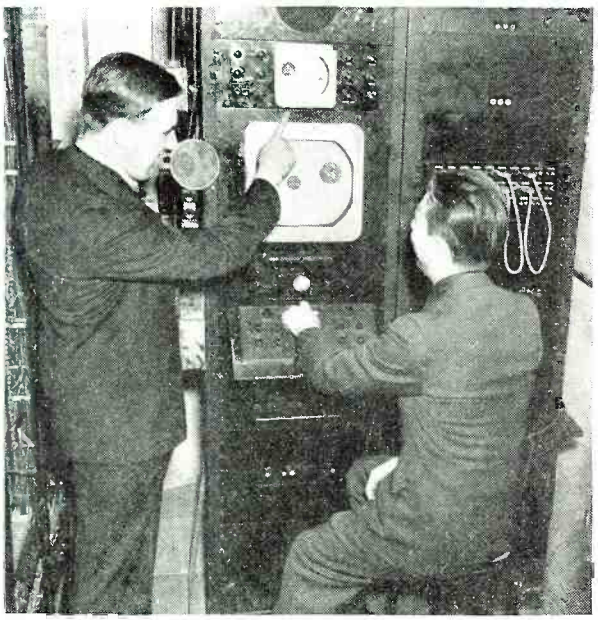
A page devoted entirely to timely pictures of radio in all its phases.



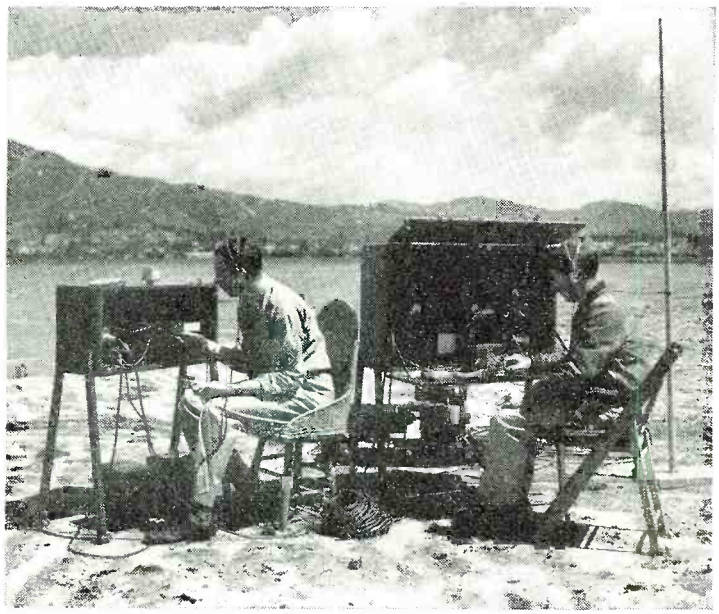
This is not a war scare picture. It's part of a fire drill aboard the SS *Santa Paula.*



Believe it or not, this is a small part of the final tuning inductance of 50kw, K N X.

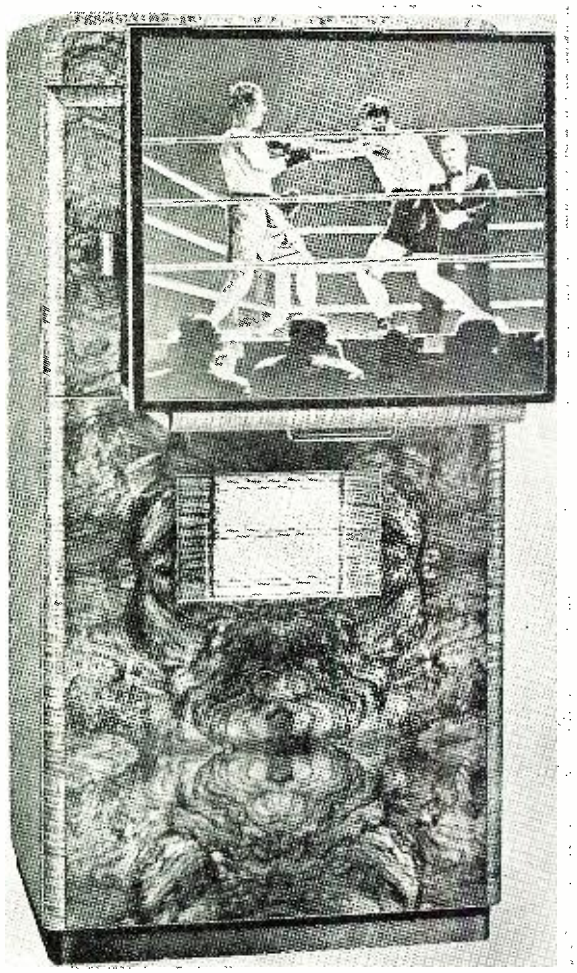


F. J. Bingley, (left) & B. E. Schnitzer, Philco television engineers, monitor a live program from Philadelphia station.



The Air Corps goes portable with u.h.f. Note the m-g, and the pedestalled antenna with single wire feed that can easily be set up.

# G. E. ENGINEER



A British version giving a 2-ft. picture without the use of expensive C-R tubes.

**By I. J. KAAR**
Design Engineer, Radio Div.
General Electric Company

**Mr. Kaar discusses a few of the outstanding problems which face the television stations both from the financial and technical ends.**

THE quality of television pictures achieved in the past few years has certainly been good enough to interest an increasingly large proportion of the population, but there are still two major questions to be answered, I. J. Kaar, design engineer of the General Electric Company's radio division, pointed out in a paper delivered November 1 in Detroit, before the fall convention of the Society of Motion Picture Engineers. The first of these —fixing satisfactory television standards—has practically been settled now, he added. The second is a method of paying for the programs.

"Television differs from sound broadcasting very markedly in the importance of standards," said Mr. Kaar. "In the latter the technical quality of transmitted programs can be improved year by year, and while this happens a receiver once purchased is always usable, even though it may become outmoded. The situation in television is quite different. Because of the use of scanning and the necessity of synchronization between receiver and transmitter, if transmission standards are changed, receivers designed for the old standards become useless. Because of this fact no responsible manufacturer would sell receivers to the public until standards were fixed by the industry and sponsored by the Federal Communications Commission.

"It required considerable technical perfection to justify our high standards, but this has now been attained and the essential standards agreed upon. It may be said with some assurance that the last technical obstacle in the path of commercial television, at least so far as the excellence of the picture under proper conditions is concerned, has been removed."

The question of who shall pay for television programs has not been answered, Mr. Kaar said, pointing out that the present broadcasting system, with its commercial sponsors who pay the bill, requires the existence of tens of millions of receivers, with listeners who may be induced to buy the advertised products.

"Such an audience does not exist in television," he said, "and cannot be expected for several years. Of course, no such audience existed in the early days of sound broadcasting, either, and the receiver manufacturers, along with a few others, operated the stations. In those days, however, the thought of something coming through the air, receivable at no cost, was an entirely new one. People were quite satisfied with the new toy as such and program excellence was a secondary consideration. This meant that the cost of broadcasting, as compared to the present, was low. Now the public has been educated to expect a high degree of excellence in program material. In other words, when television is born, it must be born full-fledged as far as program material is concerned. This means great expense, which undoubtedly will have to be borne by the pioneers."

In television, it was pointed out in a discussion of the standards which have been adopted in this country, the picture is scanned at both camera tube and picture tube by an electronic spot in a series of adjacent horizontal lines. The number of lines into which the picture is divided in the scanning process determines the fineness of vertical detail which is reproducible. After scanning the whole picture, the electronic spot then repeats the process at a sufficiently rapid rate so that no apparent flicker exists. The frequency of repetition of scanning the whole picture is known as frame frequency. In order to conserve ether space, it is desirable to keep the frame frequency as low as possible, and an artifice, "interlacing," is employed to increase the apparent frequency of repetition. It consists of scanning every other line, then scanning those in between which were missed the first time. This gives the physiological effect of scanning the picture twice, as far as flicker is concerned, even though all details of the picture have been scanned only once. The apparent flicker frequency under these conditions, which is twice the frame frequency, is known as field frequency. In America the number of lines per frame has been standardized at 441, the number of frames per second at 30, and the number of fields per second, interlaced, at 60.

Among other matters requiring standardization are the synchronizing operations at both transmitter and re-

# iscusses Television

ceiver. To keep the error small, synchronizing signals are always transmitted with the picture signals, Mr. Kaar said.

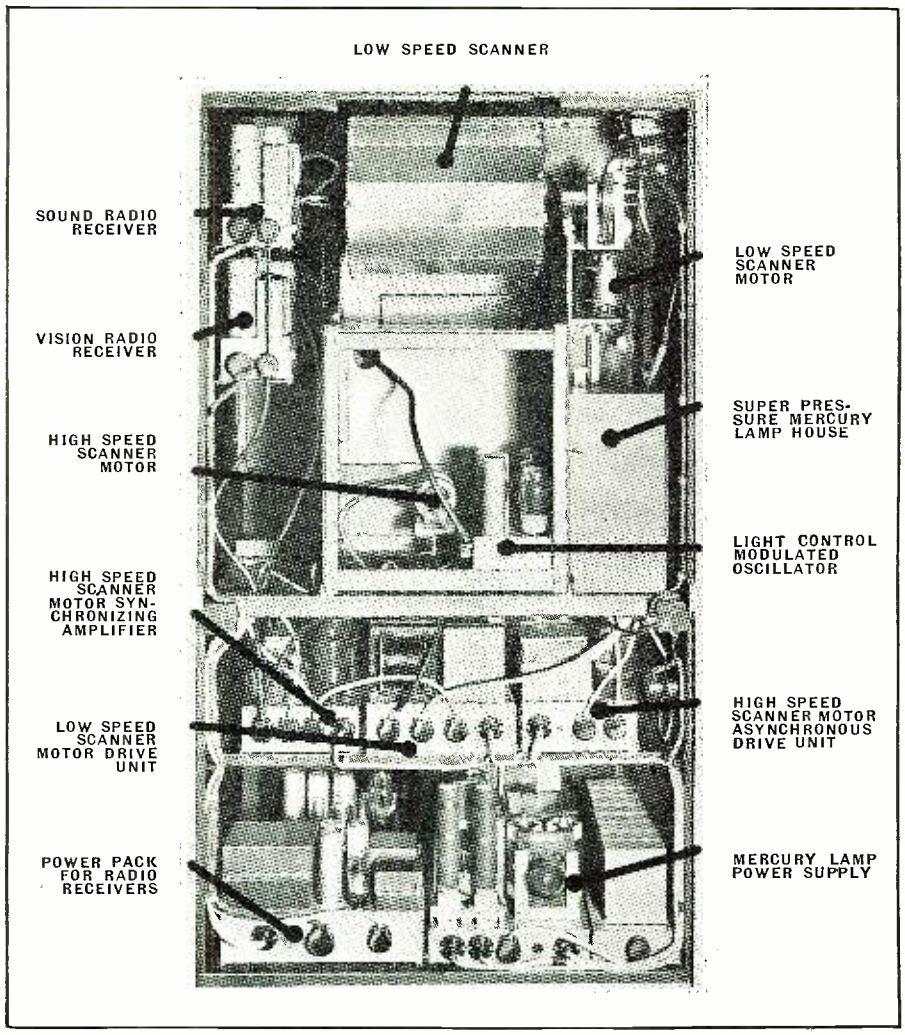
Answering the questions as to how good television will be and how much it will cost means discussing how large and bright the picture will be and how much it will show, said Mr. Kaar.

"The standard high quality television system which will possibly be commercialized shortly will have a 12-inch tube with a picture 7½ by 10 inches. Three, five, seven, and nine-inch tubes will probably also be standard commercial sizes. Compared with the size of a motion picture or even a home movie, these dimensions seem small. However, considering the fact that an audience viewing a television picture will ordinarily not be more than four feet from the screen—and in the case of the small tubes, even one foot from the screen—these sizes do have considerable entertainment value. Nevertheless it is reasonable to expect larger pictures in the best systems of the future.

"The matter of increasing the size of a cathode ray picture presents serious obstacles," Mr. Kaar declared. "As tubes become larger they also become longer, and their overall size becomes such that it is difficult to find suitable cabinets for them which at the same time lend themselves to attractive styling. When the 12-inch tube is used it is invariably mounted vertically in a cabinet, and the picture is seen as a mirror image by the observer. Since a mirror causes loss of light, and possible double images and distortion, it is an undesirable adjunct at best. As a further difficulty, as cathode ray tubes are increased in size, they require more driving power, which is expensive, and higher anode voltages, which cost more and offer shock hazards."

Mr. Kaar suggested as an alternate method of increasing the picture size the projection picture tube. In this case a very brilliant picture on the screen of a four-inch cathode ray tube is enlarged by an external optical system and projected on a screen three or four feet wide. This system requires an exceedingly bright tube with a very fine spot. The ultimate size of projection tube pictures is limited on one hand by the brightness obtainable from a fluorescent screen without causing its rapid deterioration, and on the other hand by the detail which can be obtained. Projection tube apparatus is probably too large and costly for home use, he said, but undoubtedly has a future for public performances.

(*Continued on page* 60)




The entire "works" of the British "Scophony," all-type-transmission, television receiver.

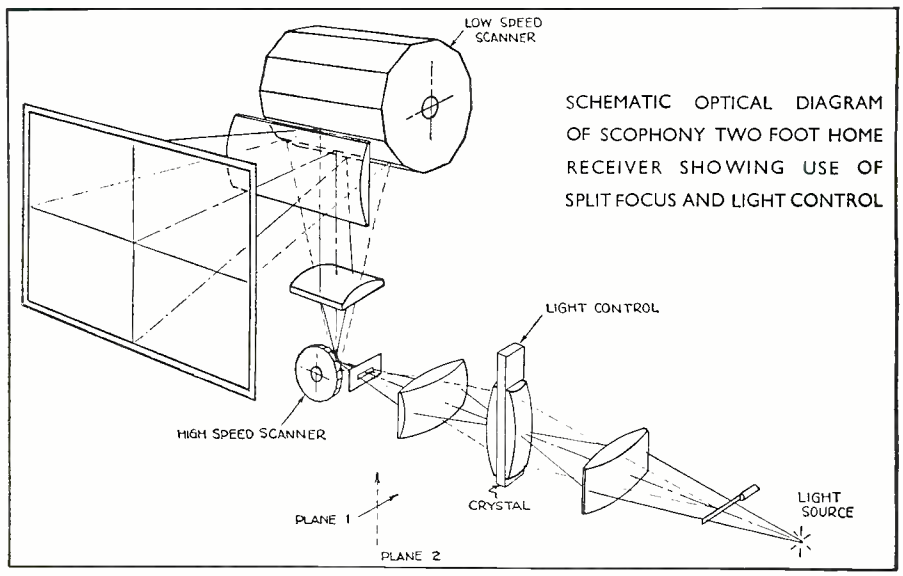



Diagram showing the mirror principle of the "Scophony" receiver.

# Serviceman's Experiences

by LEE SHELDON

Chicago, Illinois

"JUST got a call from Gilbert's *Duck Pins, Dancing, & Golf in a Small Way, Inc.,*" Al told me when I came in one morning last week. We had sold them a public address system the year before.

"I remember the place," I said. "What happened—did a cat get thrown into the equipment during a swing contest?"

"As nearly as I could figure out from the explosions that came in over the 'phone," Al replied, "one of the employees plugged a portable mike into an AC outlet instead of using one of the input receptacles on the dance floor wall. He dropped it when it began to smoke, and, since it happened during an important affair, he attempted a quick repair by patching a pair of wires between a mike receptacle and an AC outlet. The lights were out only fifteen minutes, but most of the dancers had left with their refunded money after that. When the lights came up they disclosed no one —except the manager, having a fit on the ballroom floor."

"Wow!" I was forced to concede, although it was my installation. "What'll I tell them when I get out there?"

"You're not going—*I* am," Al declared, looking down his nose. "Old Man Gilbert himself put in the call of the wild this morning to *Salutary Sales & Service,* and it was only by an adroit insertion of sympathetic grunts that I was able to talk business with him."

"But *I'm* the outside man in this business," I affirmed, "and I resent being cloistered when a juicy p.a. repair comes in. Do you expect me to stick to local midgets and warm gin highballs *all* my life?"

"Don't kid me, young fella," Al replied. "Gilbert remembers you used parallel, instead of polarized, mike plugs because you were in so much of a hurry to collect while you installed the job. You couldn't work for Gilbert, in his present state, unless you were behind locked doors; and you couldn't collect again unless you were behind a gun. Before he gave *me* the job today, I had to convince him you'd been sold for glue! No, *I'm* going—you look like you need sleep, anyway!"

The store was unusually quiet after he left; he is such a noisy person it is usually filled with loud sounds when we are there together. Now, I reflected philosophically, was to make a few changes I'd been thinking of for some time. The lack of improvement under Al's management had irked me —but you know how impossible it is to make any improvements when he is at hand. My ideas are too abstruse and modern to win his appreciation.

The tube checker, for instance. Why should we have to wait for each individual tube to reach operating temperature at its *rated* filament voltage, when other high taps were available in the same instrument? It took but a moment to put the checker on the work-bench, remove the cover, and expose the surprisingly complicated wiring to the 14-point, 5-gang selector switch. I laid out my work while the soldering iron heated up.

Only sissies use diagrams. I memorized the changes: white wire with yellow tracer to blue with black; green and yellow to tap with brown and green; slate and red to *here.* I repeated the routine rhythmically while I waited, tapping with my toe; and was just about to set it to music when the iron was ready. Within three minutes, the wires were in their new positions, and I inserted a 38 for trial.

It heated up quickly, all right. In fact, the needle on the conduction scale began to rise within two seconds, and if its rate of travel had not increased logarithmically, I'd have been able to pull the plug out before it started on its second revolution. A spatter of molten copper hit the glass face about the coil mounting, and, as I stood there wondering what to do, a wisp of blue smoke drifted from the top of the unit.

The 38, luckily, was not damaged, but I knew Al would be wild. There was no time to replace the meter before he returned, so I decided to make improvements on something else. Perhaps, if he was swept off his feet by my good work, he would overlook the mishap.

We had taken a Kolster 45 pack in trade, and although I had suggested we should adapt it for use as a test unit, Al dismissed the idea with some remark about open circuit voltage I didn't quite catch. I hoisted the heavy piece to the bench, designed a simple voltage divider network of 18 one- and three-watt resistors which would deliver test voltages of 3, 15, 17, and 435. While it warmed up, I sketched another resistor combination which would give us voltages between 17 and 435, in the event they were ever needed. Thus occupied, the power transformer was well burned before I smelled it. It wouldn't stop smoking when I pulled the juice off, so I removed the 81's and carried it out on the sidewalk. It was an old chassis, anyway.

I never could understand why Al arranged our tube stock by number instead of letter. The letter sequence is obviously better, and his excuse—that more clerks can count up to 26 than know the alphabet—was obviously a weak one. Our tube shelves are—or were—divided into three rows of rectilinear compartments, piled about seven feet from the floor.

I planned to remove the tubes from the top shelves first, and used one of the lower ones as a ladder rung. Things happened rapidly after that: the wall fastening was not too secure, and, as I descended, I noticed a lateral

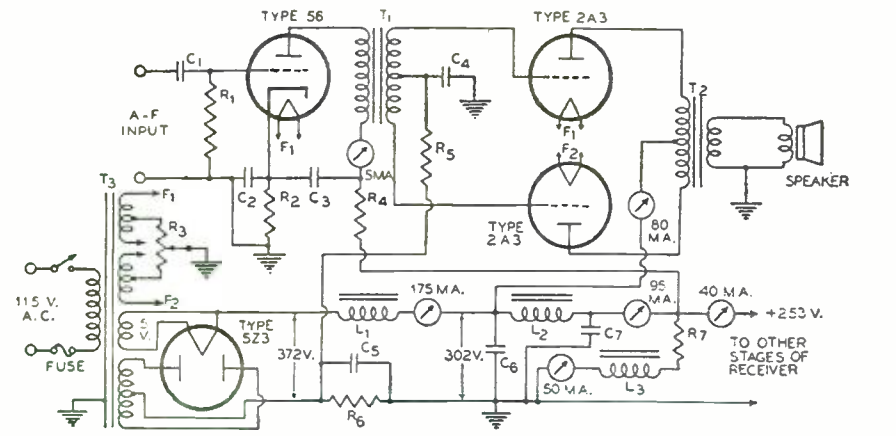
(*More Experiences on page* 53)


Celebrating 20 years in business in Salt Lake City.

# Filter Ripple Computation

By LOUIS J. GAMACHE
W9RGL
Development Engineer
Standard Transformer Corp.
Chicago, Illinois

**Building an amplifier, the serviceman must be able to compute ripple.**




$C_1$ = 0.1 µf
$C_2$ = 5 µf, 25 v.
$C_3$ = 2 µf, 350v.
$C_4$ = 0.5 µf
$C_5$ = 25 µf, 75 v.
$C_6$ = 10 µf, 400 v.
$C_7$ = 8 µf, 350 v.

$R_1$ = 0.5 - 1 MEGOHM
$R_2$ = 2200 OHMS, 1 WATT
$R_3$ = 100-OHM POTENTIOMETER
$R_4$ = 5000 OHMS, 1 WATT
$R_5$ = 50000 OHMS, 1 WATT
$R_6$ = 345 OHMS, 15 WATTS
$R_7$ = 2560 OHMS, 10 WATTS

$L_1$ = FILTER CHOKE; 12 HENRIES AT 175 MA., 60 OHMS
$L_2$ = FILTER CHOKE; 30 HENRIES AT 95 MA., 515 OHMS
$L_3$ = SPEAKER FIELD; 2500 OHMS, 125 V.
$T_1$ = PLATE-TO-PUSH-PULL-GRID INPUT TRANSFORMER
$T_2$ = OUTPUT TRANSFORMER
$T_3$ = POWER TRANSFORMER HAVING GOOD VOLTAGE-REGULATION CHARACTERISTICS

NOTE: A SPEAKER SPECIALLY DESIGNED FOR HIGH POWER IS RECOMMENDED.
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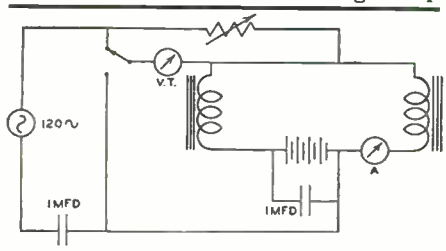
An output amplifier stage analyzed by the author.

THERE are several methods of approaching the problem of percentage of ripple permissible in each circuit of radio set or amplifier. In this first problem I will attempt to describe the steps and illustrate the design of a power supply for a four tube midget radio having the following line up: One type 35 tube as the r.f. amplifier, one type 24A tube as the detector, one type 47 tube as the audio amplifier, and one type 80 tube for rectifier. Because economy is necessary in design of this unit in a very competitive field, the start will be made with 220 volts on the plate of the 47 tube; it is found that this tube draws 28 milliamperes of plate current at this voltage and that the screen current is approximately 5 milliamperes.

The 24A as a detector has a plate current of .1 milliampere and a screen current of approximately 1 milliampere. The 35 tube as the r.f. amplifier has a plate current of approximately 6 milliamperes and a screen current of 2.5 milliamperes. It is then necessary to add to the above, that current required by the 50,000 ohm voltage divider or bleeder across the r.f. amplifier tube which draws 4.8 milliamperes. This current totals up to approximately 49 milliamperes. It was decided that the 47 tube should have a fixed bias, this to be obtained from a resistor in the negative leg of the power supply. This was found to be 350 ohms for 17 volts.

Because of the size of speaker used and the fact that the speaker is to become the only apparent filter inductance, a value of 2500 ohms was chosen. This value seemed to offer the proper amount of field excitation as well as accomplishing the effects of a filter choke.

In calculating the voltage required from this power supply it is found that the voltage drop across the field coil will be the voltage drop or $I \times R = .049A \times 2500 \text{ ohms} = 122.5$ volts. Adding these various voltages, the plate voltage to the 47 is 220 volts; to this must be added both the voltage drop




Measuring inductance of speaker field.

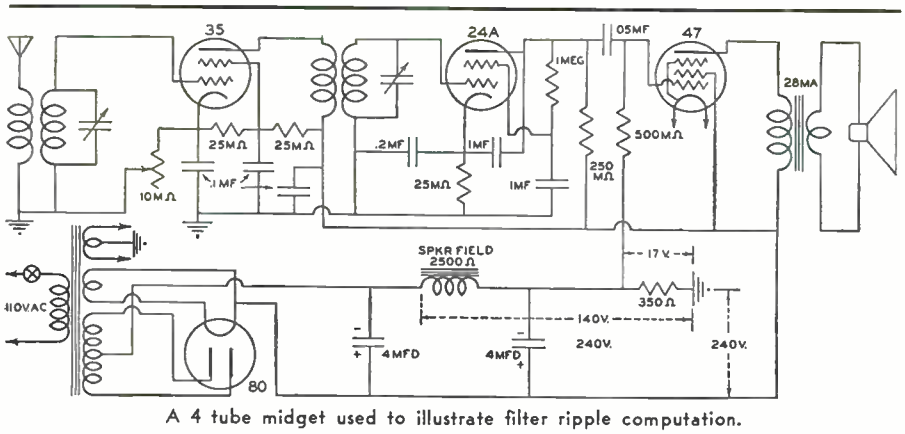
across the field and the voltage drop across the bias resistor, these values being 122.5 volts and 17 volts making a sum of 359.5 volts required at the rectifier tube socket. With a type 80 tube with four microfarads input condenser, and from data in the tube manual, 340 volts will be required for each plate.

Because of the small size and the cost factor in the design of the power transformer it is necessary to add approximately ten per cent to this value to allow for transformer regulation. The wattage requirements of this transformer are next to be determined. By adding the plate wattage of 17.8 watts and the filament wattage of the four tubes (23.1 watts), a total of 30.9 watts is needed for the complete set. Allowing for transformer efficiency, the transformer will draw approximately 40 watts from the line.

The next step is that of determining the amount of ripple permissible at various points in the circuit—economy in design being an essential factor. The percentage of hum is checked, not by scientific methods, but by the cut and try method of substitution and listening to the hum in the loud speaker. With four microfarads input and a 2500 ohm speaker field, four microfarads and the output ripple is brought down to a suitable value.

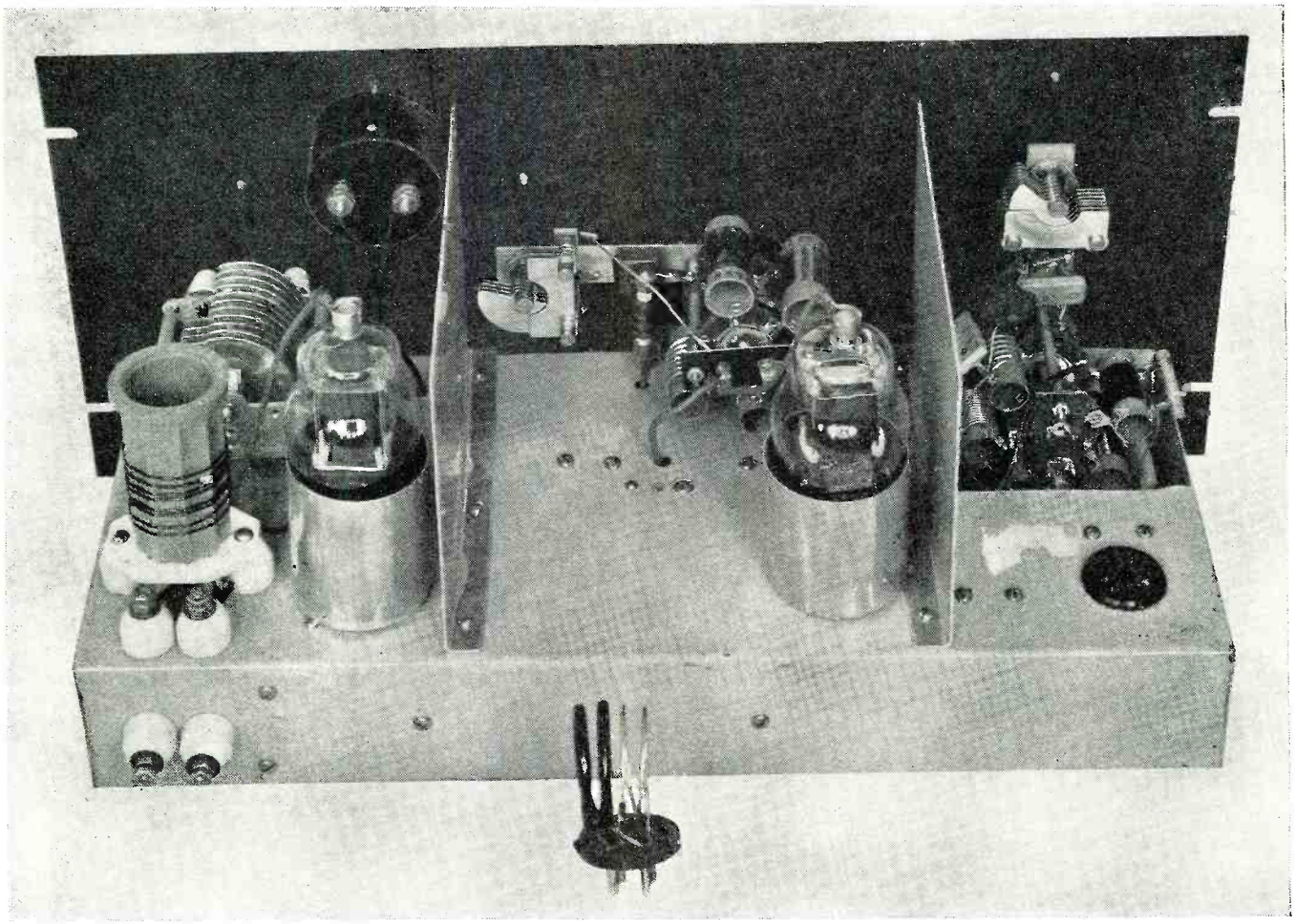
The calculation of the inductance of a speaker field requires considerable labor in which the variable factors entering into the calculation make this impractical. Some of the reasons are: the various kinds of steel employed for the pot and pole pieces, the incremental permeability of a reactor of this type which is affected by the gap, length of magnetic path which appear as a group of small hysterisis loops on the permeability curve, with their angles depending upon the portion of the permeability curve at which they coincide.

(*Compute ripple further on page* 55)




A 4 tube midget used to illustrate filter ripple computation.

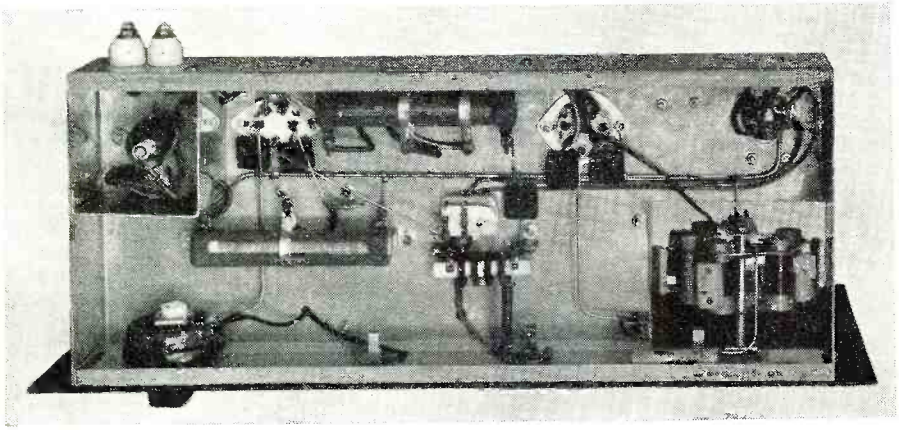
# Bandswitching Electron



Streamlined construction is featured in building up this E.C. exciter.

**Rapid bandswitching plus the ability to shift frequency within any one band is provided for in this new unit.**

By
**GENE TURNEY, W2APT, and GLENN BROWNING**



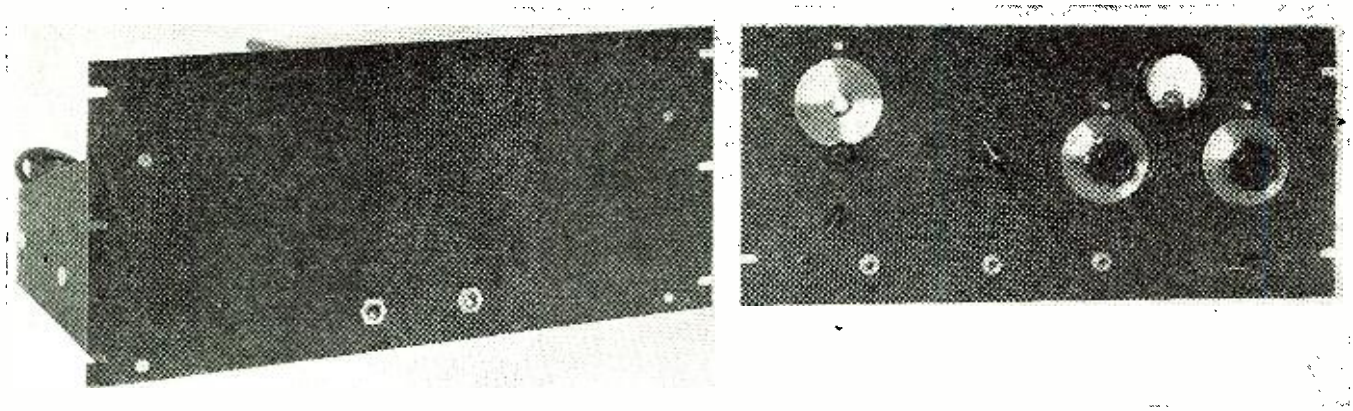
Note the extremely short leads and clean placement of parts.

THE key-note in the operation of all modern amateur equipment is flexibility. In the design of an all-band exciter there are several other requisites which must be adhered to if the unit is to have universal acceptance. Among these requirements may be listed:

1. Stability.
2. The ability to shift from one band to another and from one frequency to another within a band with maximum ease and minimum time.
3. A note which is free from chirp and crystal-like.
4. Simplicity and ease of construction.
5. Low cost.
6. Freedom from self-oscillation in output stage.
7. Output sufficient to drive a 200-watt final amplifier.

The incorporation of these several requirements have been found to be most easily obtainable through the use of band-switching tuners for the grid and plate circuits of the electron-

# [illegible] Exciter



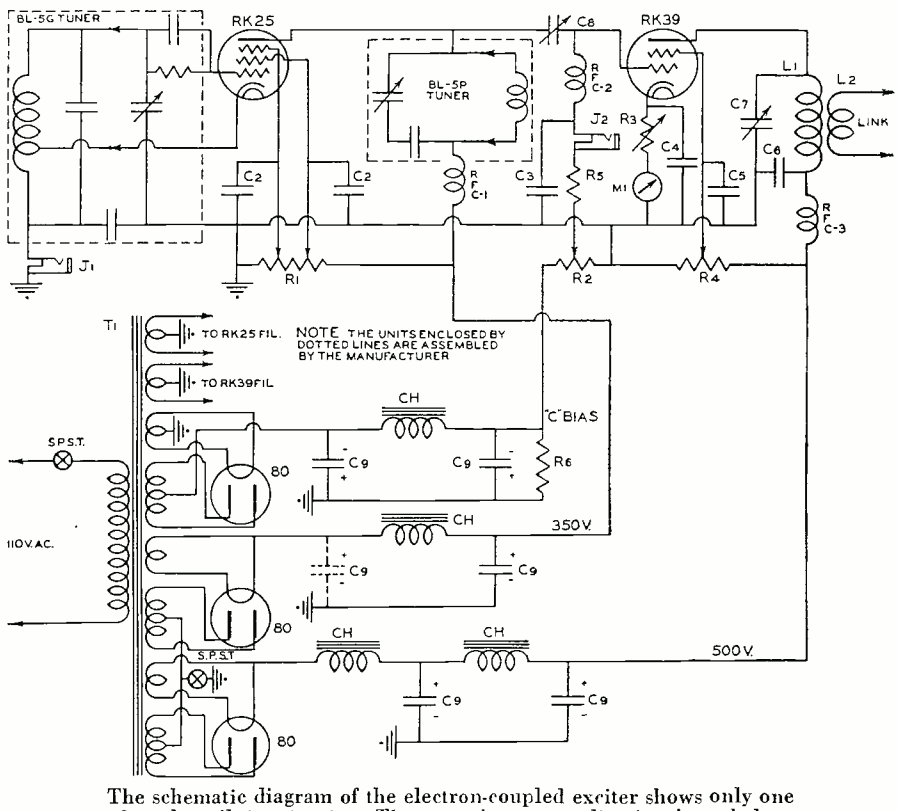
Built in two units, the power supply and r.f. sections may be mounted on a standard relay rack or steel cabinet.

coupled oscillator RK25 or 802 tube.

The first requirement—that of frequency stability—is obtained through the use of a grid circuit with a high ratio of capacitance to inductance, this high capacitance being obtained through the use of the new type *Silver Cap* condensers which exhibit practically no frequency change with wide variation in temperature and humidity. Also, for maximum stability the oscillator tube employed should be of the transmitting type so that it may be operated at very low plate dissipation in comparison to its rating. All the care in circuit design, layout, and wiring are of no avail if this tube heats up for in this case frequency drift will occur regardless of good design and good engineering.

As every amateur knows, the best operation of an electron-coupled oscillator is secured when the plate circuit is operated on a harmonic of the grid circuit. Since the exciter herein described is designed so that the output covers the 10, 20, 40, 80 and 160-meter bands and the 5-meter band by doubling in the grid circuit, coils for the tuner have the proper inductance, so that with the coil switch in the same position, the grid circuit tunes one band below the plate circuit, harmonic operation in the plate circuit is thus obtainced on all bands. The 5 high-Q coils comprising this grid circuit are mounted on a 5-position band switch. Coils are held in position by means of their soldering lug terminals and are arranged around the periphery of the switch; thus it is possible to mount the complete unit in a minimum amount of space. The band switch shorts out all other coils not actively in use, thus preventing operation at frequencies other than the one required.

The complete assembly embodying the 5 coils, band switch, fixed band setting condensers, the 100-mmf. tuner condenser, and the grid leak and condenser combination are mounted in one integral unit which can be fastened to




The schematic diagram of the electron-coupled exciter shows only one of each coil in circuit. The complete parts list is given below.

$C_1$-$C_2$-$C_3$-$C_4$-$C_5$—.002 mica (Solar)
$C_6$—.01 mfd. mica 1000 v. (Cornell-Dubilier)
$C_7$—100 mmfd. Cardwell
$C_8$—120 mmf. midget
$R_1$—25000 ohm 50 w. with 2 sliders (IRC)
$R_2$—5000 ohm 25 w. with one slider (IRC)
$R_3$—5000 ohm 25 w. variable (Ohmite)
$R_4$—25000 ohm 50 w. one slider (IRC)
$R_5$—5000 ohm 1 w. (IRC)
$RFC_1$—2.5 mh. choke
$RFC_2$—1.2 mh. Browning Laboratories No. 101
$RFC_3$—1.3 mh. Browning Laboratories No. 102
$J_1$-$J_2$—Single contact shorting jacks
$M_1$—0-100 mill meter (Triplett)

Coil data for L1 and L2

| Band | Wire Size | Turns | Turns per inch |
|---|---|---|---|
| 1.75 mc. | 28 | 68 | 44 |
| 3.5 mc. | 18 | 38 | 24 |
| 7.0 mc. | 18 | 18 | 12 |
| 14.0 mc. | 18 | 9 | 7 |
| 28.0 mc. | 14 | 4 | 4 |
| 56.0 mc. | 14 | 2 | * |

*—*1/2-inch between turns: turn diameter 1 1/4 inch. The 56-mc. coil is self supporting, mounted in a sawed off tube base. All other coils wound on Hammarlund SWF4 coil forms. Links are suggested number of turns. Load, type of feed and other conditions will vary same. Links are self supporting wound on either bare enamel or insulated solid and placed INSIDE of the coil forms at the cold end of the winding.

Panel 8 3/4" by 19" (Parmetal)
Chassis 7" x 17" x 3" (Parmetal)
$T_1$—500-425—0—425—500: 5 v. 6 amp. :5 v. 3 amp.:—:6.3 bolt 5 amp. CT. :6.3 v. 3 amp. CT. (UTC PA 431)
TCH—200 m.a. 12 henries 110 ohms resistance (UTC PA 40)
$C_9$—10 mfd. 600 v. can (Solar)
$R_6$—5000 ohms 25 w. (Ohmite)
Chassis—13" x 17" x 3" (Parmetal)
Panel—8 3/4" x 19" (Parmetal)
$SW_1$, $SW_2$—switches

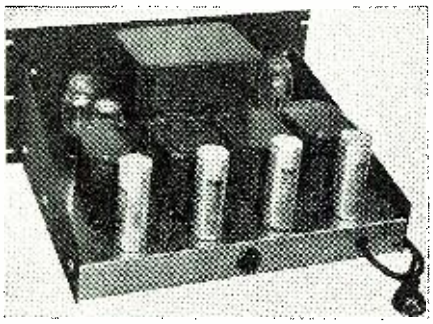
the front panel by means of studs on the band switch and tuning condensers, thus providing a maximum of flexibility, since the coil switching unit may be installed or removed at a moment's notice.

The plate circuit of the electron-coupled oscillator should, of course, be a tuner having a high L-C ratio in order that maximum output may be obtained. This is best accomplished by employing coils with no fixed band setting condensers. Like the grid circuit these coils are mounted on the periphery of a band switch which shorts out the coils not being employed. The mounting of the unit is similar in every way to that of the grid circuit.

In the diagram, the circuit employs an RK-25 as an oscillator, and an RK-39 as an amplifier or frequency doubler. The RK-25 has its own power supply which should be well filtered with good regulation and a good heavy bleeder, as an added stability precaution in the E.C. oscillator.

The ability to change frequency, is valueless unless absolute freedom from frequency drift can be assured.

A word about general construction. If the unit is to function with maximum efficiency, careful attention should be given to the layout of the



The Power Supply Chassis.

various circuit components. It has been found most convenient to mount the 5-G grid and 5-P plate circuit tuners on the front panel. A partition shield should be provided between the grid and plate circuit tuners as shown in the illustrations. Sometimes a base shield for the RK-25 may also be employed to advantage. A second sectionalizing shield is placed between the plate circuit tuner and tuned output system of the plate of the RK-39. A base shield for the RK-39 may also be employed to advantage in some cases. In the output stage, particular attention should be given to the choice of RF chokes ($RFC_2$ and $RFC_3$). Self-oscillation in the output stage is often caused through resonance of the chokes used in plate and grid circuits. This can best be avoided by choosing chokes for the plate and grid circuits which have different values of inductance and shielding one of the chokes as shown. The plate lead of the RK-25 protrudes from the top of the tube and can be connected to the appropriate point on the band switching plate tuner with a very short lead. In mounting the grid circuit tuner, it is advisable to cut away part of the chassis so that the coils in the grid circuit are below the top of the chassis. This allows reasonably short grid and cathode leads to be employed. These should be self-supporting and spaced some distance from the chassis and of bare wire, since insulation increases the capacitance to ground.

A grid-current jack and a plate-current meter for the output tube are suggested as providing a convenient means of adjusting the exciter. Two power supplies are employed, one for the oscillator tube which should deliver about 350 v., and a second for the output tube which should be about 500 v. The former power supplies as previously mentioned should be well filtered and possess good regulation if the oscillator is to be keyed without "chirp."

The rig may be keyed in either the cathode return of the RK-25 or RK-39. For best operation, the suppressor voltage on the oscillator tube should be adjusted by means of the tap on $R_1$ to about 40 v., and the screen voltage with the other tap to the lowest value which will give consistent operation on all bands (about 180 v. is usually satisfactory). It is good practice to run a separate bare bus-wire on the bottom of the chassis right out to the power cable connector as a "ground" thereby avoiding difference in potentials. The screen and suppressor by-pass condenser should be grounded to the same point as that used for the grid and plate circuit tuners. Condensers $C_3$, $C_4$ and $C_5$ should have a common "ground." Choke $RFC_1$ may be conveniently mounted above the base with one terminal connected to the switch point on the 5P Tuner while the other connection is made to an insulated terminal strip and thence to B + 350 v.

The mica condenser $C_6$ grounds the rotor of condenser $C_7$. $C_6$ should be placed between $C_7$ and the plug-in coil socket and the connection made to the rotor of condenser $C_7$ with a heavy short lead.

If desired, a filament transformer for the two tubes may be mounted on the under side of the exciter chassis. The center tap on the filament winding should be grounded to the chassis at the most convenient point.

The output coils used for the RK-39 are Hammarlund type $SWF_4$ as illustrated. The link circuits are wound on a cylindrical form which is slightly smaller than the inside diameter of the SWF coils. It is best to use a fairly heavy wire size so that the links are rigid. After the coil has been wound, the form is removed and the link inserted *inside* the $SWF_4$, so that it will be at the "cold" end of the RF winding. The number of turns as indicated in the coil chart will depend entirely on actual operating conditions.

### Tuning the Exciter

First, and of utmost importance, is the use of an absorption type of wavemeter for frequency checking. Do not, under any circumstances, trust your harmonic frequency meter or receiver when first setting up the exciter. Once you have determined the actual operating positions for a given band, then the receiver and HFM can be used to great advantage. But first, *use the wavemeter*. In the beginning it should be pointed out that the 5-G tunes to one band lower in frequency that the 5-P (with coil switches of the two in the same position) to allow harmonic operation in the plate of the RK-25.

Thus with both switches set for the lowest frequency band, the 5G tunes over a band of frequencies slightly greater than .8525 to 1.00 mc. and the 5P tunes over a band of frequencies slightly greater than 1.715 to 2.00 mc. or the 160 meter amateur band. As the amateur bands are not all the same proportional width, the 5G and 5P will cover a considerably greater frequency range than some of the amateur bands and care should be taken to be sure to operate in the band.

The 5P tuner is designed with coils of the largest possible inductance, so care should be taken to keep the wiring capacitance, which will appear across the tuned circuit, at a minimum.

After wiring and construction has been carefully checked, allow the filaments of the RK-25 and RK-39 to heat before applying high plate voltage. With a voltmeter set the sliders on $R_1$ to 40 volts and 180 volts (this latter value may have to be increased). Set the band switches on the two tuners to the same relative positions. Plug in the appropriate output coil. Connect a 25-watt lamp (or other appropriate load) across $L_2$. With the 5G tuning condenser set near its mid position; $R_3$ set at maximum resistance; and a 0-1 ma. meter plugged into $J_2$, tune the plate circuit of the RK-25 (P tuner) for maximum meter reading. If the meter reading is too low, reduce resistance in $R_3$ and readjust the tuning condenser of the 5P tuner. The plate circuit of the oscillator is then set for maximum excitation and when the plate of the RK-39 is tuned to resonance by $C_7$, the lamp load should glow which may be increased by retarding $R_3$.

A small amount of resistance should always be used at $R_3$, for if there is no bias on the RK-39, self-oscillation is apt to take place. Self-oscillation may be checked by opening J-1 or shorting the plates of the tuning condenser in the 5G tuner; if the lamp does not "go out" the output is the result of self-oscillation. This might be caused by too little bias on the RK-39, improper shielding, wrong connections, or coupling between leads in the grid and plate circuits.

The adjustment of $C_8$ is not at all critical. It should be set for maximum excitation at the highest frequency it is desired to operate. When operating, sufficient output may usually be obtained at various frequencies throughout the band without changing the tuning of either the 5P or $C_7$; the frequency being changed at will by adjusting the tuning condenser of the 5G

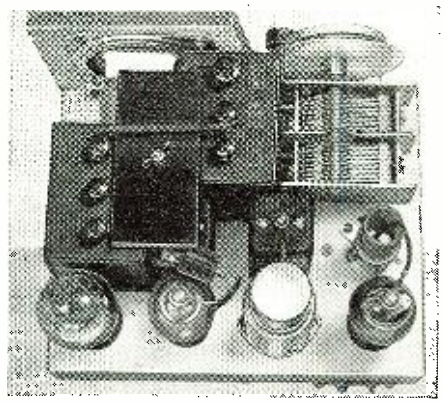
(*More building details on page* 54)

# Four-Tube Battery Superheterodyne

By J. T. WILCOX, W2CLS
Wholesale Radio Service Co. Inc.
New York City, N. Y.

**This set answers the demand of the servicemen for a battery operated 4 tube superheterodyne.**

Tuning is conventional, and the volume more than you can comfortably use.



Batteries are fastened to the top of the chassis. Construction is easy.

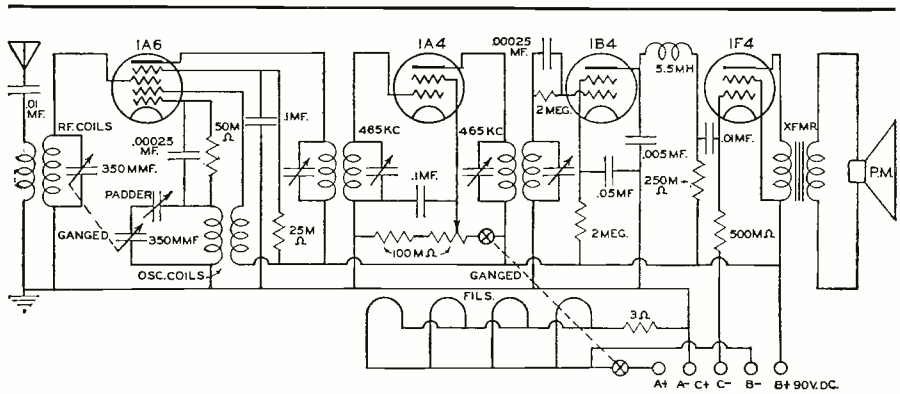
THERE are many occasions where a battery-operated receiver, and - - nothing but that type, will serve the purposes of the broadcast listener. A week-end or a week of winter sports out in the country, for instance, is made more enjoyable if radio is employed to while away the long evenings and the days when thaws interfere with the sports activities. The farm, camp, field and stream all know the advantages of battery radio. Even the city dweller finds it useful at times; a fact recognized by any one who has had the pleasure of attending a big football game accompanied by a portable battery radio which enabled him to listen in on the broadcast commentaries on the game while watching it.

Since the coming of line-operated radio sets, many enthusiasts think of dry-cell battery radio as a weak, ineffectual means of reception. Yet today this is far from the case. New 2-volt tubes have been making their bow one after another until extremely efficient types are now available for every purpose. While this article is being written the little portable superheterodyne receiver illustrated is strutting its stuff in a room at the other end of the house, filling the house with its volume although the station tuned in is over 150 miles distant; and this on a warm Indian-summer afternoon!

Just a few minutes ago the receiver was tuned slowly throughout the broadcast band and produced twenty-six stations, loud,—clear and without interference. There were a number of others, some of them 300 to 400 miles distant, whose only fault was that comfortable audibility was limited to within ten or fifteen feet of the loudspeaker. All of this with a receiver less than one-third cubic foot in size, including its built-in batteries and dynamic loudspeaker; and weighing only ten pounds complete! Add to this a total cost for all parts and accessories of about sixteen dollars, and operating economy resulting from a total "A" battery drain of three-tenths of an ampere and "B" battery drain of about 7 milliamperes, and the story is complete—or almost complete.

Developed in the laboratories of Wholesale Radio Service, the design features the very latest in 2-volt tubes in a 4-tube superheterodyne circuit. A 1A6 pentagrid converter serves as combination oscillator and first detector. This is coupled to a 1A4 i.f. amplifier tetrode with 456 kc. input and output transformers which provide a total of four tuned i.f. circuits with a

(*Build further on page* 50, *please*)




Circuit diagram of the 4 tube battery superhet.

# THE NATIONAL QSO PAGE


## THE TIDE TURNS

WELL, the tide is beginning to turn. It is beginning to turn into the channels which the National QSO Page has been advocating since its inception. More and more letters are pouring into our offices which conclusively show that at long last the amateur is awakening to his plight and the fact that he must take action if he is to survive after 1942.

There are still a very few writers who insist that there is nothing to worry about with the coming Rome 1942 Convention, but they do not advise any constructive measures nor do they explain why, in the past, the ARRL has not been able to win anything at any previous international meeting.

It has become obvious to those who are convinced that something must be done before our delegates are instructed, that were we to continue the same method of treatment, the situation will produce the same results, *ie,* the *further loss* of ham frequencies.

All over the country new organizations are springing up. Some have one idea, and others are seeking different relief. Among those from which we have heard are the *Associated Amateurs of the United States* in Philadelphia, the *Progressive Radio Amateurs of America,* and, *United Radio Amateurs of America* in California, and *The Vigilantes* in Chicago. Of all of these, *The Vigilantes* alone have a definite expressed platform that is neither pro nor anti ARRL, and which is far enough reaching to promise some success for all of the hams.

The others are nebulous and lack fixed ideals which can be adopted by the entire ham fraternity without sacrificing some other ideal to which many may still cling. For instance, the *Progressive* group on the West Coast envisages a second league, probably much along the same lines as the present ARRL, but with different officers and other methods of operation. The Philadelphia crew are trying to establish a club of international proportions which, for one thing, will agitate for increased frequencies.

On the other hand *The Vigilantes,* under the able leadership of Mr. John Harvey, W9ISR, have but two planks in their platform. (1) The retention of what the hams now have in the way of frequencies, and (2) the procurement of more frequencies. Nothing else is sought. There are not any dues, no officers, or delegates. Mr. Harvey has taken on the work himself without hope of compensation. The plan operates on the chain-letter idea, and thus the expense to W9ISR is cut to a minimum.

The *Vigilantes* are a voting organization of licensed hams, excepting the honorary members who have no vote. Federal Communications Commission propositions, such as the revisions of the amateur rules in the future, will be voted on by the membership directly, and the vote recorded at Washington. In adition to that there is a definite plan to see that the amateur's status comes to the attention of the Congressmen and Senators directly, so that they, too, will know what is going on and will be induced to help with the ham's problems. The plan is free of politics, and no one in the organization "has an axe to grind." Among the members reported as having joined are: ex-W9ZN (honorary), W9VFO, W2JUU, W2IKV, W9VDD, W9FB, W9COY, W9JPO, W9WDO, W9YAR, W9WKL, W9UVW, W9NSK, W9TLO, W9VFH, W9YUR, W8RYL, W9KQH, W9ZDC, W9OXT, W8GQQ, W1KKG, W8SHA, W1LIG, W9LQE, W6PFF, W2GUX, W2HUS, W2JBY, W2KDY, W2KTJ, and W5FSS. Further information on this most worthy of all independent movements can be had by writing to W9ISR, or contacting any of the above members.

We are pleased to reprint a letter from Lt. Com. R. H. G. Mathews, ex-W9ZN, ARRL Director for the Central Division. In it he explains why he was appointed to the post of Director from his division for the term 1938-1940, and that he endorses many of the *National QSO Page* views. That Mr. Mathews should give his approval to much of the campaign of RADIO NEWS is significant since he represents one of the largest divisions of the ARRL. The letter follows:

Dear Sirs:

As you know, I was not a candidate for re-election to the office of Director of the Central Division, having withdrawn my name from nomination prior to its being considered by the Executive Committee.

I am advised that owing to the ineligibility of the various nominees in this Division and according to the League Constitution, I will remain in office as Director for another term.

While this situation was in no way of my seeking, I feel that it is my duty, under the circumstances, to continue to represent the League members in the Central Division to the best of my ability and do my utmost to accomplish, through the actions of the Board, those things which the majority of the members in the League in the Central Division consider desirable.

I consider the Constitutional provisions on eligibility very wrong. Any regulations which bring about a situation where the members of a division, such as the Central Division, can be deprived of their right to vote, is ridiculous. It will be my first effort at the May Board Meeting to secure the changing of the Constitution so that this situation can never occur again, and so that hereafter the members of the League will not be deprived of their right to vote.

It has always been my feeling that my own personal opinions should not affect my actions at the Board Meetings, inasmuch as such personal opinions are of no greater importance than those of any other single individual member of the League.

It has constantly been my effort to secure expressions of opinion from as many members of the League in the Central Division as possible and to predicate my actions at the Board Meetings on these expressions and the wishes of the majority of these members. It is my intention to again follow this procedure and I will welcome any communications of any sort on League matters from any League member in the Central Division.

Any action which will tend to make individual League membership mean more to every qualified member as well as to the League and ham radio, to my mind, is beneficial, through strengthening the League's position as the representative of the amateur to government.

Action which will tend to make the voice of amateur radio heard more powerfully by *any* Division or Department of our Government is also, to my mind, of benefit to amateur radio.

I fully realize the menace which exists to amateur radio, partly through the negligence of the amateur himself and partly due to the pressure of international events, and can assure you that I intend to do my share toward preparing the League's defenses against any possible encroachments on the amateurs' rights and privileges, and to secure for amateur radio such additional privileges as may be right and just.

It is my hope that I will have the assistance and cooperation of all the members in the Central Division in these efforts. The Director alone can accomplish very little but with the unified backing of the tremendous body of amateurs in this Division there are few limits to what may be done.

Very truly yours,
(Sgd.) R. H. G. Mathews

Please note that the honorable Director agrees that the membership restrictions should be so written that ARRL membership will mean more to its members as well as to ham radio. He also agrees that such by-laws should be promulgated as will strengthen the League's stand with the government. This calls for a wholesale revision of the membership requirements so that dogs like Terry Law, [RADIO NEWS, November, 1938] and infants like Joel Davis [RADIO NEWS, October, 1938] will not *automatically* be made members of the ARRL without at least a signed application for membership being presented.

Further, Mr. Mathews agrees with us that there is need that the voice of the amateur shall be heard in the halls of Congress and the Senate. From this it is only fair to draw the inference that the past methods used by the ARRL in obtaining recognition do not quite meet with that Director's complete approval. Certainly the results of the League in keeping the frequencies has not been successful. Perhaps it *is* time for a New Deal, and new tactics.

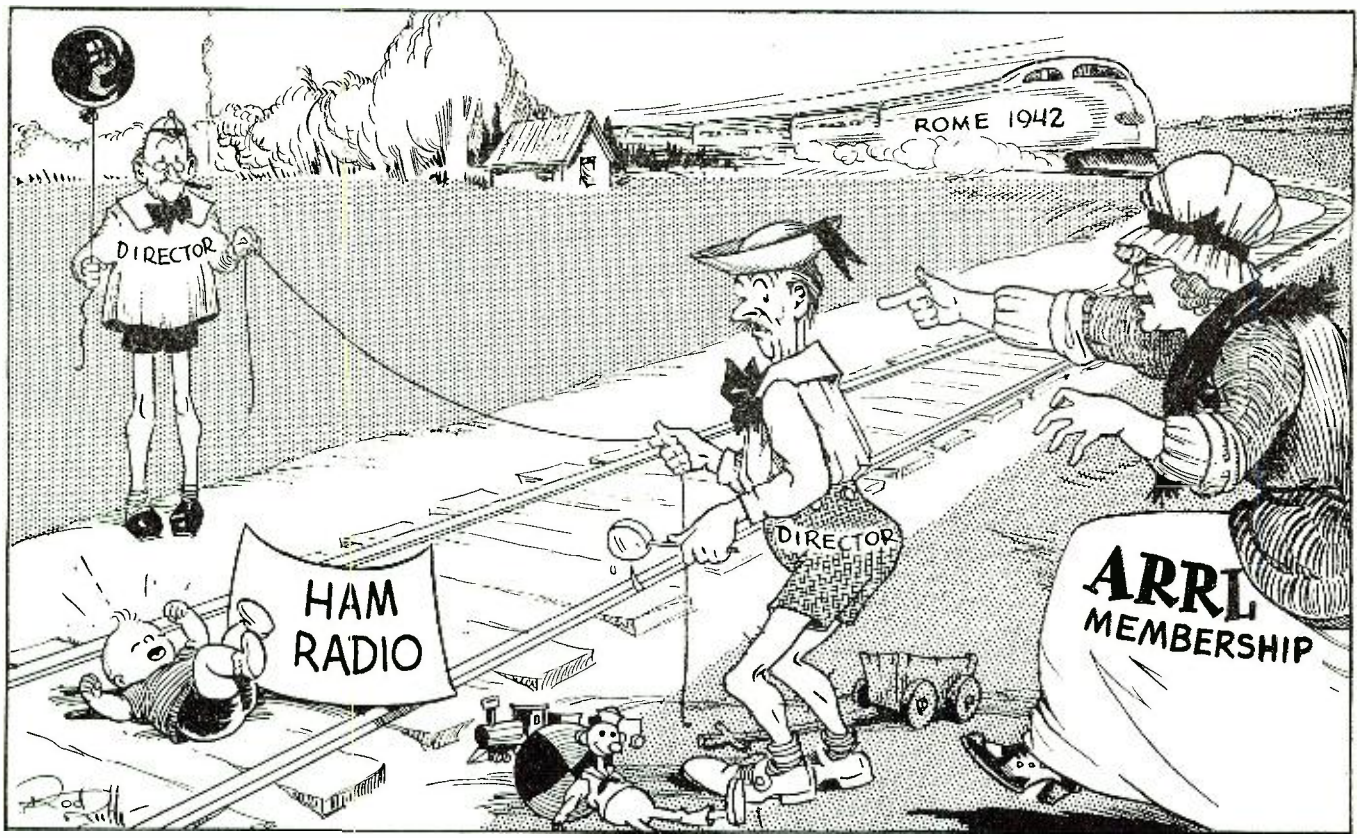
Finally, Mr. Mathews recognizes the danger that exists to amateur radio. And while he places the blame partly on the amateur himself, and partly on the pressure of international events, he promises to do something about it. Then we can safely say that the Central Division shall have some ACTION from its new Director!

Of course if we follow Mr. Mathews' reasoning, that the amateur is responsible, then we must also find as a fact that the Directors may be at fault. They have not been "in there, pitching" because the membership was so lackadaisical that it did not *demand* that the Director give them the ACTION the preservation of ham radio requires. From now on, with things rapidly changing, we hope that the membership will put pressure on their Directors to see to it that they *do* get action!

If you will back your Director and give him a "mandate" to get you action at League Headquarters, there is not any way that that venerable body can delay giving you what you want and need to retain your bands.

All of the revisions that have been advo-

# "Child's Play Won't Save That Baby"




cated here, and which are being OK'd by many, many hams, can be made into *reality* by the simple expedient of writing to your Director and demanding ACTION now and at that next Board Meeting. There is not any reason why the League should not have a lobbyist in Washington; why the League should not be compelled to go to the membership with a vote on each and every change being requested from the FCC, *before* the request instead of merely reporting the changes *after* they have taken place; and why restrictions should not be placed so that membership will be representative of all the amateurs instead of "dogs" and "infants."

The main thing to remember is that WE, THE MEMBERS are the *bosses,* and that the *officers are our employees!*—The Editors.

## CORRESPONDENCE

Dear Sirs:

In a recent issue of RADIO NEWS, you invite Directors of the ARRL to submit their views and policies for publication on the *National QSO Page* of your periodical. Though not as yet Director of this, the Hudson Division, my nominating petition has been accepted at Hartford and I will undoubtedly be a candidate in the coming election.

It is obviously impossible to contact personally, each of the 2300 League members in this Division, and financially impractical to do so by mail.

So, I write this letter, feeling, that representing as it does, the platform of a candidate for Director, it will be of interest to many local League members who otherwise would not be aware of the differences in the policies of the candidates for whom they are expected to vote.

I believe that the time has come when new and active blood be sent from the eastern Divisions to Hartford to combat, if nothing else, the wall of silence which surrounds the affairs of the League. If I may make a broad general statement describing my position, it is this: most of the points made by the opposition to the League are good ones; some of them well-nigh incontestable. These points should be investigated impartially and open-mindedly, rather than ignored, and from the results should come such changes in the League's policies as seem reasonable to broad-minded amateurs.

To go from the general to the definite, I do believe that the League has followed a policy of suppression and reticence in omitting from *QST* pertinent and accurate information and discussions on the following subjects:

(a) Fundamental radio law and philosophy.
(b) Legal activities of the League in behalf of the amateur.
(c) Information on the consensus of amateur opinion on various topics as indicated by letters received, and as a result of certain belated polls taken by the League.
(d) Personal observations and comments, and explanation of policies, by each of the several Directors, at least once a year following Board meetings.
(e) Actions of the FCC against amateurs in individual cases.
(f) State laws and municipal ordinances endangering amateur rights.
(g) Detailed information on the financial activies and status of the League, and the financial activities of the individual Directors.
(h) General information regarding the League's relations and policies with respect to advertisers.

It is quite impossible for the average amateur to decide in a reasonable manner just how much truth and justification there is in certain claims of the League's critics without knowing both sides of the story.

Several points in particular, raised notably by the late Clair Foster, and by Sumner B. Young, seem to me, as I remarked above, to be especially meritorious, having myself arrived at the same tentative conclusions through independent lines of reasoning.

However, regardless of the virtue of any particular point, the fact that the League resorts to the hush-hush method of defense causes me to be both suspicious and inquisitive. The officers of the League apparently do not realize that the line about not dignifying an opponent's charges by answering them, lost its charm and force sometime prior to the Great War.

If I go to Hartford, I intend to conduct a one man, if necessary, investigation of the affairs of the League, which will leave no doubt in my mind just how much truth there is in each and every one of the charges brought against the League. I will attempt to record the facts and my conclusions as impartially as possible, and see that the data is made available to anyone interested, and, in particular, brought to the attention of the members of my Division.

I can do no better than to quote Benjamin Franklin, who said, "If we do not all hang together, we shall all, most assuredly, hang separately." Sectional differences should not be allowed to develop to a point where it becomes a case of East vs. West in the amateur world, and the sad fate predicted by the good Mr. Franklin overtakes us.

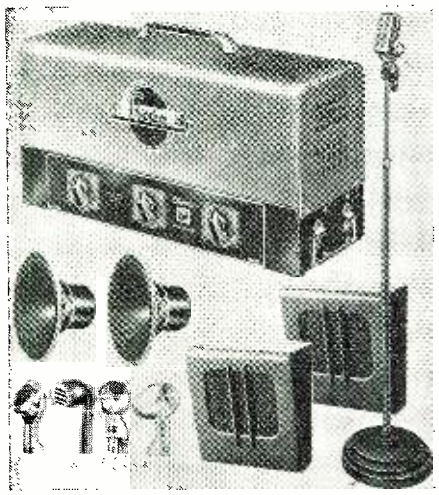
Briefly, and in addition to the above, my views on certain fundamental points are these:

(1) I believe that, the "ether" being the public domain, the right of the individual to operate a radio transmitter, under regulation, is as inherent as the right to engage in any other legitimate human activity.
(2) That the ARRL is the one amateur organization, and that it should be made to represent the interests of the radio amateur if, in the opinion of the majority it does not already do so; but that any attempt to form a rival organization would cause a split in power which would be, if not disastrous, at least detrimental to the best interests of all.
(3) That the position as a solvent venture, and the prestige of QST, aris-

(*More QSO on page* 48)

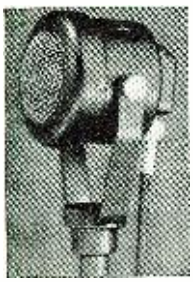
# What's NEW in Radio

Transformer Corporation of America announces a new addition to its already diversified line of sound systems in the form of a 24-36 Watt complete sound system. Unit



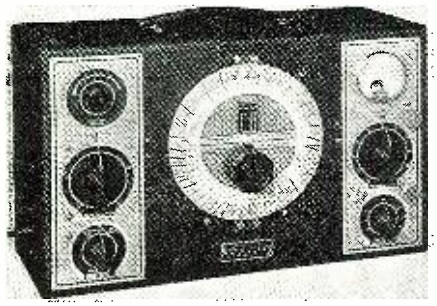
includes beam amplifier, two 12" dynamic speakers and suitable additional equipment. Choice of one of six modern microphones provided for.

The Turner Company, Cedar Rapids, Iowa, has brought out a new dynamic microphone, Model 99. This type microphone is not affected by climatic conditions. The response of the microphone is from 60 to 9000 c.p.s. An acoustic valve automatically takes care of changes in air pressure due to climate or altitude, and the microphone is not affected by dampness.



The RCA Manufacturing Co. of Harrison, New Jersey, now manufactures a new type transmitting tube, Type RCA 810. It is designed with very short internal leads and low internal lead inductance to permit compact circuit layouts for high frequency installation. The 810 can be operated at frequencies as high as 30 megacycles, with maximum ratings, and at frequencies as high as 100 megacycles with reduced ratings.

The Clough-Brengle Company of Chicago, Illinois, announce the Model 199 Mi-

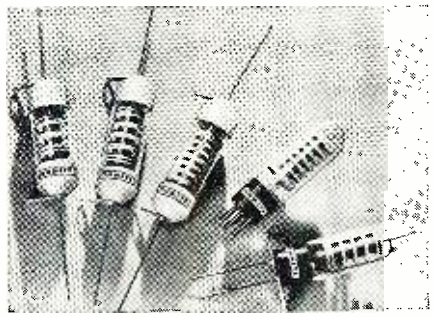


crovolter. This instrument has a 7" jumbo "verni-vider" dial which is calibrated at ½ to 100,000 microvolts at frequencies from 100 kc. to 30 mc.

The Meissner Manufacturing Co. of Mt. Carmel, Illinois, have brought out the Model 10-1121, 10-1122 and 10-1123 Receiver Kits. These are made up for operation with 1, 2 and 3 tubes and complete information is contained for the construction of these kits so that the beginner may construct one of these receivers with the least possible effort.

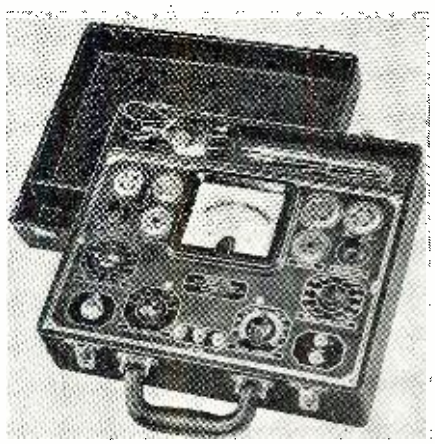
Raytheon announces a new relay type tube, which is known as the RK62. This tube was primarily designed for use in remote control application, such as would be used when operating a model airplane from a ground transmitter. It is designed for use as a super regenerative detector which will operate a high resistance relay in the anode circuit upon reception of a radio signal.

The Ohmite Mfg. Co. of Chicago manufacture several types of precision resistors which are hermetically sealed against moisture, etc. These resistors are available with



several different types of mountings. These precision units are non-inductively pie wound on porcelain in 2, 4, 6 or 8 sections and enclosed in strong hermetically sealed tubes.

The Radio City Products Company features the Model 800A Tester including a meter with linear scale superior to copper

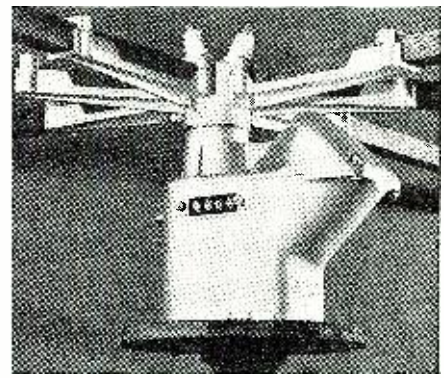


oxide rectifier type. A push button tube analyzer is also available for use in connection with the Model 800A. This Model tests all tubes, d.c. and a.c.

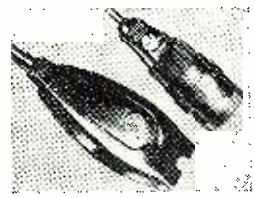
The Operadio Company of St. Charles, Illinois, have brought out the Model 190 inter-com paging system, which combines paging and intercommunication in one system over one set of wires and gives the user good efficiency and dependability. As many as ten outlying stations may be paged simultaneously with this unit.

RCA Manufacturing Company manufactures a new table model control cabinet for educational institutions. Messages may be sent to any room in a building or any group of rooms, and the unit also permits two-way communication between the principal's office and a classroom. It measures 42" long, 18¾" high and 13¾" deep.

The Amplex Engineering Company of New Castle, Indiana, have a new rotary head for use with beam type amateur transmitting antenna. The entire unit is housed



in a corrosion-proof aluminum alloy case which eliminates weather hazards and provides a small but strong power unit weighing only 17 pounds. The gears run in oil and main bearings are oilite metal and require no lubrication. The speed of rotation is ¾ r.p.m.



The Tobe Deutschman corporation of Canton, Mass., manufacture a new filterette, Type R1, for use with the now popular electric shaver. The unit is designed to remove electrical disturbances from the radio and attaches to the razor plug.

An inexpensive low-priced trouble shooter

is featured by the Radio City Products Company of New York, N. Y., and features extremely compact size and has an accuracy to within 2%. The weight of the unit is only 24 ounces.

The Terminal Radio Company of 68 West 45th St., New York City, has opened a new store at the above address with a complete line of amateur radio equipment, including accessories, and receivers for both Television and Broadcast reception.

Thordarson Electric Company of Chicago are bringing out a Band-Switch 100 watt transmitter kit offered to the amateur.

—30—

# BENCH NOTES

**by LEE WARD**
Service Manager, San Francisco, California

### Thar's Gold in Them Thar Grills

THE other day one of the repairmen came in with an inoperative toaster and a grouch. Such work, he said, was beneath his dignity; he felt he was loosing his professional status when he picked up anything less complicated than a 4-tube super.

I sympathized with him because I remembered my chagrin while some of my own customers had led me from attic to cellar, making an itinerant handy-man of me after a chassis delivery. I pointed out to him that he should feel complimented when the customer looked to him for technical advice and repairs, and that it was good store policy to take care of their requests. He in turn pointed out that the most we could charge for would be a heating element, and that we would probably lose money on the job; that the usual ratio, in a shop set up for receiver repairs, between work and amount collected was much greater than that for a broken-down bread-scorcher.

The mistake a serviceman makes when he accepts $15 for reconditioning a defective receiver, and who then refuses a minor repair for $2, is obvious. His refusal of *either* job offends the customer, who, ignorant of electron paths, looks to him to repair every portable wired device. Such a customer condition is a business desideratum in the *ne plus ultra* category.

Flat-iron, toaster, and hair-dryer repairs might not pave our way to retirement, but the refusal of such incidental "courtesy" work might well serve to pave our way to *involuntary* retirement. The success of any repair is determined, not by the ease of payment extraction, nor by the proficiency with the work is done, but by the residual satisfaction in the customer's mind after you leave his house. Proficiency and payment are nothing but contributing factors to this end.

### Liability in Profit's Clothing

The truly unprofitable calls are those which do not result in customer satisfaction. We should learn early in our business lives to identify and avoid, for specific example, the prospective customer who has brought us in to brag about the tone quality of a set he chose in 1921, but who refuses to trade-in, improve, or change his model from its original specifications.

The set doesn't play, and he wants to replace the defective part with the manufacturer's identical replacement, although the up-to-date equivalent circuit element would be much better. The manufacturer, you learn, was a quickie producer who silently folded his tents in 1922, and silently stole into another business—leaving the nation sprinkled with orphaned sets. Distributors have discontinued the original parts to protect their reputations. If the contract is made, and luck follows a two-day shopping tour, the required part is obtained by the purchase of an entire chassis. The customer then complains of the price because the part is second-hand!

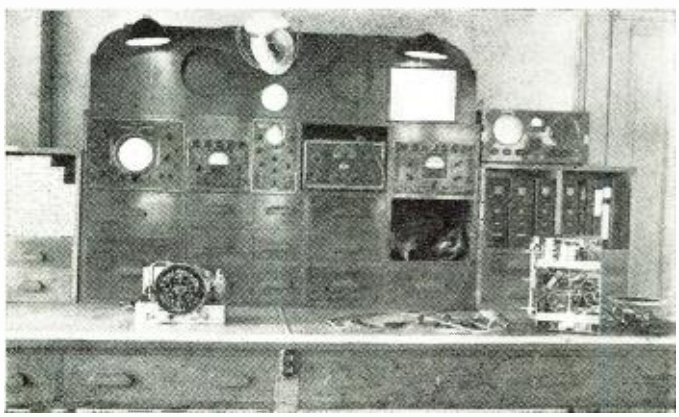
Many persons keep old receivers because they are sentimentally attached to them, and wish to preserve their original state out of respect to the donor—persons who are honestly grateful for the extra repair work involved in respecting their wishes, and who appreciate your effort by more than the money they gladly pay. These customers should be in the backbone of any business you intend to live long and grow straight. You should, however, learn to distinguish them from the customer who keeps his old set because a remodeled house makes it impossible to dump it in the alley without tearing out a window-frame. You know him—he is the same man who, after he trades the antique for a radio, complains to high heaven if you refuse to take the old hulk because the lumber in it isn't worth carting.

To avoid wasted time, learn, as early in the business deal as possible, whether your work will result in profit *and* satisfaction. Quote your exact price quickly, and watch your customer's face. If it grows long, back out as gracefully as possible; *nothing* you do for him will be appreciated, regardless of price or quality, and the job cannot possibly be to your advantage. Naturally, it is sometimes difficult to quote a fair price on a part when its source is obscure; but a little experienced judgment will save a lot of time in such cases. Why prolong a business transaction if there is no possibility of either party getting what they want from it?

### Mikes and Men

Some time ago, the owner of a small chain of restaurants called on me to lay out and supply microphone equipment for his latest, and most swanky,

(*Further dope on page* 66)



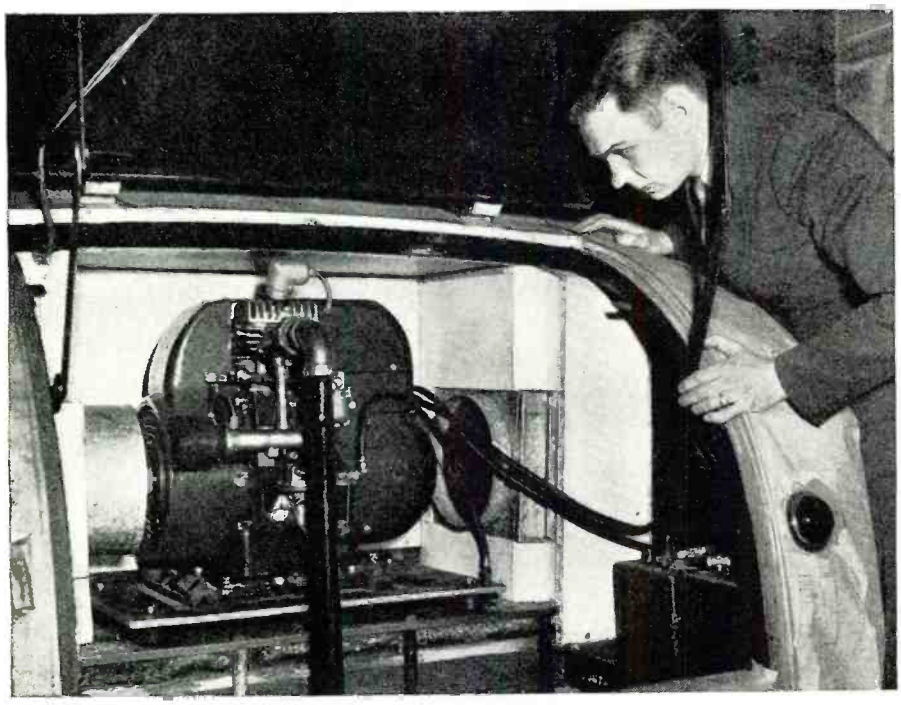
Tilley's Radio Service of Ancon, Canal Zone, features a fine service bench of solid mahogany with a linoleum top.

Demonstrating the mobile broadcaster to our Army. Similar units are used by the various branches of our militia.

# MOBILE BROADCAST UNIT

**By JACK RYAN**
NBC, Chicago, Illinois.

**A complete station on wheels, entirely self powered, is the dream of every ham. The broadcasters have realized it with the unit described here by the author.**



A kilowatt gas-driven motor-generator supplies all necessary power.

IN RADIO, when you go out to handle one of those field jobs, you can't monkey around with any panty-waist equipment. You've got to get out there on the line with the kind of stuff that will punch a signal through regardless of what the weatherman thinks up to plague you with. That need for stamina was the basis for most of the design behind the equipment with which the NBC Chicago staff takes its studio on wheels out into the backwoods to shoot "on the spot" broadcasts out to the radio audience.

The chief item of equipment on which M. W. "Joe" Rife depends to hold up his end of the special events jobs is a NBC Mobile Unit that's half greyhound and half elephant. Joe is NBC field supervisor for the Central Division under Howard C. Luttgens, NBC Central Division engineer, and when specs were drawn for the unit a good part of the emphasis was placed

on durability. Engineers who have had to handle field jobs appreciate the fact that equipment stamina is absolutely vital. The framework for this flying broadcast transmitter is a heavy duty passenger coach with a specially reinforced chassis and a fast, high powered engine.

Starting with the power supply, the reinforced trunk at the back is fitted with a 1,000 watt, 110v. 60 cycle single phase generator driven by a gasoline engine. Intake ventilating ducts were let into the body at each end of the power unit, and exhaust ports were let through the floor. The entire compartment was lined with rock wool and sheeted down with perforated metal plates to act as a guard against heat and excess noise. The compartment was also fitted with a starting battery for the gasoline motor.

Immediately behind the front seat, in the elongated coach compartment, the control console is installed. This nerve center of the Mobile Unit houses an ultra-high-frequency superhet, a high-gain audio amplifier and power supply, control panel, monitoring amplifier, automatic audio gain control unit, spare receiver power supply, low voltage packs for the receivers and drawers for miscellaneous equipment.

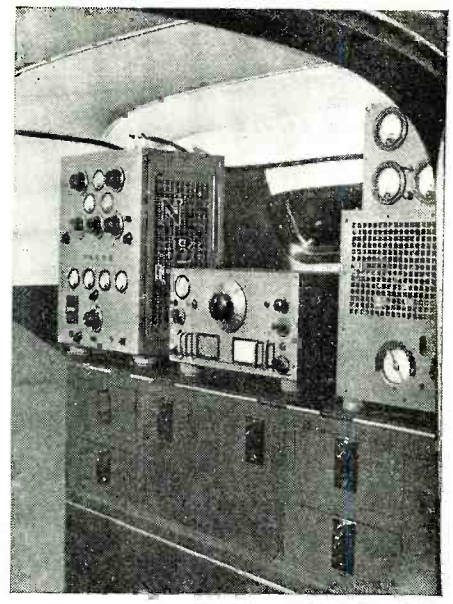
In order to lick the weight problem, the metal frames and facings for the layout were built of Dowmetal, which is about ⅓ the weight of aluminum, with rubber compression stops wherever necessary to stop possible rattles when the unit was in action.

The rear equipment console, built against the back of the car's interior, is the spot where most of the working apparatus is located. The setup includes a 50-watt intermediate frequency transmitter operating in the 1600-3000 kc. band, a 40-watt ultra high frequency crystal control relay broadcast transmitter operating in the 31-41 mc. band, an intermediate frequency receiver with a range of 550-30,000 kc., and a high voltage power pack for both transmitters.

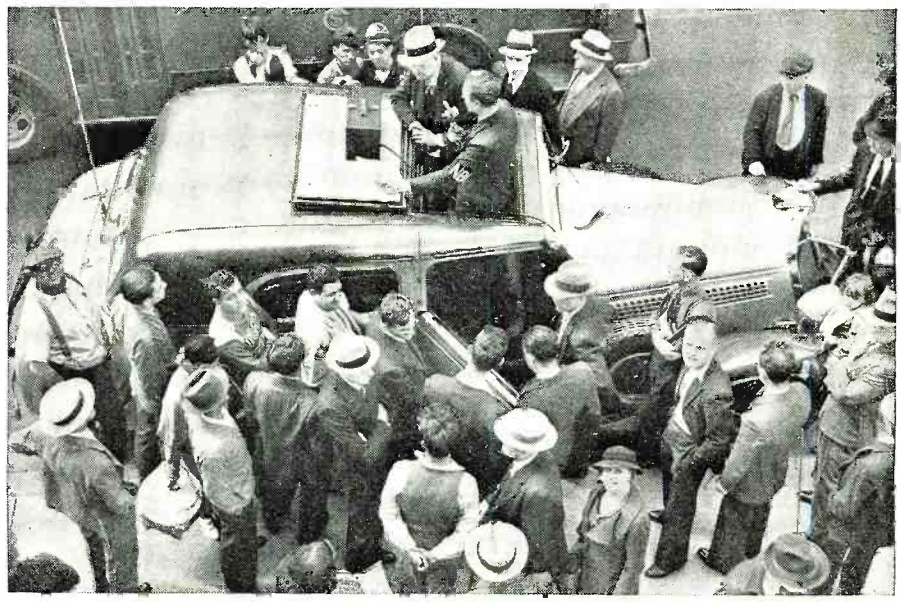
But, though the circuit features are of undoubted interest, the equipment drawers are a spot that would delight the housewifely instincts of any radio man. The equipment that the drawers contain includes the monitoring amplifier, local battery telephone, automatic audio gain control and low voltage a.c. power pack for the receivers. All of this equipment is mounted to sub bases securely bolted down to the drawer bottoms, with the connections routed in and out through twist-lock plugs. The arrangement of extra drawer space is an example of neatness par excellence. Eliminating the usual drawerful of junk, sub bases with anchored sockets hold the spare tunes and crystals, a rack carries coils for the intermediate frequency receiver, and all other accessories are buttoned down tight. The orderliness is a boon for a number of reasons, it saves time hunting for spares, it stops rattles and it makes the job of taking inventory dead easy. Carrying out this order of things, the console control panel has all of its equipment hinged so that adjustments or repairs can be made with a minimum of digging around.

Getting up into the driver's compartment, the dash carries equipment permitting headset monitoring for the announcer and driver, a meter for measuring field strength, a compass, and the controls for a regular RCA automobile radio. Two transmitter antennas and five receiving antennas are included, one of them a 30-foot sleeve tube top-loaded intermediate frequency transmitting antenna, another ultra high frequency quarter wave antenna located on the trunk lid, two conventional buggy whips on the sides, a running board job and two concealed receiving antennas inside the roof of the car.

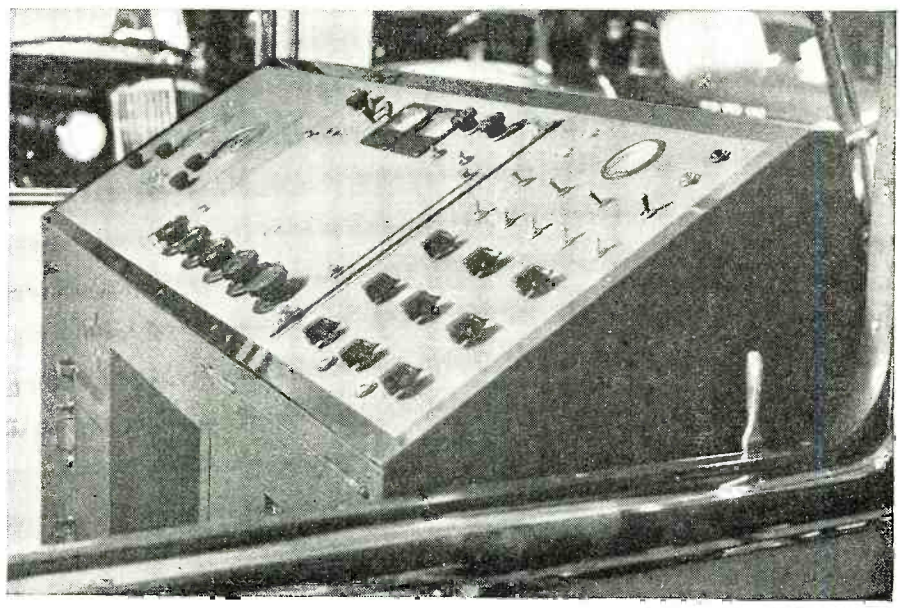
(*Ride along to page* 61)



Everything tied down and within reach to insure efficient operation.



By standing on the front seat the announcer has a clear view all-around.



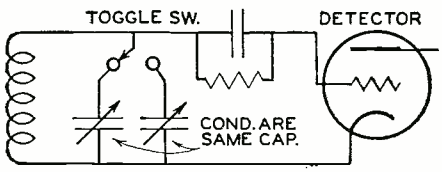
The control panel which is the nerve center of the whole mobile unit.

# "RADIO Gadgets"

### Dual Frequency Receiver Setting

Do you, as a newly licensed operator, like to practice copying code and hear both sides of a QSO? With a simple regenerative receiver the following stunt will work to nice advantage. Once both stations are found on the dial; to hear each side it is only necessary to throw a switch instead of shifting the dial each time.

To a suitable place on the receiver panel attach a second tuning condenser of the same capacity as the regular one and connect it in *parallel*. Open the lead from stator to the grid side of each condenser and insert a simple toggle switch of the SPDT

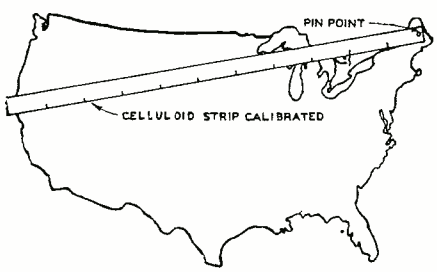



type, connecting the arm to the grid lead. Then connect the two stators of the condensers to the two remaining poles of the switch—No. 1 and No. 2 as shown.

Close one condenser and listen for one station calling for traffic. When he has finished, switch to the other condenser and fish for a station replying. Then, to pick up the first station, throw back to the first station. By this simple switch throwing you can keep track of both sides and make the copying much more interesting.

### Handy Scaling Device for D'xers

Here is an easy way for scaling the distance between two points on a map. It is especially useful where one map is being used constantly for DX airline computation.




Cut a strip of transparent celluloid as long as the greatest distance across the map. One inch will be about right for the width. Then strike off points along the edge of the strip to correspond exactly with the scale of miles on the map. Scratch these in the celluloid with a sharp point and fill the scratches with black paint, wiping off the surplus. Mark these with numbers to show the number of miles that the scale length represents. Punch a pin hole at the exact zero mark.

To use; simply pin the end with the hole to the spot on the map you wish to measure from, then swing the scale across the distant point on the map and read the distance between these two points by checking the scale on the face of the strip.

### A.C.-D.C. Ballast Tube Repairs

There are many a.c.-d.c. receivers on the market not listed in the service manuals and in a goodly number of instances the service man can not afford to make a circuit diagram of the receivers, for this runs into time and time runs to money which the customer is loathe to pay, owing to the small initial cost of the receiver when it was new.

In view of the above and as a time saver the following suggestions are offered for the quick repair of these sets when the line ballast goes haywire.

If the ballast tube blows, it is a good idea to check the rectifier for shorted elements and the various sections of the filter for shorts, opens and grounds before making any effort to repair or replace the ballast tube and after this has been attended to, go after the ballast repair.

In some cases, especially in the outlying districts, it is hard to get the proper ballast and necessitates considerable delay. Such being the case, and knowing that a customer brings repeat business to the shop where he gets the best service, it behooves the service man to get things fixed up as soon as possible.

Suppose we have a set of this description where there is no data on the circuit and where a ballast tube is a stranger to any of the jobbing houses in the locality.

If the tube is B.O. (burned out) there is no way of ascertaining the exact resistance value of the elements and only by making a diagram of this section of the receiver, can the probable elemental arrangement of the tube's interior be arrived at, so to save time, remove the metal cap or metal outer shell from the unit by using a pair of diagonals, or equivalent, to bend outward the metal clips or sections that secure the outer shell to the base.

After this operation it is only a moment's time until the base arrangement of the internal resistance units can be arrived at. In the first place it is a good idea to make a diagram of the resistor arrangement with relation to the base prongs, and if the elements show fracture, the resistance of each can be ascertained by measuring each of the sections ahead of, and behind the fracture, and the values written into your diagrams.

Splicing the fractured elements is not satisfactory unless one uses something in the way of a number forty copper wire to tightly wrap the splice, but the tube can be repaired permanently by using nearly the equivalent in size of the old wire. A good all around size that will answer ninety per cent repair requirements is a number thirty-four or thirty-eight nichrome which may be had at some of the supply houses.

If there is difficulty in locating the desired resistance wire, a wire wound volume control will furnish a very fair substitute.

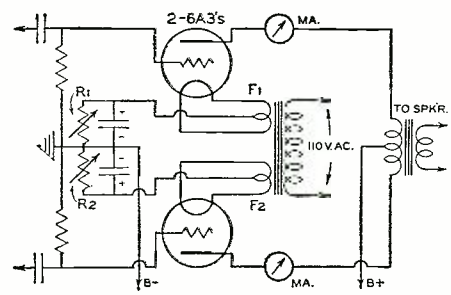
In most cases the resistor element of a ballast tube is wound on a section of flat mica which fits fairly snug inside the metal shell so the operation of taking the tube apart or taking off the outer metal shell should be done with appropriate caution.

In case the mica is cracked or broken sufficiently to endanger its rigidity, the proper resistance values may be wound on porcelain tubes such as are installed in many of the old time buildings with the knob and tube method of wiring, these being wired into their proper locations in the receiver, even if the set is of very small and compact design.

### Distortion in 6A3 Amplifier

When type 6A3 tubes are used in push-pull, it is sometimes difficult to find two tubes with characteristics close enough to establish the required nicety of balance. In one instance, where considerable distortion was encountered, the author found it necessary to use separate filament transformers and bias resistors.

In adjusting a push-pull 6A3 stage for eliminating distortion, connect a milliammeter in series with each B plus lead in turn and adjust the bias




resistors, $R_1$ and $R_2$, until the plate current of each tube is exactly the same under the same conditions. The adjustment should be made with a steady, fairly strong 400 cycle signal input to both grids.

### Step-Down Transformer from a Filter Choke

Here is an emergency stunt that will be found useful at times when an extra filament lighting transformer is wanted. With an extra filter choke of from 8 to 10 henrys, or higher, filament current can be furnished to at least one tube, and possibly more.

(*Gadget further on page* 54)

# "SIRELA"
# —A UNIVERSAL RADIO LANGUAGE

by E. STANTON BROWN
Associate Editor, RADIO NEWS

In this article, the third in a series presenting the Spatari Radio Language, verification correspondence is completed and another phase is introduced to you.

SINCE the introduction of the series of articles on SIRELA, the Spatari Universal Radio Language, RADIO NEWS has received an astonishing flood of letters from readers. Without a doubt this new language is the solution to the language difficulties encountered by DX'ers, broadcasting stations, and Hams in their contact with foreign stations.

Among those who have informed us that they have sent out verification requests and received confirmations in SIRELA are: Miss Violet Green, East Liverpool, Ohio; William Must, Sommerville, N. J.; Alfred and Henry Pagliuca, New York City; Joseph Mazzulo and Frank Li Perr, Astoria, N. Y.; Albert Vivona, L.I.C., N. Y.; and Lou Macy, Brooklyn, N. Y. The verifications received by these DX'ers vary in number from two to seven veri's. They all followed the standard form of making a verification request in SIRELA as set forth in detail in the November issue of RADIO NEWS.

To continue and complete the subject of verification correspondence, we are presenting first this month the Station Questionnaire. By means of this simple form broadcasting stations can receive complete information from their listeners as to reception, response to types of programs, and the wishes of their unseen audience. When you send in a verification request, you may also include in addition the form illustrated on this page and so render the station not only information that you heard the program, together with a description of it, but also complete information which is not provided for on the *verification request* card. Many Latin American stations are forwarding a *station questionnaire* card with their QSL cards to listeners requesting veri's. It is not necessary to wait for this, how-

22
MIBOLA —STATIONS QUESTIONNAIRE*

MIBOLADO—Will you please answer the following questionnaire?*
(This questionnaire is only for the use of this radio station, therefore your correspondence will be held in strict confidence. You may omit any answer.)
" " RE—Do atmospheric conditions annoy you? 1—Yes. 2—No. When are they most annoying? 3—(give U. R. T) Above what wave lengths in meters do they annoy you? 4—(K).
" " MI—What is your exact location? 1—Latitude North degree: (K) 2—Latitude South degree: (K) 3—Longitude East degree: (K) 4 Longitude West degree: (K).
" " FA—What receiving set do you use? Made by you? 1—Yes. 2—No. 3—Made by: (give name of maker). How many tubes? 4—(K).
" " SO—What do you think of our programs? Are they: 1—Good. 2—Bad. 3—Fair. 4—To which short wave station do you prefer listening above all others? (give Call Letters).
" " LA—At what time of the year is reception best? 1—Give months: (K) 2—At what hour? (K).
" " SI—What is your sex? 1—Male. 2—Female. 3—When were you born? Give day: (K). 4—Month: (K). 5—Year: (K). 6— Where were you born? (Give country from pages BO.)
" " BO—Are you situated in? 1—Wooded region. 2—Mountainous region. 3—Near seashore. 4—Humid region. 5—Dry region. 6—Sea level. 7—Above sea level. 8—Below sea level. 9—What is the altitude in ft.?

23
MIBOSI —STATIONS QUESTIONNAIRE*

MIBOSIDO—How many hours do you spend listening to us each day? 1—(K) To other stations? 2—(K). What hours are most convenient for you to listen to them? 3—(K).
" " RE—Did our program come in clearly? 1—Yes. 2—No. 3—Fair. 4—Very clear. 5—Just like a local station.
" " MI—Do you advise any change? 1—Yes. 2—No. If so what? 3—I suggest: 4—I suggest more: 5—I suggest less:**
" " FA—Is our program after our recent changes?: 1—Better. 2—Worse. 3—Fair.
" " SO—Do we interfere with any other radio station? 1—Yes. 2—No. 3—Your station interferes with station:
" " LA—What do you like best in our programs? 1—: What do you dislike? 2—:**
" " SI—What radio station sends the best verification cards? 1—: What station replies quicker to them? 2—(give station Call Letters).
" " BO—What other short wave stations do you hear regularly? 1—(give names of stations). Are they received better or not as well as our radio station? 2—Better. 3—Not as well.

24
MIBOBO —STATIONS QUESTIONNAIRE*

MIBOBODO—Do you belong to any radio organizations? 1—Yes. 2—No. 3—Member of: 4—President of: 5—Vice-President of: 6—Secretary of: 7—Editor of: 8—Assist. Editor of: 9—Tech. Editor of: 10—Advisor of: 11—Writer for the: 12—Committee member of: 13—Manager of: 14—Chief engineer of: 15—Engineer of: (write number of your titles then give names of organizations etc.).
" " RE—What program interests you most? 1—The program given at: (give hour, day, etc., using reference column: (K). 2—The program with:**
" " MI—What voices do you prefer? 1—Soprano. 2—Coloratura soprano. 3—Mezzo soprano. 4—Contralto. 5—Tenor. 6—Baritone. 7—Bass. 8—Chorus. 9—Juvenile singers.
" " FA—What kind of music do you prefer? 1—Opera. 2—Classics. 3—Semi-classic. 4—Popular. 5—Folksongs. 6—Modern. What Language? 7—Yours. 8—Spatari. 9—The language of: (see pages BO).
" " SO—We are glad to receive criticism. Have you any? 1—Yes. 2—No. 3—I criticise your:**
" " LA—Do we broadcast at a convenient hour? 1—Yes. 2—No. 3—I suggest that you broadcast from: (K)
" " SI—Thanking you in advance for your answer, very truly yours, 1—Station owner. 2—Manager. 3—Director. 4—Chief engineer. 5—Engineer. 6—Operator. 7—Announcer.
" " BO—We will send a souvenir to all listeners who answer our questionnaire. (If gift is given, the combination MIBOLADO will be followed by MISOLARE.) In verification cards the box ☐ will be marked by an X.

*The entire questionnaire of three groups may be expressed by using only the first combination heading the three groups —MIBOLADO. If any changes or omissions are made it will be necessary to follow the regular system.
**Answers to these questions may be coded from material on this page or from General Program Data, page MI (12-13). [The page numbers referred to are those in the Spatari Radio Language code book which contains the complete Spatari system.—Ed.]

Above is given the code word groups to be used with the questionnaire at the right.

MIBOLADO _____

" " RE 1.2.3- 4-
" " MI 1- 2-
3- 4-
" " FA 1.2.3-
" " SO 1.2.3.4- |4-
" " LA 1- 2-
" " SI 1.2.3- 4- 5-
" " BO 1.2.3.4.5.6.7.8.9-| | 6-
MIBOSIDO 1- 2-
" " RE 1.2.3.4.5.| |3-
" " MI 1.2.3-
" " FA 1.2.3.| |4- 5-
" " SO 1.2.3-
" " LA 1- 2-
" " SI 1. 2-
" " BO 1- 2.3.
MIBOBODO 1. 2.
" " RE 1-
" " MI 1.2.3.4.5.6.7.8.9.| |2-
" " FA 1.2.3.4.5.6.7.8.9-
" " SO 1.2.3-
" " LA 1.2.3-
" " SI
" " BO
REBOBORE ☐ BO

REBORELA ☐

27-20 25th AVENUE, ASTORIA, NEW YORK, U. S. A.



Example of Station Questionnaire Card.

ever, since you may send one in immediately, if you wish to do so.

On page 35 of the November issue of RADIO NEWS we stated that the **MIBOLA, MIBOSI,** and **MIBOBO** groups of the third column of code words would be given in the December issue. Unfortunately space limitations would not permit this and also the presentation of the *Universal Radio Time Chart.* Consequently it has been held over until this month when more space can be devoted to present it as clearly as possible.

The last three groups of the **MIBO** column are presented on the preceding page. When listening to a broadcast, you may hear the announcer use the code word **MIBOLADO.** This will express the entire three groups and is a request for listeners to send in a *station questionnaire* card filled out.

An examination of these three code word groups, in accordance with the explanation of the functioning of SIRELA in the November issue of RADIO NEWS, will serve to define them clearly in your mind with little additional explanation. You will note that in order to give some of the information requested it is necessary to use **Reference Column K.** This reference column was published on page 36 in the November issue of RADIO NEWS. You will also note that each translation of each code word is broken up into several numbered elements. This is for the purpose of facilitating your use of the *station questionnaire* card.

If you will refer to the illustration of the card on page 31, you will note that the code words themselves are listed in their proper order by groups, but that only the numbers of the various elements of each translation appear after their respective code words. When filling out the card it is necessary only to encircle or check the number which provides the answer you wish to give, unless further data requires the use of **Reference Column K** (Nov. issue) or the *Universal Radio Time Chart* (Dec. issue).

By way of example, let us suppose that you are answering the question indicated by the code word **MIBOSIRE** (Did our program come in clearly?). If you received the program very clear, you would encircle or check the number "4" on the *station questionnaire* card after the code word **MIBOSIRE.** Further, if you were answering the questions put by means of code word **MIBOSIDO** you would refer to **Reference Column K,** as indicated, for the coding of your answers. If you spend one hour a day listening to the station you would indicate after (1) the code word **RE.** If you listen to other stations three hours a day you would write the code word **FA** after number (2). If the hours of 10:00 p.m. to 1:00 a.m. Central Standard Time are your most convenient hours for listening, it is necessary for you to convert these hours into Universal Radio Time and then indicate them with the correct code words. In this instance the code words which you would write after (3) would be **SO BO** (4:00 a.m. to 7:00 a.m. Universal Radio Time). This is obtained from the *Universal Radio Time Chart* published last month. The other questions you cared to answer on the card would have the replies indicated in a similar manner.

The information so far on SIRELA supplements that published in the November and December issues of RADIO NEWS and should permit you to handle verification requests in their entirety. Following, we will take up another phase of the language. This first part will deal with General Program Data. You will hear the code words in this section spoken by announcers over radio station presenting programs with announcements in SIRELA. The use of this section, basically, is identical with the procedure outlined in the November issue.

You will note that each column of code words contains only those words which begin with the same two-syllable combination. Also every word in each group of code words begins with the same three-syllable combination. All of the code words referring to General Program Data have as their first syllable **MI.** This facilitates the location of the code words when using the Spatari Radio Language code book in decoding.

In Professor Spatari's book there are nine sections containing four-syllable code words, each section covering very thoroughly a certain topic of discussion. For example, all four-syllable code words beginning with **DO** refer to call letters and frequency information of short wave stations in Central and South America, the West Indies, Atlantic Ocean, Pacific Ocean, and Australia. Similarly all four-syllable code words beginning with **RE** have to do with the same information on short wave stations in Europe, Africa, and Asia; those that begin with **MI** cover General Program Data; those beginning with **FA, SO,** or **LA** cover news events. The four-syllable code words beginning with **SI** take care of a Miscellaneous Section, and those beginning with **BO** cover Countries and Possessions of the World, Geography, Titles, and Country's Activities.

The only exception to the above rule is when the *second* syllable of the four-syllable combination is **BO.** These words all cover the Correspondence Section, a portion of which was reproduced in the November issue of RADIO NEWS. Such division into easily recognized categories makes the language very simple to use.

The columns of code words given at the right may now be easily recognized as all having to do with General Program Data. Unfortunately it is not possible to reproduce all of the **MI** four-syllable code words this month, but the remaining three columns and the two reference columns (A and B) which complete this section will be given next month.

—30—

# GENERAL

1

**MIDODO** —DATA FREQUENTLY USED

**MIDODODO**—Our National Anthem
" " **RE**—Our National Anthem and Close Down.
" " **MI**—Station Close Down.
" " **FA**—The program continues with:
" " **SO**—This program originated from: (A
" " **LA**—Your announcer for this period is: (A
" " **SI**—We present a program of:
" " **BO**—We will present a program of:

2

**MIDORE** —MISCELLANEOUS

**MIDOREDO**—Our National Anthem and the Anthem (s) of:
" " **RE**—Our next program will be given, at: (B
" " **MI**—Items for this period will be announced later.
" " **FA**—Presentation (of
" " **SO**—Rebroadcast, (from:
" " **LA**—Relay (relayed) (from:
" " **SI**—Tomorrow's program to be given at: (B
" " **BO**—Two-Way conversation with station:

3

**MIDOMI** —NEWS

**MIDOMIDO**—Big Ben and News. (by
" " **RE**—Contest News. (by
" " **MI**—Convention News. (by
" " **FA**—Current Events. (by
" " **SO**—DX'ers World-wide News. (by
" " **LA**—Exposition News. (by
" " **SI**—News and Review. (by
" " **BO**—News Bulletins. (by

4

**MIDOFA** —NEWS

**MIDOFADO**—News in the Language of
" " **RE**—News in our Language. (by
" " **MI**—Newsletter. (by
" " **FA**—News of the week. (by
" " **SO**—Questionnaire News. (by
" " **LA**—News in Spatari. (by
" " **SI**—Radio Station General Change, News. (by
" " **BO**—Verification News. (by

5

**MIDOSO** —REVIEW & PREVIEW

**MIDOSODO**—Description. (of
" " **RE**—Ensemble
" " **MI**—Musical Review. (by
" " **FA**—Presentation. (by
" " **SO**—Preview of program. (by
" " **LA**—Program. (with
" " **SI**—Program continuation.
" " **BO**—Review of coming programs.

6

**MIDOLA** —TALK, REPORTS & INTERVIEW

**MIDOLADO**—Beauty talk. (by
" " **RE**—Book reports. (by
" " **MI**—Cooking talk. (by
" " **FA**—Debate. (with
" " **SO**—Household talk, (by
" " **LA**—Interview. (with
" " **SI**—Market reports. (by
" " **BO**—Political address. (by

7

**MIDOSI** —TALK, REPORTS & WEATHER

**MIDOSIDO**—Religious address. (by
" " **RE**—Sport talk. (by
" " **MI**—Statement from the government. (of
" " **FA**—Talk. (by
" " **SO**—Talk by listeners.
" " **LA**—Talk in Spatari (by
" " **SI**—Talk in the language of:
" " **BO**—Weather reports. (by

8

**MIDOBO** —SPECIAL EVENTS

**MIDOBODO**—Abdication ceremonies.
" " **RE**—Consecration ceremonies.
" " **MI**—Coronation ceremonies.
" " **FA**—Funeral ceremonies of the late: (A
" " **SO**—Inauguration ceremonies.
" " **LA**—International conferences.
" " **SI**—Nomination ceremonies. (from
" " **BO**—Wedding ceremonies.

# PROGRAM DATA ★

9
MIREDO —GREETINGS, NIGHT, ETC.
MIREDODO—Ladies and gentlemen I (we) greet you.
" " RE—Ladies and gentlemen I (we) wish you
" " MI—Good morning, afternoon, evening, night.
" " FA—Good morning.
" " SO—Good afternoon.
" " LA—Good evening.
" " SI—Good night.
" " BO—Best wishes for this (the) occasion.

10
MIRERE —OPERA (Musical Compositions)
MIREREDO—Comic opera (by
" " RE—Duetto & airs from opera
" " MI—Grand opera. (by
" " FA—Operetta. (by
" " SO—Operatic Gems
" " LA—Operatic selections. (by
" " SI—Overtures; conducted by
" " BO—Potpourri; conducted by

11
MIREMI —POPULAR MUSIC
MIREMIDO—Dance Music
" " RE—Incidental Music. (by
" " MI—Jazz music.
" " FA—March. (by
" " SO—Modern music.
" " LA—Music. (by
" " SI—Musicale. (with
" " BO—Musical Fantasy. (by

12
MIREFA —POPULAR MUSIC AND FOLKSONGS
MIREFADO—Folksongs.
" " RE—Lullabies (by
" " MI—Old and new music.
" " FA—Old favorite songs.
" " SO—Old music.
" " LA—Popular music.
" " SI—Songs.
" " BO—Songs of the homeland.

13
MIRESO —SEMI-CLASSICAL
MIRESODO—Epilogue.
" " RE—Famous songs.
" " MI—Great masters' music.
" " FA—Interlude. (by
" " SO—Intermezzo. (by
" " LA—Rhapsody.
" " SI—Semi-classical music.
" " BO—Sonata. (by

14
MIRELA —SEMI-CLASSICAL AND CLASSICAL
MIRELADO—Chamber music. (by
" " RE—Classical music.
" " MI—Martial music.
" " FA—Minuet. (by
" " SO—Musical ballet.
" " LA—Musical composition. (by
" " SI—Serenade. (by
" " BO—Symphony. (by

15
MIRESI —RECITALS
MIRESIDO—Benefit recital: (for A
" " RE—Dance recital: (by: A
" " MI—Dramatic recitation: (by: (A
" " FA—Interpretative dance recital: (by A
" " SO—Instrumental and piano recital: (by: (A
" " LA—Instrumental recital: (by (A
" " SI—Organ recital: (by A
" " BO—Pianoforte recital: (by: (A

16
MIREBO —RECITALS
MIREBODO—Poetry recital: (by A
" " RE—Recital: (by A
" " MI—Recitation: (by A
" " FA—Violin and piano recital: (by A
" " SO—Violin recital: (by A
" " LA—Violincello & piano recital: (by A
" " SI—Violincello recital: (by (A
" " BO—Vocal recital: (by A

17
MIMIDO— —TONALITY, ACT, PART
MIMIDODO—The tonality of this composition is in: (A
" " RE—Major.
" " MI—Minor.
" " FA—Flat (♭).
" " SO—Sharp (♯)
" " LA—Act number: (A
" " SI—Part Number: (A
" " BO—Opus number: (A

18
MIMIRE —PROGRAM CLASSIFICATIONS
MIMIREDO—Anniversary program.
" " RE—Benefit program. (for: (A
" " MI—Children's program.
" " FA—Commercial program.
" " SO—Juvenile artists period.
" " LA—Musical festival. (from: (A
" " SI—Novelty program. with: (A
" " BO—Sketch period.

19
MIMIMI —PROGRAM CLASSIFICATIONS
MIMIMIDO—Special events program.
" " RE—Story telling period.
" " MI—Talk: (by A
" " FA—Testimonial program: to: (A
" " SO—Theatre program.
" " LA—Theatrical review.
" " SI—Variety program. (with: (A
" " BO—Women's program.

20
MIMIFA —SINGERS
MIMIFADO—Baritone
" " RE—Bass
" " MI—Coloratura soprano
" " FA—Contralto
" " SO—Juvenile singer
" " LA—Mezzo soprano
" " SI—Soprano
" " BO—Tenor

21
MIMISO —MIXED VOICES
MIMISODO—Choir ensemble; conductor: (A
" " RE—Chorus ensemble; conductor: (A
" " MI—Female singers; conductor: (A
" " FA—Group singing; conductor: (A
" " SO—Male singers; conducted: by: (A
" " LA—Pupil concert; vocal
" " SI—Singers.
" " BO—Vocal.

22
MIMILA —MIXED VOICES
MIMILADO—Vocal & instrumental ensemble; conductor: A
" " RE—Vocal duetto; conducted by: (A
" " MI—Vocal ensemble; conducted by: (A
" " FA—Vocal quartet; conducted by: (A
" " SO—Vocal quintet; conducted by: (A
" " LA—Vocal septet; conducted by: (A
" " SI—Vocal sextet; conducted by: (A
" " BO—Vocal trio; conducted by: (A

23
MIMISI —LEADERS & ARTISTS
MIMISIDO—Accordionist
" " RE—Artist
" " MI—Cantor
" " FA—Comedian
" " SO—Comedienne
" " LA—Conductor
" " SI—Dramatist
" " BO—Harpist

24
MIMIBO —ARTISTS
MIMIBODO—Instrumentalist
" " RE—Organist
" " MI—Pianist
" " FA—Singer
" " SO—Soloist
" " LA—Violinist
" " SI—Violincellist
" " BO—Vocalist



25
MIFADO —GREETINGS AND SPATARI RADIO LANGUAGE PROGRAMS
MIFADODO—Ladies and gentlemen of the radio audience I (we) greet you.
" " RE—We are now featuring a Spatari Radio Language program.
" " MI—We will feature a Spatari Radio Language program from: (B
" " FA—We will broadcast a series of S. R. L. programs from: (B
" " SO—The Spatari Radio Language program will be given with the cooperation of: (A
" " LA—You have been listening to a Spatari Radio Language program.
" " SI—You have been listening to a Spatari Radio Language program given with the cooperation of: (A
" " BO—You have been listening to a Spatari Radio Language program given with the co-operation of this radio station.

26
MIFARE —RELIGIOUS PROGRAM & SERVICES*
MIFAREDO—Christmas Services. (from Vatican City, Rome, Italy.
" " RE—Consecration Services. (from Vatican City, Rome, Italy.
" " MI—Easter Sunday Services. (from Vatican City, Rome, Italy.
" " FA—Good Friday Services. (from Vatican City, Rome, Italy.
" " SO—Holy Week Services. (from Vatican City, Rome, Italy.
" " LA—Holy Year Services. (from Vatican City, Rome, Italy.
" " SI—New Year Services. (from Vatican City, Rome, Italy.
" " BO—Palm Sunday Services. (from Vatican City, Rome, Italy.

27
MIFAMI —RELIGIOUS PROGRAM & SERVICES
MIFAMIDO—Papal Speech and Benediction. (from Vatican City.
" " RE—Passion Play relayed from: (Oberammergau, Germany.
" " MI—Religious Festival, (from Vatican City, Rome, Italy.
" " FA—Religious Music and Services.
" " SO—Religious program (from Vatican City, Rome, Italy.
" " LA—Religious program from the Cathedral of:
" " SI—Religious program from the Church of:
" " BO—Religious services from the Synagogue of:

28
MIFAFA —RELIGIOUS PROGRAM, SERVICES & MUSIC
MIFAFADO—Religious services relayed from the Cathedral of:
" " RE—Religious services relayed from the Church of St.
" " MI—Religious services from the Temple of:
" " FA—Ave Maria (by: (A
" " SO—Devotional music.
" " LA—Hymn. (Prayer)
" " SI—Religious music (by: (A
" " BO—Religious services.

29
MIFASO —MUSICAL ORGANIZATIONS
MIFASODO—Concert; conducted by: (A
" " RE—Concert band; conducted by: (A
" " MI—Concert ensemble; conducted by: (A
" " FA—Concert orchestra; conducted by: (A
" " SO—Dance orchestra; conducted by: (A
" " LA—Fife and drum corp., conducted by: (A
" " SI—Instrumental & Vocal ensemble; conducted by: (A
" " BO—Instrumental ensemble; conducted by: (A

30
MIFALA —MUSICAL ORGANIZATIONS
MIFALADO—Instrumental duetto; conducted by: (A
" " RE—Instrumental quartet; conducted by: (A
" " MI—Instrumental quintet; conducted by: (A
" " FA—Instrumental septet, conducted by: (A
" " SO—Instrumental sextet, conducted by: (A
" " LA—Instrumental trio; conducted by: (A
" " SI—Jazz orchestra, conducted by: (A
" " BO—Military band; conducted by: (A

31
MIFASI —MUSICAL ORGANIZATION & RECORDINGS
MIFASIDO—Orchestra; conducted by: (A
" " RE—Philharmonic Orchestra; conducted by: (A
" " MI—Pupil concert, (instrumental) conducted by: (A
" " FA—Recordings. (gramaphone & Electrical Transcription.)
" " SO—String ensemble; conducted by: (A
" " LA—Symphony Orchestra; conducted by: (A
" " SI—Violin and piano.
" " BO—Wind instrumental ensemble; conducted by (A

32
MIFABO —INSTRUMENTS
MIFABODO—Clarinet
" " RE—Cornet
" " MI—Guitar
" " FA—Instrument soloist
" " SO—Organ
" " LA—Pianoforte
" " SI—Saxophone
" " BO—Violin

*If broadcasts originate outside of Vatican City, the name place to be pronounced phonetically.

## TECHNICAL BOOK & BULLETIN REVIEW

The Institute of Radio Engineers, Inc., 330 W. 42nd St., New York, N. Y., have recently published a new booklet entitled "THE STANDARDS ON TRANSMITTERS AND ANTENNAS FOR 1938." This booklet contains 39 pages and deals with definition of terms in general, of antennas, a paragraph on graphical symbols, and other paragraphs include methods of testing transmitters, power ratings, spurious radiations, frequency stability, operational stability, amplitude modulation, and a further paragraph on methods of testing antennae, single unit antennae, multi-unit antennae, propagation of radio waves. This booklet is available to members of the IRE.

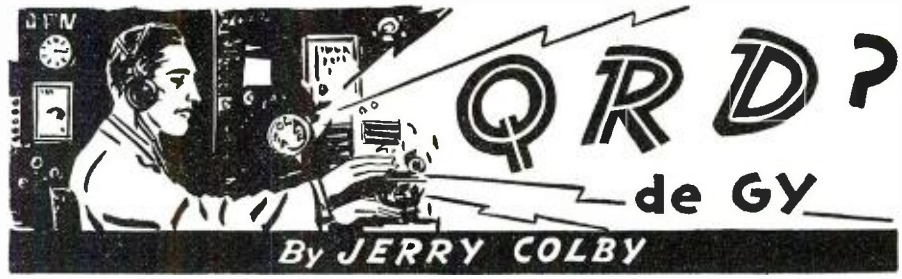
THE CORNELL-DUBILIER ELECTRIC Corporation of South Plainfield, N. J., announce their Catalog No. 161, which contains 41 pages, listing all of the various types of condensers used in the radio industry, including many midget type electrolytic condensers, and the new 600 volt series condensers with capacities of 8 and 16 mfd. A complete listing of various condensers for use in filtering circuits are also shown for auto generator, vibrator and noise elimination. A postcard to the Cornell-Dubilier Company will bring one of these leaflets.

THE RADIO SHACK CORPORATION, 46 Brattle Street, Boston, Mass., have brought out their new 1939 radio catalog on radio and electronic equipment, amateur and communication supplies, sound systems and service parts. All of the newest equipment is shown and a large portion of the catalog is turned over to the amateur's needs. This book may be obtained by writing directly.

The RCA Institute Technical Press, which is a department of RCA Institutes, Inc., of 75 Varick Street, New York, N. Y., publishes a technical booklet entitled the RCA REVIEW. The October issue contained many interesting features such as "U-H-F Equipment for Relay Broadcasting," "Review of Ultra-High-Frequency Vacuum-Tube Problems," "Microphone Wind Screen" and "Temperature Reduction in High Powered Loudspeakers." The booklet contains 258 pages and within its covers will be found many formulae on the subjects contained therein.

GENERAL-RADIO Co. of Cambridge, Mass., has just finished publishing their new catalog K. Many new G.R. instruments are to be found and the booklet contains 214 pages. Eight pages of this booklet are devoted to formulae and charts and a very complete decibel chart is therein contained.

-30-




B. E. G. GOODGER, "ham" station 2YH, Opapa, New Zealand, is one of these ops who never forgets a name, a deed or an idea. It was with pleasure that we received his msg from "way down under" with best 73 to everyone. He's expecting to ruin the atmospherics with a new 5 kw. outfit. So stand by, all ops.

* * *

AND C. Bolvin of KMLJ, Bud Taylor, Ass't Engineer of KMTR, Walt Ayres and many others hit the mill to QSO. Dolph Tuggle informs us that the Isthmian Line boats are going into the west coast to England runs now. Trip starts from New York, thence to Vancouver, B. C., then down the West Coast, and direct to London, Liverpool and Avonmouth. From there, it's but a short haul to Portland, Maine, Baltimore and New York. Sounds like they must be pulling a "Corrigan." They're also installing SW RCA 8004 on these round-the-world vessels.

* * *

OPERATOR No. 32½ reports that the relief ship idea is working swell in other precincts. Broadcast is nearly at a standstill around Los Angeles, but it is FB around New Orleans, although salaries are not so good. And shipping is picking up on the East and West coasts, with new installations being made on drydocked boats in the Gulf.

* * *

A NOTATION that Stephan McGee, RM2C, was transferred from USS Holland to Naval R.D.F. Station, Manasquan, N. J., brought poignant memories of windswept silvery beaches; listening to the pounding surf on the ocean side on Fire Island NJY; breaking an arm trying to raise Manasquan for their bearing on a ship by landwire, telephone and radio, and then coming back in a weak signal saying, "Sorry, but jamoke pot wouldn't perk." Or, "That guy knows where he's at. He's only fooling."

* * *

IS it really necessary to give a complete resume of radio activities, progress and disasters for the past year, and a prediction on what the coming year holds for us? It is our opinion that a good radiop knows what the score has been. what the score is, and what the score will be . . . all in accordance with his financial condition. But there is one resolution all radiomen should make and keep. That is to make definite plans to do some studying for furthering their knowledge, and therefore, their possibilities for a higher paying radio job. . . . Ain't that sumpin'?

* * *

I SEE by the papers that Brother WF Pascal has good reason to complain about the jamming of 500 kcs. He says, "The coastal stations of the Atlantic and Gulf regions, in contrast to those of the Pacific, have the extremely bad habit of acknowledging any and all calls on 500 kcs." So, what ho, for a bit of cooperation? Pass tfc your station frequency. With all the fast and furious operating around the East coast spots, a few QRU's tend to make this jam session not unlike a jitterbug waiting for a chance to break thru.

* * *

A FEW months ago, the city of Cleveland inaugurated a system of two-way communication between cruise cars, radio-equipped motorcycles and a few central stations, that displaced all of the regular cops and the call-box system. The only police were traffic cops at intersections. Two new transmitters were installed and a radio control room was established at Police Central headquarters, so that every car and motorcycle could be located at any moment. This newly-installed equipment and system has worked so perfectly that many more cities are considering adopting the same. . . . A word to the wise is sufficient.

* * *

THIS is not for those who are in a business to cheat the U. S. Government out of taxes, or state secrets, but we address ourselves only to those men *who are stupid enough to think that they can get away with operating a transmitter without a license.* Various sections of the country have become infested with this *fool-bug*, who is too lazy or something, to take the examinations for their third-class telephone ticket. There is no question but what they could pass the examination, as they must have the education to be able to build and operate a transmitter. He blasts the atmospherics with his signal, until the Radio Inspector of that district finds the station and arrests him for illegal transmission. The Commish *is* prosecuting these cases to the fullest extent of the law. Crime does not pay!!!

* * *

THE ARTA and CTU-Mardiv continue to report progress with agreements signed by shippers and broadcasters for better working conditions and wages and, best of all, recognition. Broadcast stations are being organized but the airway ops seem to be the orphans in the storm. Nobody loves them . . . right now . . . but the moment some organization gets wise to their existence, everyone'll scramble for their favor. 'Twas ever thus, nay.

* * *

EIGHT hour watch is now a fact. It has been a source of continual strife but has now been worked out satisfactorily by the FCC and the organizations. Quote if a vessel touches at more than one port during a full day (from mid to mid) the radiop can proportion his watch between himself and the auto-alarm to be one-third of the sea time, unquote. Previous to this men were being cited by Masters and reported by Inspectors. This is now a definite ruling . . . with everybody happy. We understand Rathborne of the ARTA was on the stand five hours in the hearing which reached this conclusion. And the CTU-Mardiv was represented by Kleinkaus. So it's a long ruling that has no turning!

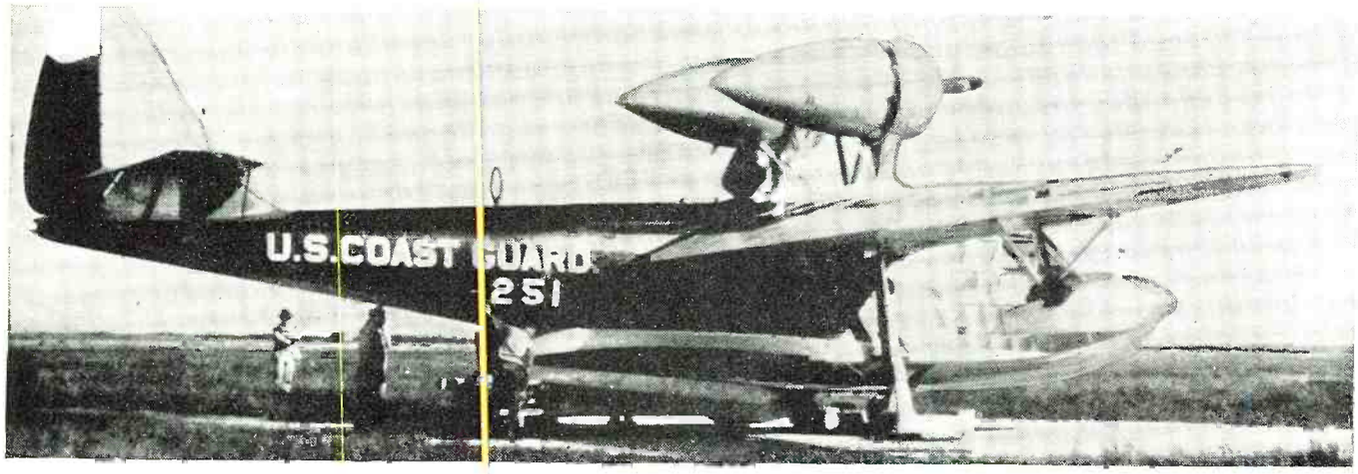
* * *

DURING a recent issue of *Satevepost* a story was published which gave the radiop a not so clean aura, caused quite a storm and almost snowed under this department with protests. All one could do was to say, "So what?" But Universal Pictures did do something about it by producing THE STORM, a film which returns the halo and self-respect to an op. This is not a plug for the film but a suggestion for use if and when your girl friend doesn't think you're a such a much. Incidentally, the ops in the picture were taught operating and have their third class phone licenses.

* * *

WELL, are you preparing yourself for Television? Or don't you believe it

(*More QRD? on page* 61)




Checking the loop by placing the plane on a turntable out of range of electrical interferences. It is swung and the loop tuned to a small transmitter for checking.

# C. G. Planes Are Never Lost!

**By C. S. VAN DRESSER**
Washington, D. C.

**With unerring accuracy, the new loop developed by the Coast Guard gives their plane its position.**

IN black, gusty nights, radios in the communication stations of the Coast Guard, up and down the wide-flung shores of the United States, squeal and click out constant messages. Reports of positions from various cutters, routine orders, and sometimes a burst of music. Suddenly from the bleak void comes that ominous call: "3 dashes—3 dots—3 dashes—" an S.O.S. Coast Guard planes roar into the sky, their pilots unable to see anything but the illuminated instrument boards in front of them. With unerring accuracy they fly straight to the origin of that frantic radio message.

It is probably a vessel in distress. Flares are dropped; radio communications with nearby ships are established, directing them to the aid of the stricken liner. When their work is done, the pilots of the Coast Guard amphibians then fly back to their base, always knowing exactly where they are—never lost for a second.

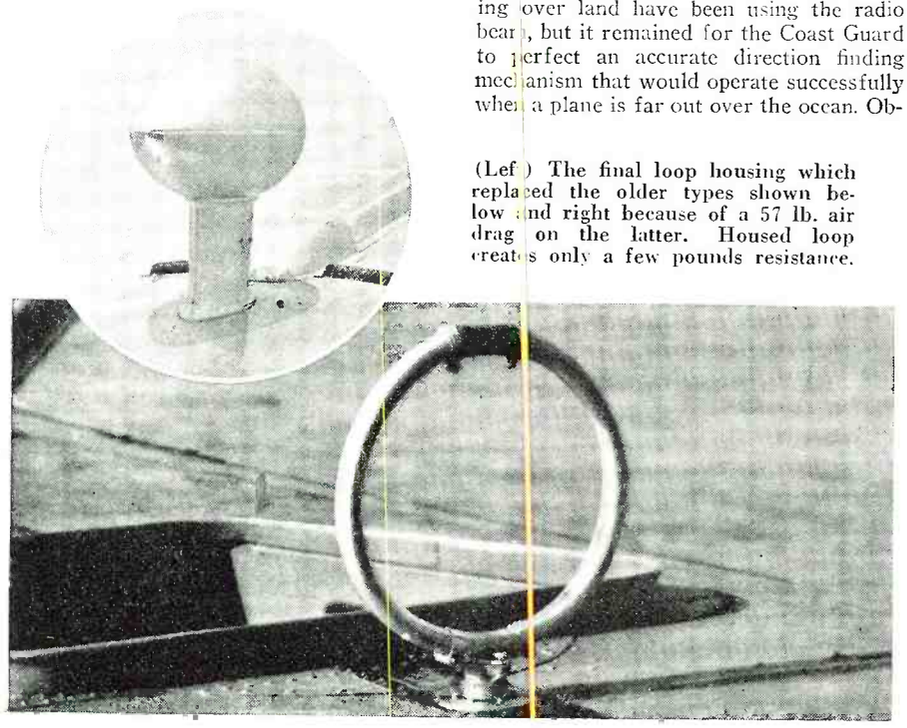
Only a few years ago the ships of the Coast Guard were virtually helpless when flying over the ocean at night. But those few years, and the lives of brave men have seen the development of a magic science that today saves hundreds of lives—a science which now is the right hand of every man who flies out over Father Neptune's domain.

For several years air transport lines flying over land have been using the radio beam, but it remained for the Coast Guard to perfect an accurate direction finding mechanism that would operate successfully when a plane is far out over the ocean. Obviously there are no radio broadcasting stations at sea; so, of course, there is no such thing as a "radio beam" for the pilot of a plane winging his way over the ocean.

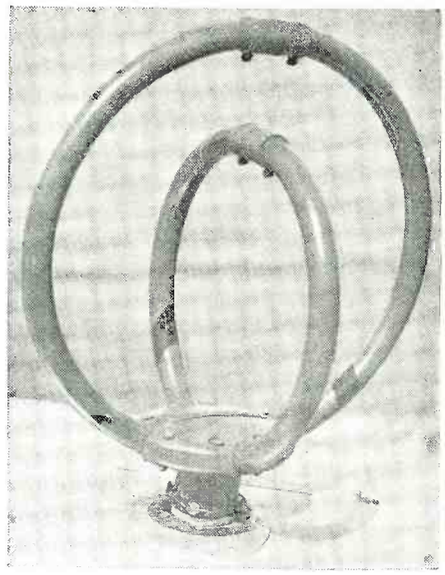
A "radio beam" is in reality only a track of radio waves, stretching from one station to another, along which a pilot actually rides his plane. A new method of laying these radio pathways had to be developed for those aviators, who, in the line of duty, are forced to fly far off any regular, marked course.

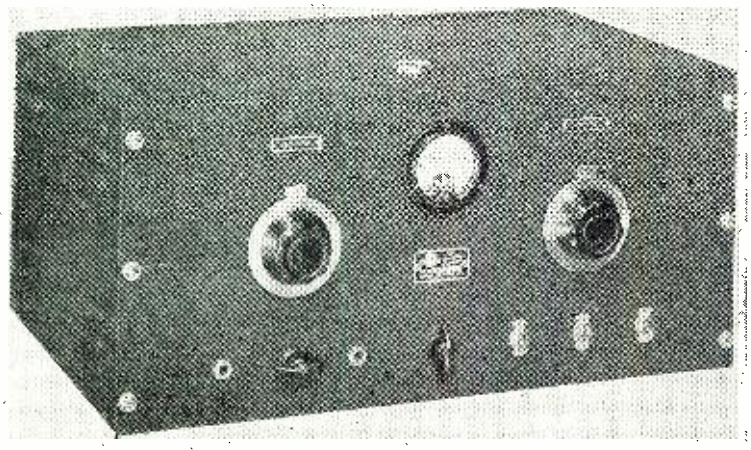
Developing the new system of radio direction finding was inaugurated by engineers of the Coast Guard in 1931, when the first actual test flight was made of the initial device that was to eventually tell a

*(Now sight along page 60, please.)*



(Left) The final loop housing which replaced the older types shown below and right because of a 57 lb. air drag on the latter. Housed loop creates only a few pounds resistance.





Excellent for QRR work, this transmitter looks like a receiver.

A.F. to right, and r.f. to left makes servicing easy.

# A 20-watt All Band Xmitter

**By EDWARD P. KELLY, W9HPW**
Engineer, Standard Transformer Corp., Chicago, Ill.

**Built essentially for small space, this set will make an excellent QRR rig because its power requirements are sufficiently low to make it readily transportable.**

IN building this transmitter, the factors of flexibility, performance, and economy were carefully considered before the final design was adopted. Complete coverage of all bands with quick band change was desired, and crystal control with a minimum number of stages. The all-band feature dictated the use of both phone and C.W. and, therefore, a complete speech amplifier and modulator had to be included. Other features such as metering of all important circuits, oscillator keying for break-in operation, and front panel control were worked into the set as the design crystallized, while economy was the deciding factor in determining the tube lineup and the use of a single power supply and meter for the entire unit, as well as the overall size.

The result is a complete phone and C.W. transmitter, including its A.C. power supply, in a cabinet measuring 19" x 13" x 8¾" overall, and capable of operation on any frequency from 1.6 to 60 mc with crystal control. Frequency change can be accomplished in 30 seconds or less by means of two plug-in coils and a plug-in crystal; and the rated input at all frequencies is 20 watts. The modulator delivers 10 watts of audio power which is capable of modulating the amplifier one hundred percent. The input can be increased to 30 watts if desired with one hundred percent modulation possible at voice frequencies on peaks.

The radio frequency section utilizes a type 6F6G tube as a crystal controlled oscillator, driving a type 807 or RK39 final amplifier. Split stator condensers are used both in the oscillator and amplifier tank circuits so that the proper L-C ratio is obtained for all frequencies; and the sections of both condensers are automatically switched when the plug-in coils are inserted. A 2 v. 60 ma. pilot light bulb is connected in series with the crystal to act as an indicator of the crystal current and also as a fuse. Proper shielding in the amplifier stage is incorporated for increased stability and eliminates neutralization even at the higher frequencies. The antenna is coupled to the set by means of a link or by capacity coupling to the amplifier tank circuit.

The speech amplifier and modulator tube lineup is as follows: 6J7 input, 6C5 voltage amplifier, 6N7 Class "A" driver, and 6N7 Class "B" modulator. Sufficient gain for any crystal microphone or similar high impedance input is provided; and different load impedances are available at the modulation transformer by tapping the secondary at a number of suitable points.

The power supply uses a type 5Z3 full-wave rectifier and delivers approximately 400 volts D.C. out of the filter, which uses condenser input. An additional filter section is inserted to the supply power circuit to the three speech amplifier stages to insure hum-free operation; and a tapped voltage divider R 17 is used to obtain the proper voltage for the speech amplifier (300 v. D.C.) and the oscillator screen grid (175 v. D.C.), while the screen voltage of the 807 (or RK39) is supplied through dropping resistor R4.

All controls are mounted on the front panel, including the microphone and keying jacks and a built-in meter switch permits the reading of oscillator, amplifier, and modulator plate currents with a single meter and no plugs or jacks.

The front panel view of the transmitter, shows all of the controls which are as follows, from left to right across the top: oscillator plate tank tuning dial, plate circuit meter, and amplifier plate tank tuning dial; bottom: microphone jack J, gain control $R_{10}$, keying jack $J_1$, meter switch, modulator "on-off" switch, filament switch, and plate switch.

The chassis parts layout is as follows, along the panel from left to

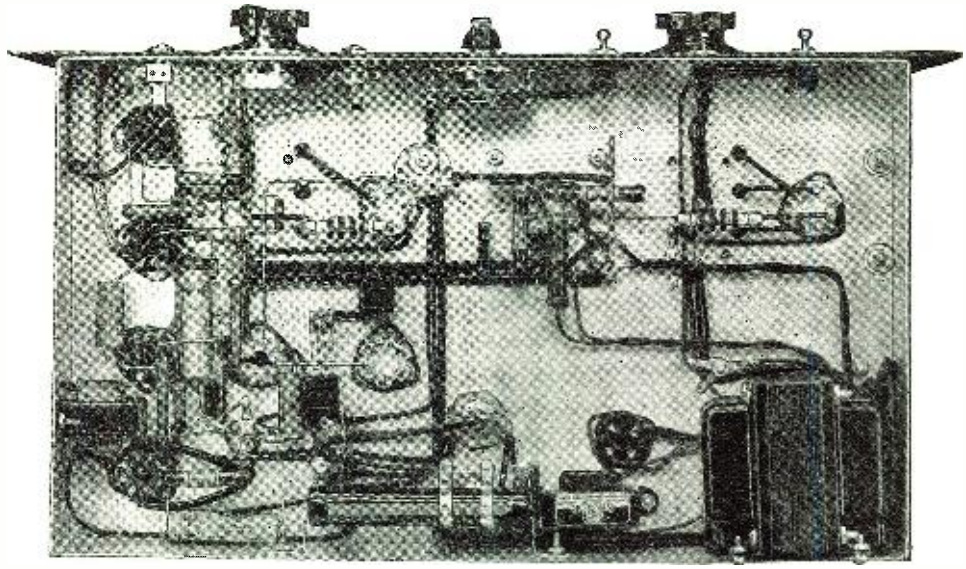
right; amplifier tank coil, amplifier tank condenser 807 (or RK39) amplifier tube, oscillator tank coil, and oscillator tank condenser.

The ordinary four metal tubes at the right end of the chassis are those of the speech amplifier and modulator. Along the rear of the chassis (foreground in the picture) from left to right: the power transformer 5Z3 rectifier tube, filter power condensers; and the tapped modulation transformer. The crystal is to the left of the oscillator tube, and the pilot light crystal fuse is between it and the tube.

It is at once apparent that the layout of each section, R.F., A.F., and power, follows as closely as possible that shown in the schematic circuit diagram.

The R.F. and A.F. sections are spread out enough to prevent feedback and interaction between circuits and still keep the plate and grid leads reasonably short. Care was exercised in the placement of the power transformer and filter chokes with respect to the audio transformers, so that a minimum of inductive coupling would exist and no apparently noticeable hum would be induced in the audio system.

In constructing the transmitter, layout the chassis and panel along the same lines as shown. After the chassis has been punched and drilled, the parts which mount on top of it can be put on, starting first with the sockets. Then the panel can be added along with the parts which hold it to the chassis. It is a good idea not to mount the other parts which go under the chassis until they are necessary to complete each circuit. This leaves more room to work and reduces the possibility of errors in wiring.



A beautiful example of wiring and careful placement of components.

The filaments should be wired first, along with the primary circuit of the power transformer and tested right away. Then the plate supply connections can be made and the complete power supply tested. Next comes the R.F. Crystal oscillator circuit followed by the 807 amplifier stage. It now becomes necessary to wind a pair of coils so that the R.F. section can be tested. All of the coils consist of a single winding and it should not take long to make up the first pair. All data for number of turns, wire size, base connections, etc., can be found in the coil table. If the data is followed carefully, little or no trouble should be experienced in getting the tank circuits to resonate properly.

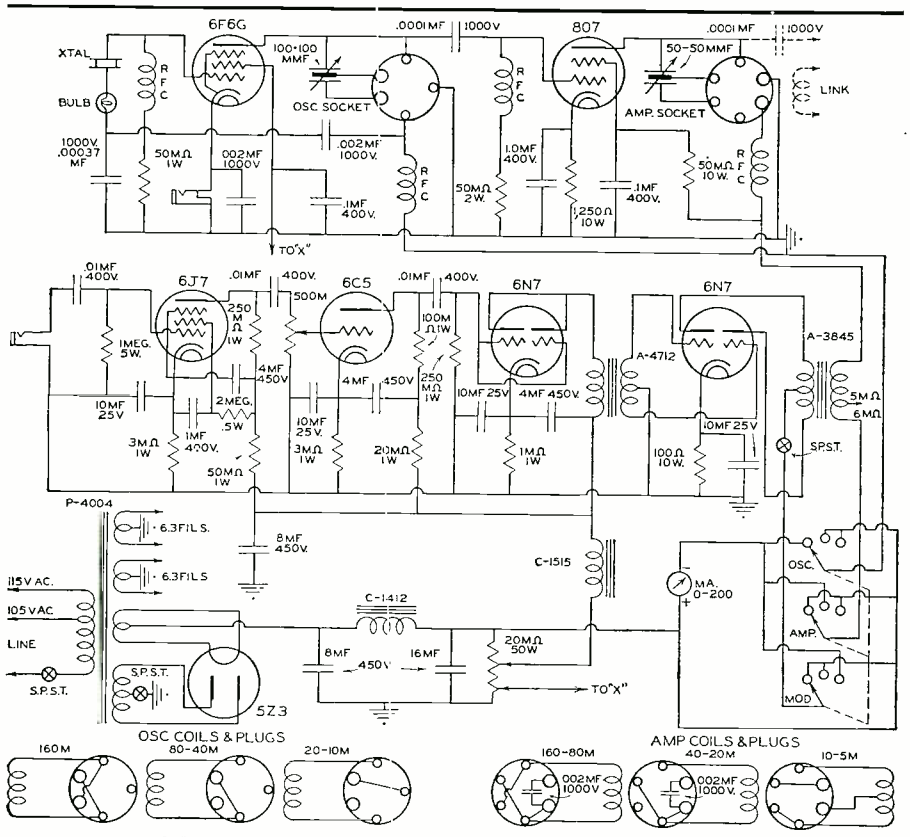
A reliable 80 or 40 meter crystal is usually a great help in getting started on the "right foot"; so, with the proper coil plugged in the oscillator plate circuit, the oscillator can be tuned up. The meter switch should be in the "Oscillator" position and the meter should read anywhere from 20 to 40 ma., minimum dip, depending on the frequency, crystal, tube, voltage, etc. When tuning the oscillator for the first time, it is advisable to leave the amplifier coil and tube out of their sockets. If the 807 is left in the socket and the amplifier coil removed, the full voltage is left on the tube's screen. This will short life the amplifier tube considerably and might even cause its complete destruction. After the oscillator is resonated, the amplifier coil and tube can be inserted and also tuned to resonance. With the meter switch in the "amplifier" position the current should dip to a value ranging from 5 to 15 ma. at resonance. When loaded the amplifier plate current should be from 50 to 75 ma., depending upon the input desired.

Frequency doubling or quadrupling can be employed in both stages of this transmitter, which makes it possible to cover all bands with 160, 80 and 40 meter crystals.

The value of condenser in the oscillator circuit is fairly critical and can be varied either way to obtain the greatest harmonic output.

The 2 v., 60 ma. pilot light bulb in series with the crystal indicates the crystal current, which should be kept to the lowest value consistent with good output. The resonant points are rather sharp in both tuned circuits, so care should be used in tuning them; especially when doubling or quadrup-

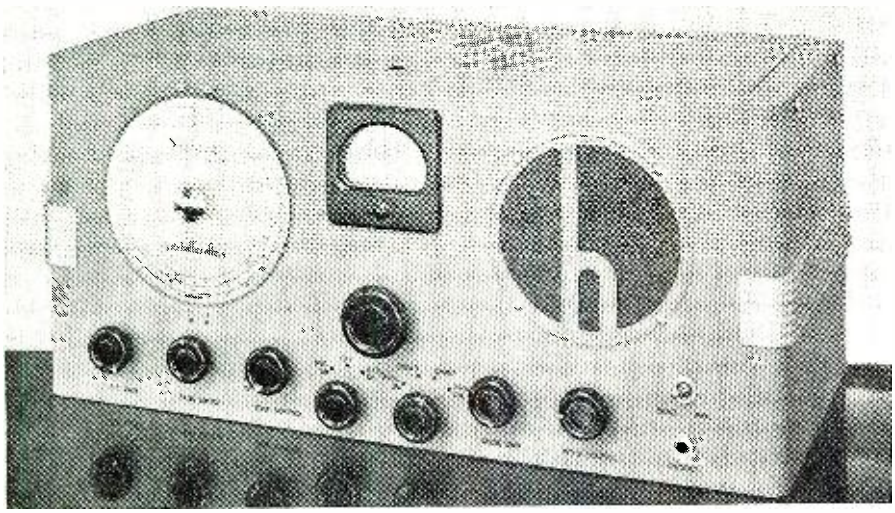
(*Please QSY to page* 65)




Schematic diagram of the 20-watt all band transmitter.

# A New

by S. GORDON TAYLOR
New York City, N. Y.



With conventional controls, the receiver is easy to tune, and bandspread is mechanical and continuous in operation.

THERE have been two recent events which have had a noteworthy effect on the design of receivers for use at wavelengths of ten meters and lower. First, the introduction of a variety of tubes especially designed for operation in these ranges has made it possible to obtain amplification comparable with that of standard tubes at lower frequencies. Second, the new amateur regulations which went into effect December 1st, require that all transmitters employed on the amateur 5-meter band be highly stabilized. This mean that the superregenerative receivers and resistance-coupled superhets that have been generally used on this band are no longer required because of their ability to receive the badly frequency-modulated signals from "wobbulated oscillator" transmitters; and that receiver requirements become the same in this range as in the lower-frequency bands.

All of this means that the engineering laboratories can at last really "go to town" in the development of efficient receivers for these ranges and one example of the result is found in the receiver shown in the accompanying photographs and diagrams, and described in this article.

This new receiver covers the range of 25 to 66 megacycles in two bands, 25-40 and 38-66 mc. with switch selection. Lower frequency amateur bands are not included because to do so would necessarily entail some sacrifice in ultra-high frequency effectiveness. Furthermore, many amateur stations are already equipped with excellent communications-type receivers, the only fault in which is their failure to include, or inability to perform effectively in, the ten and five meter ranges. For these stations it is more economical to add another relatively inexpensive receiver for 5- and 10-meter operation than to discard otherwise good equipment in favor of a new all-band job which would in all likelihood involve something less than maximum efficiency on these highest frequency ranges.

The receiver employs nine tubes. The first one is a new u.h.f. 1852 tube in the tuned preselector stage. A conventional 6L7 is used as mixer with a 6J5G as the separate r.f. oscillator. Both of these tubes, incidentally, are recognized for their effectiveness in u.h.f. circuits.

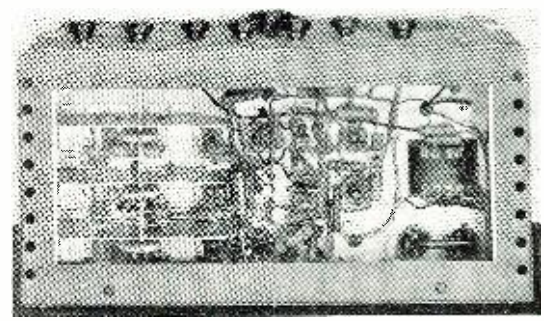
The i.f. amplifier utilizes a 6K7 in the first stage with a new 6P7G triode-pentode as combination second i.f. and beat-frequency oscillator. The second detector, a.v.c. and first-audio functions are all handled by a 6Q7G double-diode triode. A 6F6G serves as the output tube. The 6H6 shown at the extreme right is used in the Dickert automatic noise limiter circuit. An 80 rectifier completes the tube complement.

Much of the tremendous sensitivity incorporated in this little receiver is due to the 1852 r.f. amplifier stage. Previous experience in these ranges indicates that one of the prime requirements is for high gain ahead of the first detector or mixer. It might be pointed out here that the main weakness in most previous, home-built receivers of this type has been the lack of this. Not only is the benefit of the 1852 and its carefully designed circuit apparent in the increased sensitivity, but in the decreased noise and resulting favorable signal-to-noise ratio.

Separate coils are employed for each band in all three r.f. circuits. Some of these are visible in the underside view shown herewith. It will be noted that large wire is employed for the 5-meter coils. This and other factors of coil design have obviously been given extremely careful attention, as is necessary where high efficiency is to be obtained at these frequencies.

The two-stage 1600 kc. i.f. amplifier utilizes dual-tuned transformers with air trimmers. Variable coupling is provided by means of additional coupling coils in each transformer which are gang-switched to provide "sharp" or "board" band-width as required.

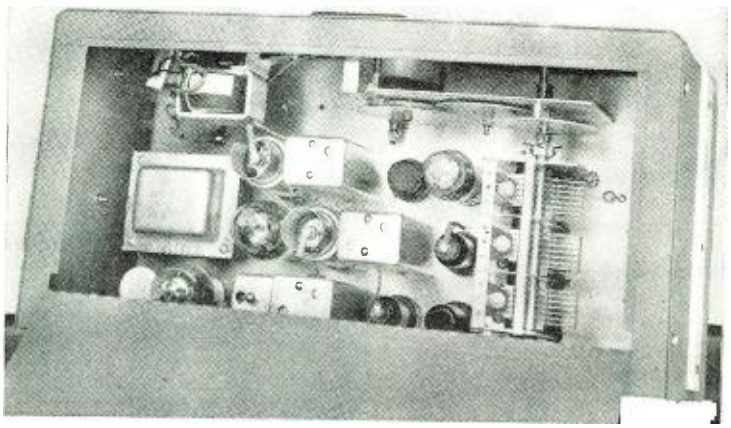
The use of 1600 kc. for the intermediate frequency results in the virtual elimination of repeat points. On the 10-meter band this might be accomplished through the use of two or more tuned pre-selector stages but this method would add appreciably to the cost of the receiver. At five meters, with an i.f. in the vicinity of 465 kc., pre-selection has little effect in improving image selectivity. For this reason the most practical method of eliminating repeat points is to employ an intermediate frequency that separates them so widely that the tuned pre-selection circuits do provide reasonable selectivity. In the 10-meter range this scheme places any remaining repeat points entirely outside the band, and for a broadcast or other station outside the band to repeat within the band would require that its signal be tremendously strong. In the 5-meter range signals at the extreme low end of the band will be heard again at the extreme high end (3200 kc. above their normal frequency) if they are strong enough; but this is



Note extensive shielding for best efficiency.

# 25-66 MC Receiver

**Using only two tuning bands enables this receiver to operate at the maximum efficiency and extreme sensitivity.**



Note the careful consideration given to the placement of parts.

such a vast improvement over the best condition that could be obtained with a conventional low i.f. that it may be considered negligible.

The noise limiter is truly automatic in its action, automatically adjusting itself to the signal level. It functions by cutting noise down to the level of the audio signal, eliminating the high peaks which constitute the troublesome factor in ignition and similar types of interference. It functions whether the a.v.c. is off or on, and in both the "broad" and "sharp" positions of the band-width switch. It is the effectiveness of this noise limiter that makes 5- and 10-meter reception possible even in locations immediately adjacent to main highways. In such cases signals which are coming in perfectly may be completely snowed under by noise when the limiter is turned off.

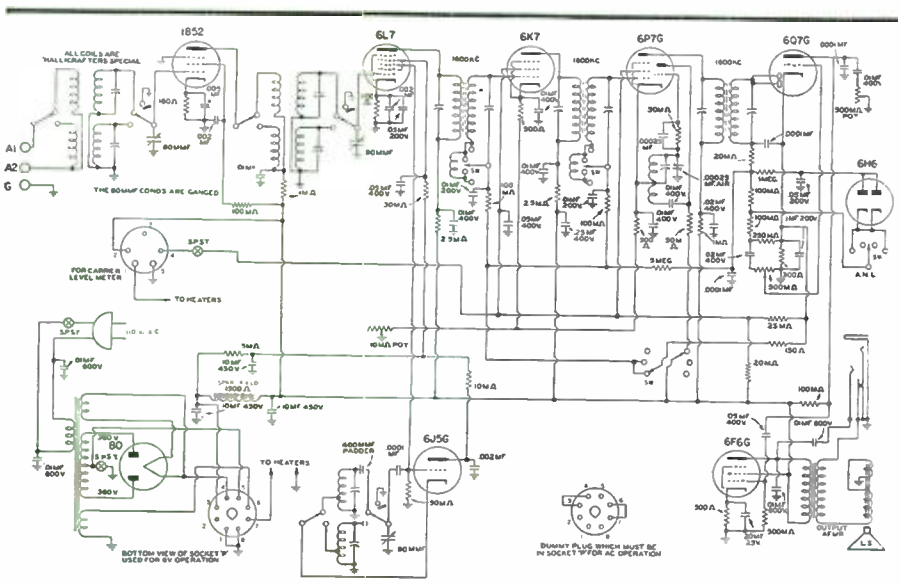
The receiver is built into a steel cabinet which measures 18½" by 9⅜" by 8½", finished in ripple gray with chromium trim. Looking at the panel the bottom controls from left to right are: r.f. gain, band-switch, tone control and a.c. line switch, a.v.c. and beat-oscillator switch, band-width and noise-limiter switch, audio gain, b.f.o. pitch control, send-receive switch, and headphone jack. The electro-dynamic loudspeaker is built in behind the fabric-covered screen at the right. At the left is the fully calibrated tuning dial and next to it the band-spread dial which moves behind the black framed window. Beneath this window is the tuning control knob.

The band-spread system is of the mechanical type, and continuous in its operation. The single tuning control requires 48 revolutions to tune the main calibrated dial throughout one range. Yet this is a simple and quick operation because the control is of the inertia type which, once twirled, carries on for considerable distance of its own momentum. The band-spread dial which makes accurate logging possible, is also geared to this and its 100-division scale makes one revolution to every two revolutions of the tuning knob.

As an example of the simplicity and ease of tuning afforded by this system, to tune through the 28-30 mc. amateur band requires over five full revolutions of the knob, during which the band spread dial makes something over 2½ revolutions or 265 divisions on its scale. With the knob control so smooth and easy that it permits close adjustment within a small fraction of 1 division on the band-spread dial, the non-critical simplicity of the tuning operation is readily appreciated.

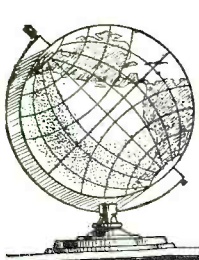
If the inveterate set builder should attempt to construct one of these sets, there are several pointers he should keep in mind. Buy the 1852's well in advance of the time that you will expect to have the set completed, and run the filaments "on" for quite a period of time. This is what is called, "ageing," and will serve to break the tubes in. Next be sure and mount the heating elements of the circuit, such as transformers, resistors, etc., where they have ample ventilation and cannot affect the rest of the parts. Short, extremely short leads are an absolute "must," and the set will refuse to function if there are stray capacities introduced into the circuit. Test all resistors under proper load to eliminate those whose tolerance differs by more than 10% of the rated value. Check voltages. If these instructions are followed, the result should be gratifying.

Antennae are a serious question in obtaining the maximum performance from the ultra high frequencies. Recourse should be had to any of the latest handbook for the very best type of dipole to use. Vertical antennae are best for 42,000 kc and up.




Circuit diagram of the 25-66 mc. receiver.

—30—



# WORLD SHORT WAVE TIME-TABLE

Compiled by the Editors of RADIO NEWS

Hours of transmission for the World's Short Wave Broadcast Stations

HOURS OF TRANSMISSION

8 9 10 11 M 1 2 3 4 5 6 7

EASTERN STANDARD TIME

| *Wave-length Meters* | *Call Letters* | *Frequency Kc.* | *City Country* |
|---|---|---|---|
| 13.93 | W8XK | 21540 | Pittsburgh, Pa. |
| 13.93 | GSJ | 21530 | Daventry, England |
| 13.94 | W2XE | 21520 | New York, N. Y. |
| 13.95 | W2XAD | 21500 | Schenectady, N. Y. |
| 13.97 | GSH | 21470 | Daventry, England |
| 13.99 | DJS | 21450 | Zeesen, Germany |
| 15.77 | HS8PJ | 19020 | Bangkok, Siam |
| 16.86 | GSG | 17790 | Daventry, England |
| 16.87 | JZL | 17785 | Nazaki, Japan |
| 16.87 | W3XL | 17780 | Bound Brook, N. J. |
| 16.88 | PHI2 | 17770 | Huizen, Holland |
| 16.89 | DJE | 17760 | Zeesen, Germany |
| 19.56 | DJR | 15340 | Zeesen, Germany |
| 19.57 | W2XAD | 15330 | Schenectady, N. Y. |
| 19.60 | GSP | 15310 | Daventry, England |
| 19.62 | LRU | 15290 | Buenos Aires, Arg. |
| 19.63 | DJQ | 15280 | Zeesen, Germany |
| 19.65 | W2XE | 15270 | New York, N. Y. |
| 19.66 | GSI | 15260 | Daventry, England |
| 19.68 | TPA2 | 15243 | Pontoise, France |
| 19.71 | PCJ2 | 15220 | Huizen, Holland |
| 19.72 | W8XK | 15210 | Pittsburgh, Pa. |
| 19.74 | DJB | 15200 | Zeesen, Germany |
| 19.76 | GSO | 15180 | Daventry, England |
| 19.79 | JZK | 15160 | Nazaki, Japan |
| 19.82 | GSF | 15140 | Daventry, England |
| 19.84 | HVJ | 15121 | Vatican City |
| 19.85 | DJL | 15110 | Zeesen, Germany |
| 19.88 | RKI | 15090 | Moscow, U.S.S.R. |
| 20.04 | LZA | 14970 | Sofia, Bulgaria |
| 20.08 | PSE | 14935 | Rio de Janeiro, Brazil |
| 20.64 | HBJ | 14535 | Geneva, Switzerland |
| 22.00 | SPW | 13635 | Warsaw, Poland |
| 24.52 | TFJ | 12235 | Reykjavik, Iceland |
| 25.00 | RNE | 12000 | Moscow, U.S.S.R. |
| 25.21 | XEWI | 11900 | Mexico, D. F. |
| 25.24 | TPA3 | 11885 | Pontoise, France |
| 25.27 | W8XK | 11870 | Pittsburgh, Pa. |
| 25.29 | GSE | 11860 | Daventry, England |
| 25.34 | OLR4A | 11840 | Podebrady, Czech. |
| 25.36 | W9XAA | 11830 | Chicago, Ill. |
| 25.36 | W2XE | 11830 | New York, N. Y. |
| 25.40 | 2RO4 | 11810 | Rome, Italy |
| 25.42 | DJZ | 11801 | Zeesen, Germany |
| 25.42 | JZJ | 11800 | Nazaki, Japan |
| 25.45 | WiXAL | 11790 | Boston, Mass. |
| 25.49 | DJD | 11770 | Zeesen, Germany |
| 25.51 | OLR4B | 11760 | Podebrady, Czech. |
| 25.53 | GSD | 11750 | Daventry, England |
| 25.58 | CJRX | 11720 | Winnipeg, Canada |
| 25.60 | TPA4 | 11718 | Pontoise, France |
| 25.60 | CR7BH | 11718 | Lourenzo, Marques |
| 25.63 | SBP | 11705 | Motala, Sweden |
| 25.64 | HP5A | 11700 | Panama, Pana. |
| 25.66 | XTJ | 11690 | Hankow, China |
| 26.01 | SPD | 11535 | Warsaw, Poland |
| 26.24 | COCX | 11435 | Havana, Cuba |
| 26.31 | HBO | 11402 | Geneva, Switzerland |
| 27.17 | CSW | 11040 | Lisbon, Portugal |
| 27.27 | PLP | 11000 | Bandoeng, Java |
| 29.04 | ORK | 10330 | Ruysselede, Belgium |
| 29.24 | PMN | 10260 | Bandoeng, Java |
| 29.35 | PSH | 10220 | Rio de Janeiro, Brazil |
| 30.43 | EAQ | 9860 | Madrid, Spain |
| 30.52 | IRF | 9830 | Rome, Italy |
| 30.81 | CSW | 9737 | Lisbon, Portugal |
| 31.02 | W3XAL | 9670 | Bound Brook, N. J. |
| 31.06 | LRX | 9660 | Buenos Aires, Argentina |
| 31.09 | CS2WA | 9650 | Lisbon, Portugal |
| 31.10 | HH3W | 9645 | Port-au-Prince, Haiti |
| 31.14 | 12RO3 | 9635 | Rome, Italy |
| 31.20 | HJ1ABP | 9616 | Cartagena, Colombia |
| 31.25 | RAN | 9600 | Moscow, U.S.S.R. |
| 31.28 | VK6ME | 9590 | Perth, Australia |
| 31.28 | W3XAU | 9590 | Philadelphia, Pa. |
| 31.28 | VK2ME | 9590 | Sydney, Australia |
| 31.28 | PCJ | 9590 | Huizen, Holland |
| 31.28 | HP5J | 9590 | Panama City, Pana. |
| 31.32 | GSC | 9580 | Daventry, England |
| 31.32 | VKVLR | 9580 | Lyndhurst, Australia |
| 31.35 | W1XK | 9570 | Millis, Mass. |
| 31.37 | OAX4T | 9562 | Lima, Peru |
| 31.38 | DJA | 9560 | Zeesen, Germany |
| 31.41 | W2XAD | 9550 | Schenectady, N. Y. |
| 31.42 | OLR3A | 9550 | Podebrady, Czech. |
| 31.42 | XEFT | 9550 | Veracruz, Mexico |
| 31.45 | DJN | 9540 | Zeesen, Germany |
| 31.48 | W2XAF | 9530 | Schenectady, N. Y. |
| 31.48 | LKC | 9530 | Jeloy, Norway |
| 31.49 | ZBW3 | 9525 | Hong Kong, China |
| 31.51 | OZF | 9520 | Skamlebak, Denmark |
| 31.55 | GSB | 9510 | Daventry, England |
| 31.55 | HJU | 9510 | Buenaventura, Colom. |
| 31.55 | VK3ME | 9510 | Melbourne, Australia |

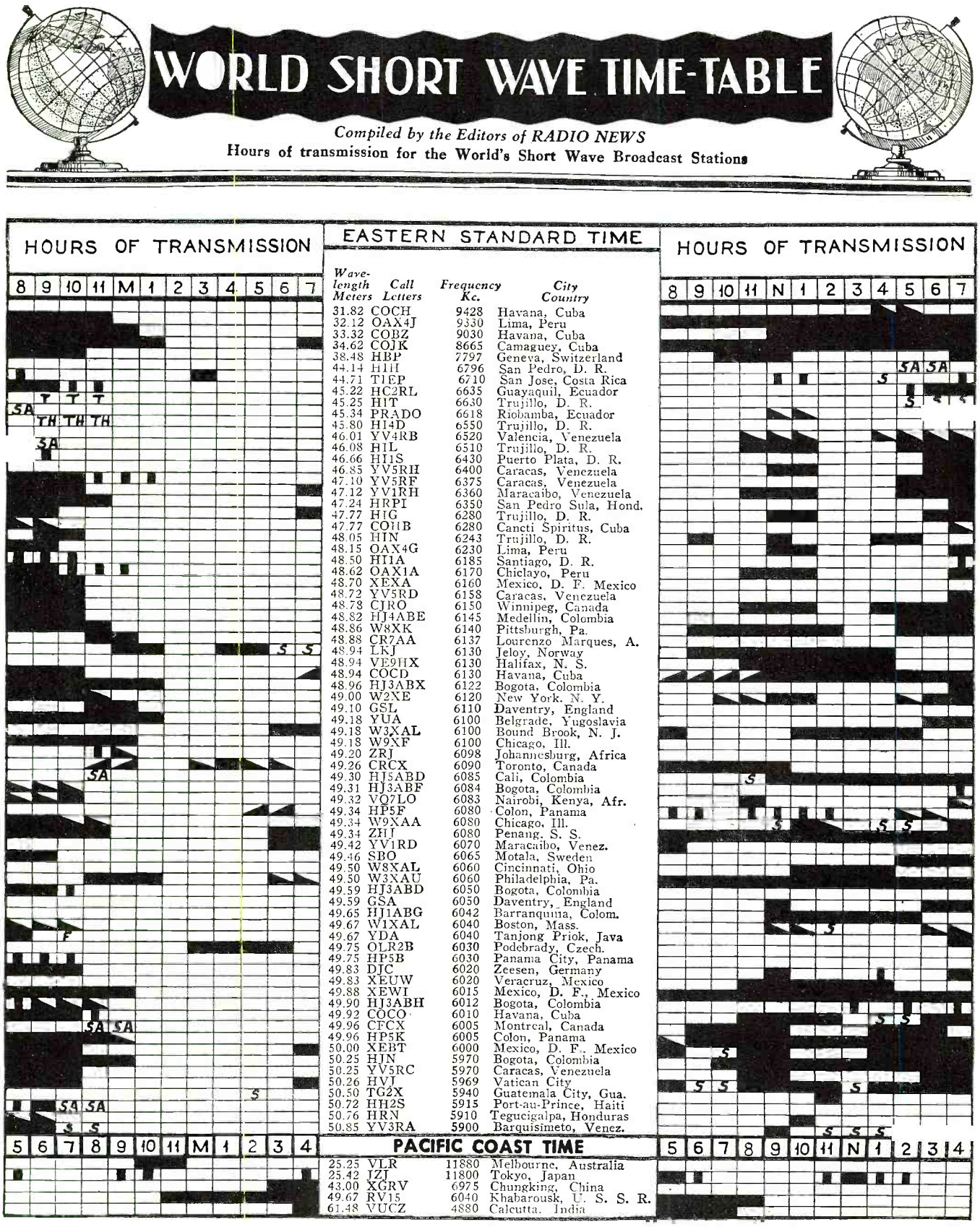
HOURS OF TRANSMISSION

8 9 10 11 N 1 2 3 4 5 6 7

# WORLD SHORT WAVE TIME-TABLE

*Compiled by the Editors of RADIO NEWS*

**Hours of transmission for the World's Short Wave Broadcast Stations**




| Wave-length Meters | Call Letters | Frequency Kc. | City Country |
|---|---|---|---|
| 31.82 | COCH | 9428 | Havana, Cuba |
| 32.12 | OAX4J | 9330 | Lima, Peru |
| 33.32 | COBZ | 9030 | Havana, Cuba |
| 34.62 | COJK | 8665 | Camaguey, Cuba |
| 38.48 | HBP | 7797 | Geneva, Switzerland |
| 44.14 | HIH | 6796 | San Pedro, D. R. |
| 44.71 | TIEP | 6710 | San Jose, Costa Rica |
| 45.22 | HC2RL | 6635 | Guayaquil, Ecuador |
| 45.25 | HIT | 6630 | Trujillo, D. R. |
| 45.34 | PRADO | 6618 | Riobamba, Ecuador |
| 45.80 | HI4D | 6550 | Trujillo, D. R. |
| 46.01 | YV4RB | 6520 | Valencia, Venezuela |
| 46.08 | HIL | 6510 | Trujillo, D. R. |
| 46.66 | HI1S | 6430 | Puerto Plata, D. R. |
| 46.85 | YV5RH | 6400 | Caracas, Venezuela |
| 47.10 | YV5RF | 6375 | Caracas, Venezuela |
| 47.12 | YV1RH | 6360 | Maracaibo, Venezuela |
| 47.24 | HRPI | 6350 | San Pedro Sula, Hond. |
| 47.77 | HIG | 6280 | Trujillo, D. R. |
| 47.77 | COHB | 6280 | Cancti Spiritus, Cuba |
| 48.05 | HIN | 6243 | Trujillo, D. R. |
| 48.15 | OAX4G | 6230 | Lima, Peru |
| 48.50 | HI1A | 6185 | Santiago, D. R. |
| 48.62 | OAX1A | 6170 | Chiclayo, Peru |
| 48.70 | XEXA | 6160 | Mexico, D. F. Mexico |
| 48.72 | YV5RD | 6158 | Caracas, Venezuela |
| 48.78 | CJRO | 6150 | Winnipeg, Canada |
| 48.82 | HJ4ABE | 6145 | Medellin, Colombia |
| 48.86 | W8XK | 6140 | Pittsburgh, Pa. |
| 48.88 | CR7AA | 6137 | Lourenzo Marques, A. |
| 48.94 | LKJ | 6130 | Jeloy, Norway |
| 48.94 | VE9HX | 6130 | Halifax, N. S. |
| 48.94 | COCD | 6130 | Havana, Cuba |
| 48.96 | HJ3ABX | 6122 | Bogota, Colombia |
| 49.00 | W2XE | 6120 | New York, N. Y. |
| 49.10 | GSL | 6110 | Daventry, England |
| 49.18 | YUA | 6100 | Belgrade, Yugoslavia |
| 49.18 | W3XAL | 6100 | Bound Brook, N. J. |
| 49.18 | W9XF | 6100 | Chicago, Ill. |
| 49.20 | ZRJ | 6098 | Johannesburg, Africa |
| 49.26 | CRCX | 6090 | Toronto, Canada |
| 49.30 | HJ5ABD | 6085 | Cali, Colombia |
| 49.31 | HJ3ABF | 6084 | Bogota, Colombia |
| 49.32 | VQ7LO | 6083 | Nairobi, Kenya, Afr. |
| 49.34 | HP5F | 6080 | Colon, Panama |
| 49.34 | W9XAA | 6080 | Chicago, Ill. |
| 49.34 | ZHJ | 6080 | Penang, S. S. |
| 49.42 | YV1RD | 6070 | Maracaibo, Venez. |
| 49.46 | SBO | 6065 | Motala, Sweden |
| 49.50 | W8XAL | 6060 | Cincinnati, Ohio |
| 49.50 | W3XAU | 6060 | Philadelphia, Pa. |
| 49.59 | HJ3ABD | 6050 | Bogota, Colombia |
| 49.59 | GSA | 6050 | Daventry, England |
| 49.65 | HJ1ABG | 6042 | Barranquina, Colom. |
| 49.67 | W1XAL | 6040 | Boston, Mass. |
| 49.67 | YDA | 6040 | Tanjong Priok, Java |
| 49.75 | OLR2B | 6030 | Podebrady, Czech. |
| 49.75 | HP5B | 6030 | Panama City, Panama |
| 49.83 | DJC | 6020 | Zeesen, Germany |
| 49.83 | XEUW | 6020 | Veracruz, Mexico |
| 49.88 | XEWI | 6015 | Mexico, D. F., Mexico |
| 49.90 | HJ3ABH | 6012 | Bogota, Colombia |
| 49.92 | COCO | 6010 | Havana, Cuba |
| 49.96 | CFCX | 6005 | Montreal, Canada |
| 49.96 | HP5K | 6005 | Colon, Panama |
| 50.00 | XEBT | 6000 | Mexico, D. F., Mexico |
| 50.25 | HJN | 5970 | Bogota, Colombia |
| 50.25 | YV5RC | 5970 | Caracas, Venezuela |
| 50.26 | HVJ | 5969 | Vatican City |
| 50.50 | TG2X | 5940 | Guatemala City, Gua. |
| 50.72 | HH2S | 5915 | Port-au-Prince, Haiti |
| 50.76 | HRN | 5910 | Tegucigalpa, Honduras |
| 50.85 | YV3RA | 5900 | Barquisimeto, Venez. |

**PACIFIC COAST TIME**

| | | | |
|---|---|---|---|
| 25.25 | VLR | 11880 | Melbourne, Australia |
| 25.42 | IZJ | 11800 | Tokyo, Japan |
| 43.00 | XGRV | 6975 | Chungking, China |
| 49.67 | RV15 | 6040 | Khabarousk, U. S. S. R. |
| 61.48 | VUCZ | 4880 | Calcutta, India |

## LIST OF SYMBOLS

S—Sunday

M—Monday

T—Tuesday

W—Wednesday

Th—Thursday

F—Friday

SA—Saturday

SS—Saturday, Sunday

—Daily

—Irregular

—Daily Except Sunday

—Daily Except Saturday, Sunday

# SHORT WAVE FLASHES

BY CHARLES A. MORRISON

and JOHN D. CLARK

IN order to give complete and useful information, two authorities on short wave conduct this column. Charles A. Morrison supplies information of interest to readers everywhere in his section entitled *Short Wave Flashes—General.* All frequencies in Mr. Morrison's column are in *megacycles* and all time is *Eastern Standard Time.*

John D. Clark conducts his column specifically for short wave listeners residing on the Pacific Coast, where reception differs considerably from the rest of the United States east of the Rockies. Mr. Clark's data is based on reports from listeners in all parts of the Pacific Coast area. In this section of *Short Wave Flashes* entitled *Short Waves for West Coast DX'ers,* all frequencies are also given in *megacycles* but all time is *Pacific Standard Time,* for the West Coast short wave listeners.

## SHORT WAVE FLASHES
by CHARLES A. MORRISON

*Frequency in megacycles* *Time is Eastern Standard*

### Short-Wave International Friendship Programs

FRIDAY, December, 9, or Saturday, December 10, from 2 to 4 a.m., over TI2XD (11.928), of San Jose, Costa Rica.

Sunday, January 15, from 9 to 10 p.m., over OAX4J (9.34), of Lima, Peru.

Saturday, January 21, and Sunday, January 22, from 3 to 4 a.m., over TG2 (6.19), of Guatemala City, Guatemala.

### New Short-Wave Stations
*(On the Air)*

*CHILE*—CB970 (9.715), "Radio Gobierno Servicio. La Voz de Chile," Valparaiso, is operating nightly from approximately 6:30 to 11:30 p.m.

*CHINA*—G. C. Gallagher of San Francisco, California, is hearing XGXA (6.98), location unknown, broadcasting daily from 9 to 10 a.m. . . . H. Orlaw of Vancouver, B. C., Canada, reports XGOX (6.82), Nanking, being heard from 6 to 6:30 a.m. . . . Shokichi Yoshimura, and Akifusa Saito, of Japan, write that XUD (9.56), the Peking Central Broadcasting Station at Peking, is relaying XGAP, from approximately 4 to 9 a.m. daily. The programs consist of recordings and the latest news in English. The announcement in Japanese is "Kochira Wa Pekin Chuwo Kohan Den Dai De Ari Masu."

*COLOMBIA*—HJ3ÇAB (4.841), "Emisora Nueva Grenada," at Bogota, is being heard with good signals until 11:30 p.m. . . . Earl Roberts of Indianapolis, Indiana, reports HJ7EAH (4.89), location believed to be Bucaramanga, being heard nightly to 10:30 p.m.

*CUBA*—A new station located at Holguin, is testing nightly on 6.195.

*DOMINICAN REPUBLIC*—Eric Butcher of San Juan, Puerto Rico, writes he is hearing HI9C (9.10), "Voz de Trujillo," at Trujillo City, irregularly.

*GUADELOUPE*—Eric Butcher of San Juan, Puerto Rico, reports hearing a new station at Pointe a Pitre, Guadeloupe, in the French West Indies, broadcasting all French programs near 6 p.m., on a frequency of approximately 7.2.

*GUATEMALA*—TG3 (2.34), of Guatemala City, is operating on Sundays from 1 to 3 a.m. according to Frank Sekach of Detroit . . . TG25E (5.79), location unknown, but believed to be a portable or mobile transmitter, is being heard irregularly.

*IRELAND*—The new 2,000 watt station at Moydrum, near Athlone, is reported to be completed and awaiting the allocation of official frequencies by the International Broadcasting Union, before taking the air.

*NORWAY*—According to Radio Press Service the new "Norsk Rikskringkasting" short-wave station was inaugurated on October 30, and is radiating special programs for Norwegian residents abroad, nightly from 8 to 9 and from 10 to 11 p.m. on a frequency of 9.53.

*PHILIPPINES*—KZIB (9.503), of Manila, is being heard best between 6 and 7:40 a.m. by west coast listeners.

*SOUTH AFRICA*—Hal Clein of Los Angeles, California, informs me that ZRD (9.72), of Durban, is being heard nightly from midnight to 1 a.m.

*TURKEY*—TAP (9.465), of Ankara, inaugurated on October 29, is now being heard with excellent signals daily from 2:30 to 5 p.m. At irregular intervals and just before sign-off the station identification is given in English as "Ankara Calling."

*VENEZUELA*—The National Radio Club reports YV4RQ (5.02), power 2,000 watts, at Puerto Cabello, is being heard irregularly.

### (Under Construction)

*CHINA*—XMHA, "The Call of the Orient," a broadcast station located at Shanghai, will soon inaugurate a short-wave relay which will operate on the 16 and 19 meter bands.

*CUBA*—Manuel Alvarez is building a short-wave station at Santa Clara.

*CZECHOSLOVAKIA*—Two new 30,000 watt transmitters to be inaugurated soon will operate on 21.64. and 21.565, under the calls OLR7C, and OLR7B respectively.

*LITHUANIA*—A 60,000 watt short-wave transmitter will be put into operation near the first of next year.

*TANGIERS*—A 10,000 watt transmitter will be erected near Tangiers.

### Notes

*AUSTRALIA*—VLR3 (11.88), Melbourne, is in operation nightly from 10 p.m. to 3 a.m. At 3:15 a.m. the station returns as VLR on 9.58. This transmitter is also licensed to operate on 6.14.

*BRAZIL*—PRA8 (6.015), Pernambuco, signs-off at 9 p.m. with a vocal selection by a choir.

*CANADA*—CHNX (6.13), formerly VE9HX, Halifax, Nova Scotia, is being heard regularly from 9 to 10 p.m.

*CANARY ISLANDS*—The Spanish Nationalist programs over EAJ43 of Tenerife, are now being heard on dual frequencies of 10.37 and 7.53.

*COLOMBIA*—August Balbi of Los Angeles, California, reports that HJ7ABD (9.63), of Bucaramanga, has not been heard for several weeks.

*CUBA*—COCA (9.095), Havana, signs-off with "The Indian Love Call"; issues an attractive QSL card promptly in answer to reports . . . COHB, Sancti Spiritus, is temporarily off the air while the power of its transmitter is being increased.

*DENMARK*—The Danish short-wave station has an optional, but little used, frequency of 17.75.

*DOMINICAN REPUBLIC*—Both HIG (6.285), Trujillo City, and HI3U (6.017), Santiago, assure me that they verify all correct reports sent directly to their stations . . . HI1S (6.43), Santiago, transmits a Chinese program irregularly at 7:40 p.m.

*ECUADOR*—HC1PM (5.73), is back on the air and according to announcements operating Monday nights only . . . HCJB (12.46), of Quito, Ecuador, will soon receive a power increase to 5,000 watts if present plans mature.

*ENGLAND*—The following Daventry winter frequencies are now being used: daily, 3 to 5:15 a.m., GSE (11.86); 5:45 a.m. to noon, GSE; 12:20 to 6 p.m., GSA (6.05); 6:20 to 8:30 p.m. and 9:20 to 11:20 p.m., GSL (6.11).

*FRENCH INDO-CHINA*—Radio Hanoi (11.91), is heard with weak signals on the Pacific coast from 3:45 to 4:15 a.m. and with much better signals from 7 to 9:30 a.m.

*FINLAND*—Lahti is not operating on 15.19, according to Hal Clein of Los Angeles, California.

**GERMANY—According to Radio Press Service, all coils enabling reception on short-wave are being forcibly removed from receiving sets in Vienna.**

*HAWAII*—Max Bass of New York City, informs me that reports on the "Hawaii Calls" program sent to commercial station KQH (14.92), of Kahuku, are being promptly verified with attractive QSL cards.

*HOLLAND*—Herbert Campbell of Athens, Pennsylvania, writes that PCJ, Huizen, is being heard irregularly on a new frequency of 21.48.

*INDIA*—The Director of All-India Radio at Delhi, writes that he is indebted to the readers of RADIO NEWS for the valuable data they have been supplying regarding the programs and performance of their stations. However, he feels that not enough importance is attached to the necessity for a *detailed reception report,* without which it becomes difficult to forward a verification, and he requests me to urge that listeners submit as much detailed and accurate data as possible in their reports.

*POLAND*—It is believed that the permanent calls to replace SP19 and SP25, will be SPN and SPM.

*ST. KITTS*—The new call for VP2LO (6.384), is ZIZ. The station operates weekdays from 4 to 4:35 p.m. and on Wednesdays from 7 to 7:30 p.m. The Wednesday night session is sponsored by the Bookers Drug Stores of Demerara.

*SOUTH AFRICA*—The power of ZRK (9.61), Klipheuvel, is soon to be increased to 25,000 watts.

*TURKEY*—TAQ (15.195) was heard with loud signals on Saturday, October 29, from 9 to 9:30 a.m., by August Balbi of Los Angeles, California.

*UNITED STATES*—W3XAL of Boundbrook, New Jersey, is operating on its new frequency of 9.67, nightly from 5 p.m. to 1 a.m. The call W3XL is now being used for all transmissions on a frequency of 6.1 . . . W4XAD (6.425), Gainesville, Florida, operated by the University of Florida, often contacts K4XAO, VE9AU, W4XEZ and W4XDC, between 10:45 and 11 p.m. in connection with collecting of hurricane data . . . The Crosley Radio Corporation of Cincinnati, seeks permission to raise the power of short-wave station W8XAL to 50,000 watts . . . W9XAA of Chicago, Illinois, seeks a voluntary assignment of its license to the Radio Service Corporation of Saltair, Utah . . . The Columbia Broadcasting System has been granted two additional frequencies, namely 9.65 and 6.17, for its short-wave station W2XE of New York City.

*VENEZUELA*—The slogan of YV5RF (6.38), of Caracas, has been changed to "Estudios America."

### Transmissions

*Daily except Mondays*—10 to 10:45 p.m., "The Friendship Hour," over HCJB (12.46), and HC1JB (14.42), of Quito, Ecuador.

*Weekdays*—At 2 p.m., news in French, German and Italian, over GSA (6.05) and GSE (11.86).

*Sundays*—12 midnight to 12:30 a.m., "Voice of Hawaii," over KQH (14.92), of Kahuku, Hawaii; at 10 a.m., church services, over W1XAL (15.13), of Boston, Mass.; from 1:30 to 2 p.m., a program in English, over HVJ (15.12), of Vatican City; from 1:30 to 2:30 p.m., over TFJ (12.235), of Reykjavik, Iceland; at 4:45 p.m., messages from jungle outposts, over VP3BG (6.13), of Georgetown, British Guiana; at 6:20 p.m., "Bulletin Board," over W1XAL (11.79).

*Mondays*—From 6:45 to 8:30 p.m., variety program for North America, over HBL (9.345) and HBP (7.797), of Geneva, Switzerland.

*Tuesdays*—At 8 p.m., *Newark News Radio Club* broadcast, over W2XJI (26.3), of New York City.

*Thursdays*—From 7 to 7:30 a.m., birthday greetings in English, over VUD3 (9.57) and (4.99), of Delhi, India.

*Fridays*—12:15 to 12:30 a.m., "Voice of Hawaii," over KQH (14.92); 12 midnight, NNRC broadcast, over W2XJI (26.3), of New York City.

*Saturdays*—From 9 to 9:30 p.m., "Hawaii Calls," over KQH (14.92).

### Revised Schedules

*ANGOLA*—CR6AA, Lobito, operates Wednesdays and Saturdays from 2:45 to 4:30 p.m. on dual frequencies of 7.177 and 7.614; occasionally on 9.666, according to Hal Clein of Los Angeles, California.

*HOLLAND*—Over PHI (11.73), weekdays except Saturdays 6:15 to 6:45 p.m.; Saturdays 7:15 to 7:45 p.m. . . . over PHI (17.7), Sundays 6:25 to 9:40 a.m., Mondays and Thursdays 7:40 to 8:55 a.m. and Tuesdays, Wednesdays, Fridays and Saturdays 7:40 to 8:40 a.m. . . . over PCJ (15.22), Tuesdays 2 to 3:30 a.m. and Wednesdays 9:30 to 11:30 a.m. . . . over PCJ (9.59), Sundays 1:20 to 1:35, 7:15 to 8:15 and 8:25 to 9:25 p.m.; Tuesdays 1:45 to 2:40, 7:15 to 8:45 and 9 to 10:30 p.m.; Wednesdays 7:15 to 8:15 and 8:35 to 8:50 p.m. and on Fridays 8 to 9 p.m.

*HUNGARY*—over HAS3 (15.37), Sundays 9 to 10 a.m. and over HAT4 (9.125), nightly from 7 to 8 p.m.

*JAPAN*—The schedule for the overseas hours is now as follows: over JZJ (11.8), daily 12:30 to 1:30, 7 to 7:30, 8 to 9:30 a.m., 2:30 to 4, 4:30 to

5:30, and 8 to 8:30 p.m.; over JZI (9.535), daily 2:30 to 4 and 4:30 to 5:30 p.m.; over JVP (7.51), 8 to 9:30 a.m.

*PORTUGAL*—CSW7 (9.735), Lisbon, is now broadcasting to North and South America, daily from 6 to 9 p.m.

*UNITED STATES*—W2XAD (9.55) of Schenectady, New York, is now operating nightly from 7:15 to 10 p.m. . . . W2XE of New York City, is now operating as follows: on 21.57, weekdays 7:30 to 10 a.m. and on Saturdays and Sundays 8 a.m. to 1 p.m.; on 15.27, weekdays 1 to 3 p.m. and on Saturdays and Sundays 1:30 to 2:30 p.m.; on 11.83, weekdays 3:30 to 6 p.m. and on Saturdays and Sundays 3 to 6 p.m.; on 9.65, daily 6:30 to 11 p.m. and on 6.17, daily 11:30 p.m. to 12:30 a.m. . . . W3XL (17.78) of New York City, operates daily 9 a.m. to 11 p.m. and W3XAL (9.67) of New York City, operates daily from 5 p.m. to 1 a.m. . . . W8XK of Pittsburgh, Penna., operates on 21.54, 6:45 to 9 a.m.; on 15.21, 9 a.m. to 1 p.m.; on 11.87, 1 to 11 p.m. and on 6.14, 11 p.m. to 1 a.m.

*VATICAN CITY*—on 15.12, Tuesdays 10:30 to 10:45 a.m. and Sundays 1 to 1:30 p.m.; on 9.55 or 9.66, Sundays 5 to 5:30 a.m. and on 6.19 or 6.03, weekdays except Thursdays 2 to 2:30 p.m.; Mondays, Tuesdays, Thursdays and Fridays 2:30 to 3 p.m. and Wednesdays and Saturdays 3 to 3:30 p.m.

### Frequency Changes

*COLOMBIA*—HJ1ABB variable near 4.776 to 4.797 . . . HJ2ABC back on the air on 4.8 . . . HJ2ABJ to 4.86 . . . HJ3ABD to 4.82 . . . HJ3ABH back to 4.9 again . . . HJ3ABF to 4.851 . . . HJ6ABH to 4.86 . . . HJ6ABU to 5.88 . . . HJ7ABB to 4.76.

*COSTA RICA*—TIEP to 6.696 . . . TILS now on 5.9, heterodyning YV3RA.

*CUBA*—COBC to 9.99 . . . COBX to 9.2 . . . COBZ, variable between 9.015 and 9.027 . . . COCM back on 9.805 . . . COCO to 5.934, below HJ3ABX on 5.99 . . . COCQ now in vicinity of 9.705.

*CURACAO*—PJC2 to 9.1.

*D.R.*—HI9B to 6.67.

*GUATEMALA*—TGQA to 6.4.

*MARTINIQUE* — "Radio Fort-de-France" to 9.705, where it is heterodyned by COCQ.

*NICARAGUA*—YNRF, Managua, to 6.76 . . . YN1GG, now jumping around in the vicinity of 6.46.

*PANAMA*—HP5G, Panama City, back to 11.78.

*PERU*—OAX1A, Chiclayo, reported testing on 12.01.

*VENEZUELA*—YV2RA, San Cristobal, to 5.75 . . . YV3RA, Barquisimeto, to 5.9, where it heterodynes TILS on the same frequency.

### Data

*AUSTRALIA*—VJI (8.82), Cloncurry, contacts base stations 8SI at Wyndham, 8SC at Fort Hedland, 8UB at Kalgoorlie and 8SK at Broken Hill. . . . VK8SK, the Flying Doctor Station at Broken Hill, has also been heard testing with phonograph records on a frequency of 6.69.

*BECHUANALAND*—Herb Allen of Venice, California, writes that ZNB (5.9), Mafeking, is now issuing a fine blue and red QSL card which indicates the station's schedule as daily 6 to 7 a.m. and 1 to 2:30 p.m. As a commercial it communicates with the following interior transmitters: ZNC at Maun, ZNF at Ghanzi, ZND at Tsabon, all on 5.9; ZNG (7.6) at Gaberons, and ZOK (7.8) at Francistown. Reports should be sent to ZNB, c/o Director of Public Works, P. O. Box 106, Mafeking, Bechuanaland Protectorate.

*GUATEMALA*—The *Cleveland Radio Club* informs me that TGS (5.713), "Radioemisoria de la Casa Presidencial Guatemala, operates Wednesdays, Thursdays and Saturdays from 7 to 10 p.m. irregularly; TG2X (5.945), operates Mondays and Thursdays 9 to 10:30 p.m., Saturdays 10 to 11 p.m. and on Sundays from 2 to 5 a.m.

*HAITI*—HH2S (5.955), is issuing a new blue and red QSL card which gives the address as The West Indian Broadcasting Company, c/o Gerald Bourke-Denis, Port-au-Prince; world news in English at 8 p.m. and signs off at 10:15 p.m. with selection "Ave Maria."

*HONDURAS*—HRP1 (6.351), San Pedro Sula, power 100 watts, operates weekdays from 6 to 7:30 a.m. and from 2 to 4 p.m.

*KENYA COLONY*—VQ7LO (6.083), operated by Cable & Wireless Ltd., P. O. Box 777, Nairobi, operates daily from 11:15 a.m. to 2:15 p.m.; weekdays from 5:30 to 6 a.m. and on Tuesdays and Thursdays from 8:15 to 9:15 a.m.

*JAMAICA*—VRR4, a commercial station at Stony

(*Continue DX hunt on page 45*)

# QUESTIONS and ANSWERS

**P. L. S., New Orleans, La.: Every time I insert the receiver plug into the socket, I blow a fuse. Can you tell me what might be the trouble? We have AC at our home.**

Perhaps you are trying to use a DC set across the line. In any event we are not equipped for trouble shooting at this great distance, and suggest that you consult your local serviceman. Do not try to put the set in operation until he has seen it and rectified the trouble.

**G. B., Chicago, Ill.: I have been hearing a frying noise in my receiver for some time, only in the evenings. When I look out of my window I can see one of the insulators on the trolley line is arcing over. I wish to have this trouble rectified. How will I go about it?**

Write to the traction company. If that fails to bring results, write to the Federal Communications Commission, Chicago, Ill. Usually you will find that the trolley company will be more than happy to receive the information and to rectify the condition.

**N. M. L., New York City: I have just purchased a receiver for my car and it contains a band for police signals. I have heard something about having to register this with the local police. Am I right?**

As far as we know all receivers using a band capable of receiving police signals have to be registered with the local police and permission obtained to have them in a car. We suggest that you contact your local precinct police captain for full information.

**R. J. Q., Racine, Wis.: I want to learn the radio trade. Can you suggest a good way for me to do it? I am 18 years old.**

Probably the best way is to join the Army, if you are a citizen of the U. S. They have a very fine school, and will give you fine training. Barring that, the best way is to contact any of a number of radio schools, and take the matter up with them.

**P. O. T., Tucson, Ariz.: I have built me a "Treasure Hunter" similar to that described in RADIO NEWS. Now a friend of mine tells me that I must obtain a Federal License. Is this true?**

The matter is under advisement with the Federal Communciations Commission at the present time. We suggest that you write them at Washington, but we do not think that you will be required to obtain any license as long as you use the "Hunter" properly.

**R. M. M., Peoria, Ill.: When and where was the last allocation convention held?**

In Cairo, Egypt, during the months of February and March, 1938.

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# SPECIAL BROADCAST PROGRAMS FOR THE DX FAN

LISTED below are the special DX broadcast programs and frequency monitoring periods dedicated to the various DX Clubs and to RADIO NEWS. The schedule has been arranged for quick and easy reference. The initials of RADIO NEWS and the DX clubs are given at the end of the program, indicating the organization receiving the dedication. The schedule is shown in Eastern Standard Time and all hours are a.m. unless otherwise indicated.

Tune in on these special broadcasts and do not fail to send in your report to the station. Give them complete information. Practically all of the stations listed will be pleased to verify reports.

### DECEMBER

| Day | Call | Kc. | Hour | Power Kw | Ded. |
|---|---|---|---|---|---|
| 9 | WBTM | 1370 | 4:00-4:20 | .1 | RN |
| 9 | KWYO | 1370 | 5:30-5:45 | .1 | RN |
| 9 | WRAK | 1370 | 4:20-4:35 | .1 | RN |
| 10 | WGAR | 1450 | 3:50-4:05 | .5 | RN |
| 11 | CJCJ | 690 | 3:30-4:30 | .1 | NRC |
| 12 | WAIR | 1250 | 5:20-5:40 | .1 | RN |
| 12 | KVOX | 1310 | 4:20-4:35 | .1 | RN |
| 12 | CKCH | 1210 | 3:00-4:00 | .1 | NRC |
| 12 | CFAR | 1370 | 2:00 | .1 | NRC |
| 13 | KGMB | 1320 | 5:35-5:50 | 1. | RN |
| 14 | KAND | 1310 | 3:40-4:00 | .1 | NNRC |
| 14 | KDAL | 1500 | 4:35-4:50 | .1 | IDA |
| 14 | CHWK | 780 | 3:45-4:15 | .25 | RN |

### PERIODIC PROGRAMS

Every Sunday, station CKWX, Vancouver, B. C., 1010 kc.-.1 kw. broadcasts a special DX program from 3:01 to 4:30 a.m.

Station WPAY, Portsmouth, Ohio, 1370 kc.-.1 kw. will broadcast the NRC and Tips that are sent in from all radio clubs the first of every month from 4:00-4:30 a.m.

Station WJBO Baton Rouge, La., 1120 kc.-.5 kw. will broadcast special tip period for the NRC on the first and the third Sunday morning of the month, throughout the DX season, from 2:00-4:00 a.m.

Radio Station KBIX, Muskogee, Oklahoma, 1500 kc.-100 w., broadcasts two special DX programs each month. On the second Saturday of the month at 5:00 to 5:15 a.m. the FCC frequency monitor schedule is broadcast, on the fourth Saturday of the month at 5:00 to 5:30 a.m. a DX broadcast is also made. These broadcasts are arranged and announced by Lester Harlow, chief engineer of KBIX. At the present time all DX reports received are verified.

Special—Station PRF3 on 960 kc. Sao Paulo, Brazil, S. A., will transmit on January 22, 1939, a special for the NRC and NNRC clubs from 2:00 to 3:00 a.m. EST.

### NEW STATIONS AND REVISIONS

| Call | Kc. | Location | Power Kw. |
|---|---|---|---|
| WCOS | 1370 | Columbia, S. C. | .1N—.25DT |
| WPIV | 1210 | Petersburg, Va. | .1N—.25DT |
| WTMA | 1210 | Charleston, S. C. | .1N—.25DT |
| WTRY | 950 | Troy, N. Y. | 1. |
| KUWC | 1500 | Vernon, Tex. | .1 unl. |

**Granted License for Power Change and Time**

KINY, 1310 kc., Juneau, Alaska, to 1430 kc.
WJAC, 1310 kc., Johnstown, Pa., to 1370 kc.
WFOY, 1210 kc., Augustine, Fla., to 1220 kc.
WCBS, 1420 kc., Springfield, Ill., to 1290 kc. unl.
WSLI, 1420 kc., Jackson, Miss., to operate new station .1—.25 D. unl.
WLAK, 1310 kc., Lakeland, Fla., .1—.25. 1. kw. D. and N.
WMBR, 1370 kc., Jacksonville, Fla., to 1120 kc.
WTHT, 1200 kc., Hartford, Conn., .1 N.—.25 D.

Radio Station KTUL, Tulsa, Oklahoma, 1400 kc. will soon take to the air with increased power to 5,000 w. day, 1,000 w. night, using the first Western Electric 5,000 w. Doherty circuit transmitter to be built. Their transmitter is to be located near Turley, Oklahoma, north of Tulsa.

Radio Station KOME, new 250 watter in Tulsa, to operate on 1310 kc., daytime only, will go on the air as soon as KTUL places their new transmitter in operation. They are going to use the old KTUL transmitter site and antenna. This should be a good catch for DX fans. James Manship is the chief engineer.

Radio Station KOCY, formerly KFXR, in Oklahoma City, have moved their transmitter from its old location to the Plaza Court location of its studios. This station operates on 1310 kc. with a power of 100 w. (250 watts LS).

### NOTES FROM READERS AND DX CLUBS

*The Newark News Radio Club* announces a series of twice-weekly programs over the experimental station of WOR, Station W2XJI, which operates on 26.3 megacycles with a power of 100 watts. These transmissions will be broadcast every Tuesday evening at 8 p.m. and every Friday night at 12 midnight. They should be of interest to all observers and the NNRC and the station, will be interested in your report.

Observers on the eastern seaboard are reporting good reception conditions, DX fans in the south, write in that conditions are only fair, while some reporters in the middle west, say reception is N.G., but in looking over their catches for the past month, they would indicate that they are doing all right by their stations.

We are indebted to the National Radio Club for the latest allocations of the Havana Stations. A shift in frequency has been ordered for all of the Havana stations to conform in part with the North American Regional Pack agreed upon last winter. Following is the list of stations and the new frequency.

| | | | | | |
|---|---|---|---|---|---|
| CMCD | — 550 | CMOA | — 910 | CMX | — 1260 |
| CMCY | — 590 | CMBZ | — 940 | CMCG | — 1290 |
| CMCD | — 630 | CMCK | — 970 | CMBQ | — 1320 |
| CMCR | — 660 | CMQ | — 1010 | CMCA | — 1350 |
| CMBG | — 690 | CMCP | — 1050 | CMCW | — 1380 |
| CMK | — 720 | CMBX | — 1080 | CMCQ | — 1410 |
| CMBL | — 750 | CMCJ | — 1110 | CMBY | — 1440 |
| CMCU | — 780 | CMBC | — 1140 | CMCX | — 1470 |
| CMCF | — 810 | CMBS | — 1170 | CMOX | — 1500 |
| CMCM | — 850 | CMCO | — 1200 | CMC | — 1530 |
| CMW | — 880 | CMBC | — 1230 | CMBF | — 1560 |

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**DX HUNTERS!**
**Send in your dx list.**

## Short Wave Flashes

(Continued from page 43)

Hill, works Hialeah, Florida, intermittently between 3 a.m. and 1 p.m.

*MADAGASCAR*—CR7AA (6.137) and CR7BH (11.718), of Laurenco Marques, operate simultaneously from 12 to 1, 4:30 to 6:30, 9 to 11 a.m. and from noon to 4 p.m., and on Sundays from 5 to 7 and from 10 a.m. to 2 p.m. CR7AA has been testing a new 500 watt transmitter on 3.495.

*MEXICO*—August Balbi of Los Angeles, California, writes that XEBR (11.82) is back on the air and operating daily from 9 to 11 a.m. and 9 to 11 p.m., or later. XEBR is located at Hermosillo.

*NEW ZEALAND*—2ZB (6.96 and 3.48), power 200 watts, Wellington, operates nightly from midnight to 7 a.m. The station identification is given at 3 a.m.

*NICARAGUA*—YNRF (6.76), Manague, operates nightly 7 to 11 p.m., and signs off with the selection "La Golondrina"; news in English at 10:55 p.m.

*SWITZERLAND*—HBQ (6.675), Geneva, broadcasts Sundays from 1:45 to 2 p.m.

*SUMATRA*—YDX (8.09), a recently inaugurated 500 watt transmitter located at Medan, relays the NIROM Javanese network weekdays from 10:30 p.m. to 2 a.m. and on Sundays from 7:30 p.m. to 2 a.m. On a frequency of 5.175 the station operates daily from 8:30 to 10:30 a.m.

### Amateur Reception Notes

*CHINA*—Ashley Walcott of San Francisco, writes that XU8RJ replies with a small green QSL card, rounded on the edges, somewhat of a curiosity. His 80 watt rig was built in Shanghai and the aerial is a *SIK*. XU8MC is about a mile away and has a power of 135 watts. XU8ET is about 7 miles down the river and runs about 60 watts. XU8RJ appreciates reports on reception of his signals, especially from East Coast listeners.

*DUTCH GUIANA*—Reports to amateur station PZ1AA (14), operated by Gouvernments Radio Dienst at Paramaribo, some of them more than two years old, are at last being verified. The QSL card pictures the transmitter and flag of the country.

*DUTCH NEW GUINEA*—PK6XX (14.007), amateur base-station of the Archbold Expedition at Hollandia, is still being heard almost nightly from 1 to 3 a.m. At 2:30 a.m. PK6XX contacts the five watt portable transmitters of the advance party, on a frequency of approximately 6.52.

*LABRADOR*—Thos. Cunningham, operator of VO6D, "Six-Ducks," in Labrador all last winter, now back in Montreal, writes that he has already sent out 2000 QSL cards. Neither he nor VO6J will return to Labrador this winter. VO6B will still be on the air in Labrador.

*MALTA*—The *Newark News Radio Club* informs me that the following amateur stations are in operation in Malta: ZB1R (14.3-14.03), 80 watts; ZB1L (14.14); ZB1J (14.032); ZB1H (CW only); ZB1S (14.36), (CW only); ZB1U (14.3), (CW only), and ZB1E. All Malta amateurs with the exception of ZB1H, ZB1J, ZB1R and ZB1U are limited to 30 watts power.

*SWITZERLAND*—Amateur station HB9L, "Radio Club Schaffhausen." Schaffhausen, is on the air Mondays at 4 p.m. on the 20, 40, and 80 meter bands, and on Sundays at 2 p.m. on the 40 meter band, playing records.

*UNITED STATES*—It is reported that W1OXAB, amateur station of the MacGregor Arctic Expedition, has at last arrived safely in the United States.

*YUGOSLAVIA*—Although amateur activities are forbidden by government regulations the following amateurs are on the air: YU7AY, operated by Ivo Bricelj, 3 Koblarjeva, Ljubljana; YU7DX (14.395), 150 watts on phone; YU7AU (14.388), 30 watts on CW mostly; YU7AL (14.28), 200 watts on phone and YU7TE, with 25 watts on phone. Reports to any of the above stations can be sent to Ivo Bricelj at the address given above, but they must be sent under cover and no mention of call letters be made.

### Last Minute Notes

Roger Legge of Binghamton, New York, sends the following list of revised calls for the Colombian stations: HJ3CAH (4.895), Bogota (ex-HJ3ABH); HJ2BAJ (4.865), Santa Maria (ex-HJ2ABJ; HJ3CAF (4.855), Bogota (ex-HJ3ABF); HJ3CAB (4.845), Bogota (ex-HJ3ABD); HJ2BAC (4.815); Cucuta (ex-HJ2ABC); HJ6FAC (4.795), Ibague (ex-HJ6ABC); HJ7GAB (4.775), Bucaramanga (ex-HJ7ABB); HJ3CAX (6.02), Bogota (ex-HJ3ABX).

SHORT WAVES IN THE WEST
*(All Times Are PACIFIC STANDARD)*
by JOHN D. CLARK

THE past thirty days have witnessed some of the year's most surprising frequency shifts and reception changes.

After almost nine years of daily operation on 4.27 meg., station RV15 of Khabarovsk, U.S.S.R., provided one of the major bits of news this month when it suddenly abandoned this frequency and reappeared on approximately 6.05 meg. with tremendous volume. For a few days 6.85 meg. was used simultaneously with the new wave, but as we go to press this higher frequency seems to have been released.

Since RV15 announces only in Russian and Chinese, it is not yet known whether the station will remain permanently on 6.05 meg., or whether it will return to 4.27 meg. At present its broadcasts are being received in all parts of the Pacific Coast with tremendous volume from 11 p.m. to 8:30 a.m. daily. As a matter of fact, RV15 is probably the strongest short wave broadcast station ever heard by listeners in the western United States.

### Australia

Another startling change in frequency for VLR of Melbourne finds the evening broadcasts of Australian network programs on 11.88 meg. instead of 9.58 meg. for the first time in many years. These transmissions take place daily except Saturday from 10 p.m. to midnight. A shift back to 9.58 meg. is effected at 12:30 a.m.

### China

Advices from Chungking (new capital of China) indicate that a station XRVG on 11.418 meg. is now broadcasting news of the Far East in English and French from 4 to 4:30 a.m., and from 9 to 9:30 p.m. daily.

The Chinese Government has also placed a new 3.500 watt broadcaster in operation on an announced wavelength of 43 meters (6.975 meg.). A female announcer gives advance program details in English just before the station closes down at 7:20 a.m. with the Chinese National Anthem. Reception is very good.

Still another Chungking station has been reported irregularly between 2 and 6 a.m. on a varying frequency near 9.20 meg., but volume is considerably weaker than on the 43 meter band.

### India

Station VUC2 of Calcutta, India, has evidently

increased power, and is now sending its signals to the west coast with surprising volume between 4 and 8 a.m. The transmitter employs a frequency of 4.88 meg., and news bulletins in English are released daily from 7:15 to 7:30 a.m.

VUD2, Delhi (4.99 meg.); VUB2, Bombay (4.90 meg.); and VUM2, Madras (4.95 meg.), are on the air at the same hour, but are considerably weaker than the Calcutta broadcaster.

VUD3 of Delhi, India, has also greatly improved its signals, and is now reported regularly by Pacific Coast listeners on 15.16 meg. from 5:30 to 7:30 p.m., although volume begins to weaken after 6:30. Programs consist almost entirely of native music. On several occasions recently, JZK, which operates on the same frequency, has been testing with KWE near 6 p.m., and blocking the Indian broadcaster almost completely.

### Japan

As predicted last month, the Broadcasting Corporation of Japan has replaced JZK (15.16 meg.) with JZJ (11.8 meg.) for the daily Overseas Broadcast between 9:30 and 10:30 p.m.

The same shift was made for the transmission between 5 and 5:30 p.m., with the result that reception on America's west coast has been considerably weakened at this hour. JZK will not be used for broadcasting again until next spring.

JIB of Taihoku, Formosa, is now remaining on the air until 7:15 a.m., signing off at that time with the distinct announcement "J-F-A-K . . . J-F-A-K." JFAK is the long wave station which is relayed by JIB from 5 to 7:15 a.m.

### Philippines

An experimental short wave transmitter has been relaying the programs of Manila's KZRG on approximately 9.50 meg. The broadcast ends at 5:30 a.m. with the following announcement, "You have been listening to a program of dance music from the Universal Hotel in Manila. OK, studio, take it away . . ." Volume is excellent.

Station KZRM "Radio Manila," is now remaining on the air until 7 a.m. The frequency of 9.57 meg. is the same as that used by W1XK of Springfield, Mass., and the American station usually causes serious interference between 4:30 and 6 a.m.

### Hawaii

The "Hawaii Calls" programs have been relayed to America through stations KQH (14.92 meg.) and KKH (7.52 meg.). As we go to press. the time for this transmission is 9 to 9:30 p.m., Saturday, but the exact schedule is subject to change without notice. Both KKH and KQH are heard in all parts of the Pacific Coast with good volume.

### Straits Settlements

Singapore is now calling on 6.175 meg. regularly, and the 9.69 meg. frequency seems to have been abandoned until next spring. Volume is not as strong as it was on the higher frequency, but should improve during the next month. Schedule is 3:40 to 6:40 a.m.

ZHJ of Penang (6.06 meg.) is again being reported near 4 a.m., after a silence of several months, and ZGE of Kuala Lumpur is also making itself audible near the same hour, but on an apparent new wavelength of 6.24 meg.

### Late Western Tuning Tips

*CHILE.* A new Spanish speaking broadcaster, announcing as Valparaiso and Santiago, has been reported on 9.73 meg. from 6 until about 10 p.m. irregularly.

*SWITZERLAND.* A new station located somewhere in Switzerland is working on about 9.535 meg. (just slightly higher in frequency than New York's W2XAF) from 5 to 6 p.m. daily except Sunday.

*FIJI ISLANDS.* "Radio-Suva" has added three new frequencies of 6.13 meg., 11.90 meg., and 15.16 meg., and has increased power to 10,000 watts, according to an announcement from the station. As yet, no reports have been received on any of these new frequencies, and "Radio Suva" is still operating on 9.54 meg. from 2:30 to 4 a.m.

*RANGOON, BURMA.* A Government experimental station XYO, located in Rangoon, Burma, may be heard with weak volume on 6.007 meg. from 4:30 to 6:30 a.m. daily. A powerful code transmitter sometimes blocks this Burma station for almost an hour at a time, however.

*PAPEETE, TAHITI.* After being unreported for several months, station FO8AA, of Papeete, Tahiti, Pacific Islands, is again being received on approximately 7.10 meg. Programs of recorded music are released from 8:30 to 9:30 or 10 p.m. every Tuesday and Friday. Announcements are entirely in English.

*BANKOK, SIAM.* The regular Monday transmission from HS8PJ of Bankok, Siam, is now being released on 15.53 meg. from 5 to 7 a.m. Although no announcement has been made, it is expected that the frequency will be lowered still further during the winter months. Thursday's transmission during the same hours will continue to be broadcast on 9.51 meg.

*CHINA.* Station XTJ of Canton, China, has been broadcasting on 11.70 meg. near 4:30 a.m. irregularly. It is not yet known whether these are just test transmissions, or whether a regular broadcasting schedule will be adopted in the near future. XTJ is still used for phone work between 5 and 6 a.m.

### Miscellaneous

Our listeners tell us that YDA of Batavia, Java. is now being heard well on the extremely low frequency of 3.04 meg. from 3 to 7 a.m. . . . HH2S of Port au Prince, Haiti, is now audible on the Pacific Coast, and is broadcasting an English program on 5.96 meg. from 5:30 to 6.45 p.m. daily. . . . W3XAL of Boundbrook, N. J., is being heard well on the west Coast in the evenings, using its new frequency of 9.67 meg. . . . W9XA of Kansas City, Mo., will soon start a pick-up and rebroadcast of the programs of KSL in Salt Lake City on 26.45 meg. . . . HP5G of Panama City has returned again to 11.90 meg. after having shifted several times between that wave and 11.78 meg. . . . "Radio Hanoi" of Hanoi, Indo-China, has again abandoned its 7.44 meg. frequency. Listeners now report this one on both 9.51 and 11.90 meg. irregularly between 3 and 7 a.m.

### Trans-Pacific Reception

Since the primary interest of most short wave fans seems to be reception from stations in the South Pacific and the Far East, it might be well to mention that more than 90% of such reception is now available during the hours between 5 and 7 a.m. Not only are trans-Pacific broadcasts stronger at that hour, but stations are far more numerous than at any other time of day.

On the extremely low frequencies, the Dutch East Indies are represented by YDA on 3.04 meg., YDE2 on 4.82 meg., PMY on 5.14 meg., and YDX on 5.17 meg. In addition, from 3 to 6 unidentified Javanese broadcasters have been reported near the frequency of YDE2.

Four Indians, VUC2 of Calcutta, VUB2 of Bombay, VUD2 of Delhi, and VUM2 of Madras are clustered between 4.85 and 5.00 meg., but VUC2, on 4.88 meg. is by far the strongest.

Moving gradually up the dial, there are some weak signals from Rangoon, Burma, on 6.00 meg., and from ZHJ of Penang, Straits Settlements, on 6.08 meg. Midway between these two is the powerful RV15 on its new wave of approximately 6.04 meg., coming through with enough volume to shake the antenna masts.

On 6.16 meg. is another weak broadcaster which may be identified with difficulty as VPB of Colombo, Ceylon, and 10 kc. higher, on 6.17 meg., is Saigon, Indo-China, another weak sister, VPB usually leaves the air at 6 a.m., while Saigon completes its transmissions at 6:30.

On 6.175 meg., so close to Saigon that a heterodyne is usually audible and troublesome, is ZHO of Singapore on its new wavelength, broadcasting until 6:40 a.m. daily. At times ZHO is responsible for some fairly good results, and is usually considerably stronger than the other Straits Settlements station ZGE on 6.24 meg.

Below the 49 meter band tune in PMH of Bandoeng, Java, which carries programs of native eastern music with good volume on 6.72 meg., while the surprisingly strong new Chinese transmitter is sending its special broadcasts to America on 6.98 meg.

The 31 meter band is fairly flooded with Asiatics near daybreak. A station XGX is audible irregularly on 9.20 meg., while the extremely powerful phone signals of Java's PLV usually occupy 9.42 meg. from 6:30 to 7. HS8PJ of Bankok, Siam, is very good on 9.51 meg. every Thursday, and other transmitters which put in their daily appearance on this band include ZBW of Hongkong on 9.53 meg.; YDB of Batavia, Java, on 9.55 meg. (relayed by PLP on 11.00 meg. and PMN on 10.26 meg.); KZRM of Manila on 9.57 meg.; VLR of Melbourne, Australia, on 9.58 meg. (signs off at 5:30); VUD2 of Delhi, India, on 9.59 meg.; ZRK of Johannesburg on 9.61 meg.; JFO of Taihoku, Formosa, on 9.62 meg. (relayed by JIB on 10.53 meg.).

—30—

**Marine Transmitter**
(*Continued from page* 13)

tirely to the modulator and audio sections and the small cans are those containing the audio and output transformers. By using metal tubes, shield-

ing is unnecessary, even though they are in the direct field of the r.f. coil.

The output of the r.f. section of the transmitter is 15 watts, which is 100% modulated by the 6L6 tubes. Due to their small grid drive requirements, it is necessary only to use two in parallel to modulate this transmitter, and the input is taken directly from a single button type of microphone directly through a transformer to the grids, which are connected in parallel. Current for the microphone is supplied by dropping a portion of the 6 volts used for the filament through a resistor and hence into the microphone button, and there are no batteries used in the entire installation. The two 6L6 tubes, which are operated in Class A, simplify the problem of power supply design as the current to these tubes is steady and does not affect the regulation from the power supply to any degree.

### The Receiver

The receiver, like the transmitter, embodies fixed frequency control by means of four crystals. These are placed in the usual oscillator circuit and there is no tuned coil located in the receiver oscillator portion of the 6A8 tube. Two stages of i.f. are used to insure adequate selectivity in that circuit, and also to provide enough gain to drive the output tube to good advantage.

The tube line-up for the receiver is as follows: a 6K7 as an r.f. amplifier; a 6A8 as a combined detector and oscillator; two stages of i.f. amplification using 6K7 tubes, which feed into a combined detector and automatic volume control tube, 6Q7; the output uses a single 6F6 audio pentode which drives the speaker to full output. Reference to the illustration showing the front view of the transmitter discloses that there is only one control located on the receiver portion, and this is for audio volume only. All of the circuits are pretuned to the frequencies used.

The circuit in the receiver is entirely conventional and has the usual automatic volume control features, but instead of using variable condensers to tune the r.f. and first detector portions, these are supplanted by the small semi-variable type which are permanently placed in connection with the four point selector switch across the various coils. Each condenser is tuned to one frequency and once adjusted remains in that position until such time as it is necessary to change the frequency. Amateurs will find this schematic very interesting from the standpoint of rapid frequency selection and would be ideal when building a receiver to cover several frequencies within one band from a remote position such as would be found in a mobile unit installation.

The i.f. transformers are on the rear edge of the chassis with their associated tubes placed directly inbetween. Also the four receiving crystal holders and their associated switch. These are so mounted that very short leads are provided to the oscillator section of the 6A8 tube. Along the left-hand edge of the chassis are the padding condensers used to tune the various circuits. These condensers are locked in place once the setting has been determined.

The intermediate frequency used in a receiver of this type, of course, will be determined by the frequency desired to be covered. For the amateur bands this would be an i.f. of approximately 465 kc. if the receiver is used for the lower frequencies, say 1600 kc. to 4.3 megacycles for the higher frequency bands such as 5 and 10 meters.

Although there are no 5 meter crystals available, it would be quite possible to construct a 10 meter mobile unit utilizing 10 meter crystals for use in the various circuits as shown. A choice of four or more crystal frequencies could then be built into the receiver and a control placed on the dashboard of the auto so that the selection of any frequency as contained could be selected by means of push buttons or some type of a selector switch in connection with a tuning motor located at the receiving end.

All cabled leads are bonded thoroughly in this receiver so that stability will not be affected by movement of parts. This is very important wherever vibration is encountered, as most certainly would be found in a ship or small boat plying rough wa-

ters. In building, the amateur very seldom thinks of the bonding of leads as being important, but if one has built and serviced this type of equipment he can well understand why this is so.

—30—

## RADIO NEWS SEALS OF ACCEPTANCE NOW READY FOR DISTRIBUTION

ANNOUNCEMENT is made that the RADIO NEWS Seals of Acceptance are now ready for distribution. More than fifty different radio articles are waiting to be checked.

Seals are awarded to those manufacturers whose products exactly measure up to the claims they make for them. The Seals are given out free as a service alike


to the buyers and manufacturers. The former can purchase knowing that an impartial source has checked the product against claims made for it, while the latter has the opportunity of getting an unbiased opinion on the article.

For further information, write to the RADIO NEWS Seal of Acceptance Div. 608 S. Dearborn St., Chicago, Ill.

Hereafter each month this Division of the publication will carry a list of products on which Seals have been awarded.

—30—

## NAT. QSO PAGE
(*Continued from page* 25)

ing from its high technical standards, be safeguarded at all times.

(4) That, due to the unsympathetic attitude towards amateur radio prevailing among European governments, which makes it unlikely that we shall ever obtain satisfaction by direct participation in foreign conferences. insofar as is possible, money spent to protect or to acquire amateur frequencies should be spent within the boundaries of the United States.

(5) That the livelihood provided by the League Headquarters to a number of persons should not be jeopard-

(*Concluded on page* 60)

## Earshot of the Editor
(*Continued from page* 4)

geous to change the broadcast frequencies to below 50 meters.

Of course the super-power bugaboo has been blasted and the modern trend in broadcasting is towards more and more power. 500 kilowatt stations are not a rarity, and there is great possibility that the radio stations of the future will use still greater power.

In fact, if the dictators are to surmount the cacophony of their own ilk, if the purveyors of seeds of murder, hate, and oppression are to succeed in furthering their rotten ends, then they will have to have super-super power. A mega-watt (million watts) station, or series of them is not unlikely.

The one bit of "blue sky" in the whole clouded picture is that we still have our AVC circuits and our switches which can cut the wildest roaring dictator to the size of a mouse, and can even completely eliminate him. For this much thanks to the radio engineers.

* * *

IT SEEMS to us that the amateurs did themselves a great harm when they requested that the Federal Communications Commission move their television from the present ham bands to below 2½ meters. The only peg on which the ham has hung his hat, lo these many years, has been the advancement that he has contributed to the general radio art.

It is the ham who rightfully takes much of the credit for developing the use of the ultra-high frequencies. It is the hams who have shown that collectively they are fairly good engineers, and most of all, the ham ranks have served as the melting pot from which many of our finest professional engineers have arisen.

Faced with the chance to do a "repeat performance" with television, given the opportunity to make the whole nation "ham" conscious by his development work in the video field, the amateur turned a deaf ear and a blind eye to the situation and selfishly refused his chance.

There are those who will argue that the ham should not develop something by which the commercials make money. There are those who will say that we, as hams, got the "dirty end of the stick" last time. And there are those who say that there is not any interest in ham-television. All of them are wrong. It makes little difference whether we did get the "dirty end of the stick," whether we did let the commercials realize financially on our development. What is most important is that *we are still here,* with the greatest amount of freedom that any body of amateurs enjoy anywhere on the face of the globe. True, our status is now being seriously challenged, but equally true it is that there seems to be just cause for such a challenge.

And figure it from the other end.

Suppose that we had asked (and there is every reason to suppose that the F.C.C. would have granted the request, at least temporarily—) that the licensed hams be permitted to rebroadcast any and all commercial programs we "see." Most of the commercial receivers equipped for television cover 42-80 mc., and that includes the 56 mc. band, and our rebroadcast would be on that band.

What would have been the result? Why, many, many homes outside the normal range of the few commercial television transmitters would have been able to have their programs. Would the sellers of television sets object? Certainly not! Here would be a chance to sell many more television receivers than is possible today or for some time to come. Would the public have been grateful? Well, we think that they would have been so grateful that they would not let their Congressmen, Senators or even the F.C.C. put the ham off the air.

That is the chance that the ham has muffed. It is not too late to make a change. We urge that all radio amateurs think it over, and talk it up. Don't pass up a chance to make the U. S. Public thoroughly amateur conscious!

* * *

WE have added to our technical staff, Mr. Oliver Read, W9ETI, formerly Chief Engineer Amateur Division of Utah Radio Products Co. has joined with RADIO NEWS as Tech-

(*Continued on next page*)

## CASH PRIZE CONTEST

(*Continued from page* 14)

for connections, nails, etc., may be omitted, but panels, woods, and wire used in coils (unless manufactured complete) must be given. The list shall be written in ink or typewritten double spaced on white paper the same size as that of the diagrams.

(e) A description of not more than 500 words fully describing the article, how it was built and its best features. This to be written in ink or typewritten double spaced on white paper 8½"x11".

4. You may submit as many complete entries as you wish, but each must contain the 5 units above mentioned. The entry must concern itself with any radio, serviceman or allied equipment.

5. You may cooperate with a photographer, who may be an amateur or professional, but the name of the photographer must appear on the photographs.
   (a) If the photographer is to share with you in the prize money, if you win, this must be stated on the back of the photograph.

6. Each unit, except the entry blank, must bear your name, address and call (if any). Place this information in the upper right hand corner of each sheet.

7. If return postage is included all losing entries will be returned, otherwise they will be destroyed. All winning entries become the property of Ziff-Davis Publishing Company.

8. The judges will be:
   B. G. Davis, Editor, RADIO NEWS.
   Ulmer Turner, W9UG, *Chicago Herald & Examiner.*
   Oliver Read, Technical Associate, RADIO NEWS.
   (a) The decision of the judges will be final, and all entrants agree to be bound by their decisions.

9. The prizes will be:
   $100 in cash, FIRST PRIZE.
   $25 in cash, SECOND PRIZE.
   $5 in cash for 3rd to 12th Prizes,
   Ten $2 Prizes for honorable mentions, and
   $5 in cash for the booby prize for the silliest article.
   (a) In the event of a tie, duplicate prizes will be awarded.

10. All entries must be post-marked not later than January 31, 1939. No correspondence with the entrants can be entertained.

11. The article which is the subject of the entry, must have been built by the entrant, or for the entrant. It cannot be a manufactured instrument. Articles made up from manufacturers' kits *are eligible.* If you did not build the article yourself, you must state who built it for you.

12. In mailing entries, please make sure that there is sufficient postage for it to reach the Contest Editor, also that the photographs are adequately protected from damage in transit.

## ENTRY BLANK

CASH PRIZE CONTEST EDITOR,
RADIO NEWS,
608 S. Dearborn Street, Chicago, Ill.

Please enter the enclosed in your CASH PRIZE CONTEST. I agree to all the Rules of the Contest.

My name is.....

(Call if any).....

Address .....

.....

RADIO NEWS Subscriber? Yes ☐ No ☐ (Check correct answer)

I am a Serviceman, Licensed Amateur, DX Listener, Experimenter, Student, Engineer .....
(Check correct class).

The equipment was built by.....
.....in (date) .....

The photographs were taken by.....
.....
whose address is.....
.....(If taken by yourself, so state)

The photographer will receive (will not receive) a part of the prize money if I win. (Check proper item)

The Camera used to take the pictures was a .....

## WITHIN EARSHOT

(*Continued from preceding page*)

nical Associate. With him he brings a wealth of engineering knowledge, a fine writer's style, and an appreciation of the problems that confront the experimenter, serviceman and amateur. W9ETI is well known on the air, operating in the 75, 20 and 10 meter bands with three kilowatt home built transmitters. In time Ollie will take over the entire technical work which has heretofore been ours. We know that our readers will be pleased with this expansion, and will welcome W9ETI to our staff.

* * *

AND talking about the staff, we wonder how many of our readers have followed the changes in our diagrams from the old R. N. style to the most modern technique as it is now used by us. Our engineering draftsman Eugene Gleeson is responsible for this. He has asked that we urge any of you to write in any suggestions about the diagrams which you think would make them easier to read.

* * *

IT seems that our apple-cart has tipped a bit. At this writing, Mexico has refused to ratify the Habana Conference. This throws a monkey wrench into the frequency allocations that were decided at that meeting. While the effect is not as pronounced in the ham bands, it is being felt in the broadcast spectrum. What repercussions this will have on the matter of future conferences in regard to spectrum allocations, is hard to say. But one thing is sure. Mexico has conclusively demonstrated that a country need *not* ratify a conference allocation. We could use this in 1942 as a precedent towards refusing to ratify any treaty which "liquidates" the ham. When writing to your Representative, remember that. If we can get these gentlemen on our side, half of the battle will be won.

* * *

WE wonder what—if anything—has happened to Jimmy Fidler. He is the one who introduces himself in his broadcasts with Morse code spelling out J-I-M J-I-M. The other day we were considerably surprised to hear him "come in" with JIM JEM. And he didn't send the usual ..——.. either! Got a glass arm, Jimmy?

For those who listen to Walter Winchell—his dots and dashes do not spell anything. He makes them himself with two bug keys, one for Morse and the other for telegrapher's code.

* * *

AND so we come to the end of our stint. DX has been very swell this month, and we have been working the transmitter overtime. There certainly is nothing that can compare to working or listening to the far corners of the world coming in over the crisp cold starlit nights which we have been experiencing. B.C.N.U. es 73 de W9QEA. —30—

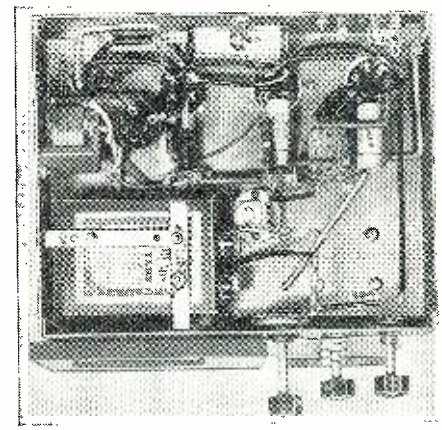
## Four Tube Battery Receiver

(*Continued from page* 23)

proportionately high order of selectivity. Volume is controlled in this stage by means of a potentiometer in the screen circuit. A switch in this circuit, ganged with the filament switch, prevents current drain through the potentiometer when the set is not in use.

The second detector is the well-known 1B4 pentode. This provides ample input to operate the 1F4 high-gain power pentode at full output even on moderately distant stations. It is to this thoughtful selection of tubes and skillful circuit design that the receiver owes its excellent combination of sensitivity, selectivity and good volume. The loudspeaker, too, must be given its share of credit. Although only three inches in diameter, it is of the permanent-magnet dynamic type and gives a surprisingly good account of itself from the standpoint of quality as well as volume, especially when a small wood or heavy cardboard baffle is mounted on its rim, as shown in the photographs.

Provision is made for mounting the two 45-volt "B" blocks right on the chassis. The "A" battery is one of the new 3-volt block type and fits in space provided for it beneath the chassis, as does the small "C" battery. This arrangement is especially convenient

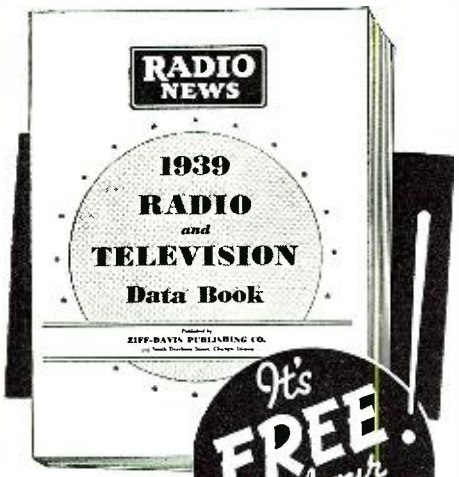


Underside the Chassis.

when using the receiver as a portable unit as there are no external accessories of any kind except the antenna, and this may be anything from a regular broadcast antenna to a few feet of wire draped across the floor or dropped out a window.

The accompanying drawings and photographs make detailed description of the construction unnecessary, especially if the chassis furnished is punched and drilled as indicated and therefore automatically determining the proper placement of all parts.

With the construction and wiring completed and checked, the "A" battery may be connected. With the switch "on" the filaments should light, but so dull that the glow will be hard to detect in a lighted room. If the

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filaments are lighted, connect the "C" battery and the negative side of the "B" battery. Finally, watching the filaments closely, tap the "B+" connection wire on the positive terminal of the "B" battery to make sure there is no mis-connection which might apply the high voltage to the filaments. If the glow remains normal, connect this wire to its terminal and the receiver is ready for alignment.

Alignment is simplified by the fact that the i.f. transformers are accurately tuned to 456 kc. at the factory and variations due to capacity of wiring, etc., will have little detuning effect. Such being the case it should be found possible to hear some stations as the tuning dial is rotated throughout its range. Exact alignment of the i.f. is accomplished by tuning in one of these stations, then adjusting the four screws of the i.f. trimmers for maximum volume. That's all there is to the i.f. alignment with this set.

The r.f. alignment is also readily possible without a test oscillator; but an oscillator can be used if one is available.

If an oscillator is used, connect it to the antenna and ground terminals of the receiver. Then with the oscillator tuned to 1400 kc., tune its signal in on the receiver and adjust the trimmer (on the side of the antenna tuning condenser) for maximum signal. If the receiver will not tune to the signal, readjust the trimmer on the oscillator section of the gang-tuning condenser until the signal is heard, then adjust the trimmer on the antenna tuning section of the gang as suggested.

Next, with the test oscillator tuned to 600 kc., tune the receiver to that signal. Rock the receiver tuning condenser back and forth around this point and slowly adjust the oscillator padding condenser until the adjustment is found that provides the loudest signal response. Go back to 1400 kc. again and make any slight readjustment that may be needed and repeat the process at 600 kc. The job is now complete and the receiver is ready for use.

Without an oscillator the procedure is the same except that the first adjustment is made by turning the gang-condenser dial until the rotor plates are meshed in the stator about ¼ inch. This will be about 1400 kc. The r.f. trimmer is then adjusted for maximum noise. With this preliminary adjustment made, tuning around this frequency should bring in a station at or near 1400 kc. and thereafter this and another station around 600 kc. can be used as alignment signals, the procedure then being exactly the same as when an oscillator is used.

Some emphasis has been placed on alignment because while the job is not difficult, it is highly important if maximum results are to be obtained in using this little battery operated receiver. In test it showed itself remarkably efficient in bringing in the dx as well as the locals with good volume.

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**Television in New York**
*(Continued from page 7)*

Directors that public participation was assured by next Spring and that RCA, in addition to manufacturing video receivers and transmitters, would license other manufacturers under the many patents it holds. But it is anticipated that many leading receiver firms will have sets on the market before RCA, a few models having appeared in New York retail shops already.

C. W. Farrier, NBC television Coordinator and a special assistant to Lenox R. Lohr, president of the network, told the writer that there are many great problems still to be ironed out. He has exactly the same views as Mr. Sarnoff regarding the need of time in which to establish an acceptable and regular home television service.

"For one thing," Mr. Farrier said, "a program technique must be perfected. While we have always considered the program end of television as a chief angle to be developed, the technical side has advanced far more rapidly.

"We now find that engineers and laboratories have provided us with the powerful medium of television. The question is how to use it to best advantage. It's no easy task.

"Many persons may just assume that it will be a simple task to draft talent from the stage, screen and sound radio. But it's not that simple. Here we are with a brand new medium. There is no precedent to follow. There are definitely some technical limitations as to what may be successfully picked up and transmitted and we are doing our best to discover how to best employ the facilities to guarantee an adequate service to the masses.

"Script writers, for example, must know the technical side to the extent of knowing how the designated action can be followed by the television camera. We find, too, that standard motion pictures are not actually as practical for television program purposes as some persons claim them to be. And even if they were, the problem is whether radio can afford to use them, inasmuch as the revenue from movie theatres is tremendous at the outset and the financial side of television programs is still something to speculate about.

"I predict that television entertainment will consist of a brand new technique and will present features not available elsewhere. There's no reason why television must represent a composite of stage, screen and radio entertainment. Just what the public wants is for the public to decide. We know that we have a valuable medium that embraces many possible advantages to society. It's our purpose to provide the best acceptable material but haven't an idea of public tastes as yet.

"Hence, the program side has to do a bit of catching up with technical television advances. This indicates that time is essential to develop the new art."

Mr. Farrier expressed the belief that, aside from spasmodic on-the-air tests, the Empire State Building transmitter will not present even temporary program schedules before the launching of the public-participating schedule in the Spring. He indicated that the types of sight-and-sound transmissions given during bracketed periods the past year will not be repeated but that, rather, all efforts will be concentrated on the launching of the New York World's Fair transmissions which, in effect, may turn out to be the official starting gun for a big industrial television era.

While all eyes and ears are on New York's pioneering television efforts which are expected to set the pattern for the rest of the nation to follow, it must be remembered that there are a score of licensed experimental television stations throughout the U.S.A. Latest grants by the FCC included the Allen B. DuMont Company, of Passaic, New Jersey, and the Zenith Radio Corporation of Chicago. Both are radio manufacturing firms. The DuMont grant assures a third video outlet in the New York metropolitan area inasmuch as the proximity of Passaic to the metropolis assures the inclusion of the city in the coverage zone. But, despite Zenith's television station licensing, the firm's head, Commander E. F. McDonald, Jr., made an announcement to the effect that there are many technical problems still unsolved and that there are serious economical points which must be settled before the public should be asked to buy television receivers. [See RADIO NEWS, April, 1938.—Ed.]

An important television application was recently made to the FCC by the Journal Company, publishers of The Milwaukee Journal, for a transmitter to present a regular program service rather than experimental images. This will probably be the first newspaper-owned video station. The paper, which operates Station WTMJ, plans the erection of two 1,000-watt transmitters, one for the picture signal, the other for accompanying sound.

The nearness of television is emphasized by recent New York displays and demonstrations. The Radio City television "tour," described in this article, is the most pretentious of the demonstrations, taking observers through every stage of video development.

Other recent displays and demonstrations were given by the Garod Radio Corporation, offering a low-cost television kit using a five-inch tube, and the American Television Corporation with assembled small-image sets. A DuMont cathode-ray television receiver in a New York furniture store window attracted large groups of passers-by. The displayed model was in a table-top cabinet and had a large-sized tube. Glass-panelled sides permitted internal inspection.

Marshall P. Wilder, television de-

velopment engineer of the National Union Radio Corporation, recently returned from a two-month study of television abroad and told of amazing European developments. He said there was a definite trend towards smaller receivers combining video reception with all-wave sound. He reported further that some projection-type receivers were marketed, the cost going over the thousand-dollar mark.

The RCA Manufacturing Company recently announced the availability of television transmitting equipment. The firm had previously made such equipment on special order, but now the products are catalogued in the new line. The unit known as the RCA 1-kilowatt television transmitter is the first medium-powered video set marketed by the firm. Auxiliary television testing equipment is also available.

There has been talk of the British Baird and Scophony companies entering the American market with the establishment of domestic firms backed by American capital. But with the virtual entire American radio industry prepared to enter television on short notice it is problematical as to what share of the market will go to foreign firms.

In all, television is coming ahead with the throttle wide open. In New York trade circles, the feeling predominates that it will bring new prosperity not only within the industry but will affect all business favorably.

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**Serviceman's Experiences**

(*Continued from page* 18)

collapse of the fixture which changed all its rectilinear compartments into parallelograms. Had I not been sandwiched between the shelves and the floor, it would have been an interesting phenomenon. It so happened I was too occupied on the way down to be concerned with abstractions, and my science left me.

It was interesting to notice the metal tubes had fared better under such dynamic conditions than the glass ones. While the former were broken, the latter were merely bent. Al, I knew, would be more interested with the cost of the descent than with dispassionate technical results, so I began to reassemble the store quickly. I sorted the tube cartons quickly: shaking them one at a time, I threw away the ones which tinkled. Many of the tubes had flatter curves after the accident.

I walked out to the sidewalk to view the wreckage in panorama from a pedestrian point of view. As I stood there, breathing heavily, several persons stopped, followed my eyes, and began to talk. I did not notice I was key man until one fellow tapped my arm and asked: "What was it, buddy —an ax raid?" I took the Kolster 45 with me on the way in—dogs had been sniffing the scorched insulation, and were guaging the height of the filter block contemplatively.

It was time to turn the lights on, but I couldn't because some lampcord—which I had strung temporarily, in 1932—had torn adrift and shorted at the time the tube cabinet left the wall. Fifteen minutes is long enough for any person to creep about a dark basement, looking for a meter-panel; I came out, bought some candles, and stuck them at various points in the shop which had not yet been razed.

A pinch-featured customer entered, laid a bag of tubes on the counter, looked at the dimly-lighted debris, and said:

"Test these for me—if you think radio is here to stay!"

"I am very sorry," I replied, "but my tube checker broke down this afternoon. Could you call later?"

He pursed his lips several times, and replied: "You might think me a strange person, but nevertheless, when I want music in my home, I want it within the same fiscal month!"

He leaned toward me, making a tripod of himself with his cane, and I noticed something I never knew before: light given from candles is a greenish-purple. "I can call at your house later, after my partner returns with the analyzer," I suggested.

"Young man," he said from behind quivering spectacles, "something is wrong with your business if one instrument shuts the place down. I begin to understand what happens to a mental cripple when someone kicks his crutch

out from under him!"

He clenched his teeth and counted to ten—aloud. "Into each life a little rain must fall. This is it. Never mind testing the tubes—give me a complete set of them, and let me go home—where I won't take up any more of your time!"

"Just now," I replied, kicking a tube base under the record changer, "we are all out of them. I can get them for you—"

His cane went up in the air. So did he. Although he seemed well-heated, his voice showed me he was shivering as he yelled: "You disowned son of Marconi! You're too incompetent to give a customer the time of day!"

"I *am* not," I declared, holding a candle up to the wall-clock, which, unfortunately, had stopped when the juice went off.

Then Al entered; and the attempted customer, relaxing in a bitter sort of way, said: "My unwary friend, don't let the sign on the window fool you; don't try to buy anything here. Yesterday, this was a radio store—today, it has changed into some strange sort of non-profit organization. Before we take our trade down the street, what would you say was the cause of the transition?"

"Labor trouble," Al answered, and the look in his eye made me wish I'd let well enough alone that afternoon.

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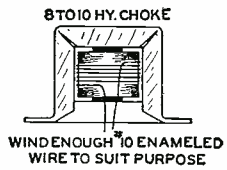
## Radio Gadgets

(*Continued from page 30*)

The cut and try method of figuring turns will be necessary.

The best way is to remove the shield and then remove the core if possible. Wind on say, ten turns of fairly large insulated wire. About No. 12 to No. 16 will do, depending upon the load. Test with a low reading a.c. voltmeter and add or subtract turns until the reading shows voltage 10% higher than that desired. Then put the turns on permanently and varnish with insulating compound or shellac. Core, of course, must have been replaced before the voltage is read. Replace the shield and you have a transformer.




In emergency, where appearance does not count, the windings can be made directly over the entire choke, and bound in place with electricians' tape.

### Testing a Receiver

A very quick test for any receiver operating on a.c. is to touch the grid cap of any detector or i.f. tube and listen for the hum. If none is heard, look to the audio section.

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## Bandswitch Exciter

(*Continued from page 22*)

Tuner. The output of the exciter may be varied by means of $R_3$.

To operate the exciter on 5 meters, it is necessary to double in the RK-39 tube. In this case, the 5G and 5P are set for the highest frequency bands and the excitation of the RK-39 *carefully* tuned to maximum as before described.

The exciter as constructed was found to give an output of about 35 watts on all bands from 5 to 160 meters. If desired, the frequency in the output stage may be doubled as described for operation on 5 meters and about 15 or 20 watts output obtained. The exciter thus provides a small transmitter in itself or may find admirable use as a driver for a 200-watt final power amplifier c. w.-phone stage.

### Power Supply

No matter how carefully we construct our exciter unit, unless equal consideration is given the power supply, frequency stability will not be maintained. While the power transformer is actually larger than is required it can be operated for hours at a stretch and remain cold. The whole unit is built on a 13" x 17" x 3" Par-metal chassis. An eight wire cable supplied with two Amphenol octal plugs is used to connect the two units. This cable should not be over three feet in length due to the voltage drop in the filament circuit. $SW_1$ and $SW_2$ are merely single pole single throw switches used to turn the AC and high voltage respectively on and off. A single heavy ground should be run around the bottom of the chassis right out to the cable connector.

Typical Tuning Data

| Band | Frequency in megacycles | Condenser setting BL-5G | Condenser setting BL-5P |
|---|---|---|---|
| | 1.715 | 0. | 35. |
| 160 meters | 2.00 | 9.1 | 75. |
| 80 meters | 3.5 | 15. | 49. |
| | 4.0 | 99. | 77. |
| 40 meters | 7.0 | 12. | 54. |
| | 7.3 | 38. | 66. |
| 20 meters | 14.0 | 5. | 37. |
| | 14.4 | 23. | 45. |
| 10 meters | 28. | 11. | 46. |
| | 30. | 52. | 65. |
| 5 meters | 56. | 11. | 46. |
| | 60. | 52. | 65. |

*The above Typical Tuning Data is given for reference purposes. Capacities in wiring may change the tuning of the plate circuit Tuner materially. In obtaining the above data, the dials on the Exciter were set for increased dial reading with increased frequencies.*

## Filter Ripple

(Continued from page 19)

In practice the procedure is as follows: the circuit requirements are calculated as above and in this calculation the amount of field excitation is considered to be approximately the same as the audio power which the speaker will handle. This is built to these specifications, and checked for permissible ripple by the performance method of listening to the output of the final stage. If it is found that the field induces too great a hum in the voice coil, a hum bucking coil is then tried.

The value of this hum bucking coil is determined by the percentage reduction required in the circuit. The inductance of the speaker field may be measured by an impedance measuring circuit using two speakers in a series parallel circuit and a resistor. The formula for this impedance is:

$$L = \frac{X_L}{2\pi F} 2 \qquad X_L = 2\pi FL$$

The following covers design of the filter network of a 12 watt amplifier in RCA's RC-13 Tube Manual: By using the value shown in the diagram, to find the percentage of ripple at the plates of the 2A3 tubes it is necessary to use the following formula:

$$\frac{\text{Alternating current voltage across load}}{\text{Alternating voltage applied to the input}} = \frac{1}{\omega^2 L_1 C_1}$$

The input ripple voltage may be used in place of the 1 above the line to find the ripple voltage across the output of the first choke and condenser combination which is the ripple at the 2A3 plates. The input ripple voltage is found by multiplying the d.c. voltage at the rectifier filament by .4, this being 372 volts × .4, or 149 volts a.c. ripple. Example: $\omega = (2\pi F)$, F = 120 CPS, L = Ind. in henries, C = capacity in farads, $L_1$ = 12 henries with 175 milliamperes of d.c. current flowing through it, $C_1 = \frac{1}{\frac{1}{C_5} + \frac{1}{C_6}}$.

Carrying this still further, it is found that $(2\pi F)^2 = 567912.96$, $C_1$ = .00000715 farads (7.15 microfarads) and 149 volts. The ripple voltage across the input divided by the result obtained above is found to be approximately 2 volts. This value is correct if the condenser has a power factor of unity, no leakage, and the inductance has no distributed capacity.

In the diagram the condensers $C_5$ and $C_6$ are in series. Their capacities total 7.15 microfarads. Since the capacity of $C_6$ is 10 mfd., and the ripple across it is proportional to the capacity of the condenser at this point the following formula can be used to determine the percentage ripple at the plates of the 2A3's (across $C_6$):

$$\frac{\text{7.15 (the cap'ty of } C_5 \text{ plus } C_6 \text{ in series)}}{\text{10.00 (the capacity of } C_6\text{)}} = \frac{\text{ripple at 2A3 plates}}{\text{computed ripple (2 v.)}}$$

solving the formula, the ripple at the 2A3 plates is 2.8 volts.

Since ripple voltage is always figured in percentage of direct current, and since the d.c. at the plates is about 302 volts, the percentage of ripple is about 0.91 per cent. This is inaudible and O.K. for amplifier purposes.

To determine the ripple percentage across condenser $C_7$ the following formula must be used:

$$\frac{\text{Alternating current voltage across load}}{\text{Alternating voltage applied to input}} = \frac{1}{\omega^4 L_1 L_2 C_1 C_2}$$

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# RADIO PHYSICS COURSE

*(Continued from last month)*

*Effects produced by the common electromagnetic radiations:* From the foregoing it is evident that radio rays, heat rays, visible light rays, ultra violet light rays, X-rays, radium rays, and cosmic rays, are really all produced by electromagnetic radiations and may all be explained on exactly the same basis. They differ from the radio rays only in frequency. Gamma rays are produced by radiations within a band of frequencies almost 4 octaves wide (an octave of a frequency is a frequency twice as high); X-ray radiations cover a band 8 octaves wide, as do also ultra-violet radiations. X-rays have the peculiar property of passing through substances which are opaque to longer waves. They are not able to excite the optic nerve but if allowed to fall on certain fluorescent substances they cause these substances to emit radiations which do affect the eye and permit vision. Lead resists the passage of X-rays through it. The ultra-violet light radiations also do not affect the human eye directly, but their presence can be detected by a photo-electric cell or by a photographic plate upon which they produce the same photographic effects that the ordinary visible light rays do.

Our eyes are really radio receivers tuned to respond to only a very narrow band of very high frequencies or short wavelengths; a band of about one octave. When the frequency of radiation is about 400 million-million cycles per seconds, we perceive the color *red* by means of the impression made on our optic nerve. When it is increased to 750 million-million cycles our eyes interpret the rays as *violet* light. All other colors are caused by various frequencies or combinations of frequencies lying within these two limits, outside of which our eyes cannot respond. Some grades of glass offer practically no opposition to light and little to heat. Metals offer little opposition to heat flow but are impervious to light.

The heat perception centers of our skin are also tiny radio receivers which are tuned to frequencies somewhat lower than those to which our eyes respond, and the physiological sensation we receive in that case is one of heat instead of color. The infra red or heat radiation frequencies lie within a band about 8 octaves wide. The production of electromagnetic radiations, of frequencies which affect our senses to produce the sensations of heat and light of different colors, may be illustrated by the following simple experiment.

*[The experiment will be described in the next month's issue.*—ED.]

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## Diversity Coupler

(*Continued from page* 11)

thor, instead of requiring two receivers, can be added to the existing set to accomplish the same results. In this new diversity coupling system no attempt is made to combine the same out-of-phase signal from two different antennae, since the weak one will be of no practical value anyhow, but rather to cause the fading signal automatically to select for the receiver that one of two antennae in which a desired signal is fading upward at any given instant. The addition to any good receiver to obtain dual diversity reception needs only an antenna selector switch operated by the fading signal. As the signal in one antenna fades down to what may be considered one-half its maximum volume, the decreasing a.v.c. voltage generated in the receiver by the signal is caused to operate the antenna switch to shift over to the second antenna in which the signal will be rising.

A casual reading of the above will suggest that this coupling system provides only one-half average signal volume. The reverse is true, for it provides a constant signal volume equal to the maximum volume obtained on the same receiver without it. This is because the full cycle of fading is not actually heard on any receiver equipped with a good a.v.c. system—only the downward fade is actually heard. When the signal fades up, the a.v.c. levels it off to averaged volume, but when it fades down, the a.v.c. cannot release enough receiver sensitivity to bring in a signal which has faded out.

The new *Diversity Coupling System* operates to erase the downward fade by replacing it with an upward fading signal, and so hold volume consistently strong enough to be leveled down to desired volume by the receiver's a.v.c. system.

This not only increases average signal volume through eliminating the volume decrease on the downward fade, but erases all the noise which afflicts the weak signal in its downward fade. Given a signal the maximum volume of which on a good receiver provides relatively or completely noise-free reception, the *Diversity Coupler* eliminates the noise which invariably accompanies fading by replacing the downward fade with a strong signal.

A practical operating form of the *Diversity Coupler* is illustrated and diagrammed herewith. It is contained in a grey enameled steel case 8" x 4" x 5½". Operating-wise, it has two binding post strips, one for a connection to the receiver's antenna binding post and two for connection, one to the existing antenna and the second for connection to a second antenna anywhere from 20' to 50' long. The only requirement for this second antenna is that it be at right angles, or

as close to this as possible, to the existing antenna.

If the existing antenna is horizontal, the second or new antenna should preferably be vertical, or at least at right angles to it. The second binding-post strip has two terminals for connection to the two ends of the receiver's a.v.c. load resistor. The one knob on the front panel turns on a.c. power and then regulates the volume level at which automatic selection between the two antennae occurs. Backing this knob "off" mutes the *Diversity Coupler,* but keeps it ready to be cut into circuit whenever a signal starts to fade by simple advancement of the knob. If it is turned up too far, the automatic switch will "chatter," for it is essential that the antenna be switched out as its signal begins to fade down should, at the instant of switching, be a little weaker than the second antenna signal, in order that the signal in the second antenna may be just enough stronger to hold the switch closed after the shift is automatically made. This difference, a matter of 1 to 5 microvolts, is controlled by single knob.

The circuit diagram shows that the *Diversity Coupler* is an extremely sensitive voltage-operated S.P.D.T. switch used to select either one of two antennae. Its sensitivity and adjustability to different strengths of signals is what allows it to be operated by a receiver's a.v.c. voltage, which varies in accordance with signal strength, and is the "power" used to switch from the weak signal to the strong signal antenna automatically. In the illustration are seen the three contacts making up the S.P.D.T. switch, together with the circuits and components which cause a fading signal to operate it.

Although simple in the extreme in principle and in operation, the delicacy of the operation to be performed, involving the translating of a volt or less into eight to ten watts of power to operate the switch, involved extensive research and experiment over a long period.

Examining the illustration, and neglecting the switch contacts marked for antenna connections the left hand pair of binding posts are for connection across the receiver's a.v.c. load resistor to provide signal controlled actuating voltage. In effect, the signal generated a.v.c. voltage is used to add to the negative grid bias for the 2A4G gas triode Thyraton control tube provided by the 25 volt filament secondary (for 25Z6 dual rectifier tube) of transformer MC81.

This negative grid bias is obtained by using one diode of the 25Z6 rectifier, a 12 mfd. dry electrolytic condenser, a 3000 ohm, ½ watt resistor and a 2000 ohm potentiometer. These provide about 12 volts d.c. across the 2000 ohm potentiometer, which is applied to the 2A4G grid in amount just insufficient to prevent this tube igniting, or providing a high-current path from cathode to plate.

In this way, any a.v.c. signal voltage adds to it to prevent ignition, but when the signal fades downward, the grid bias drops, the Thyratron ignites or conducts, and pulls the switch over from antenna No. 1 to antenna No. 2. Transformer MC81 also lights the 2A4G filament, and could not be combined with plate transformer MC80 because of regulation problems—when the 2A4G ignites it suddenly draws, not zero plate current, but about 85 ma., which drops the plate voltage from MC80 and, were MC80 and MC81 combined, would drop the bias voltage for an instant so that the switch would "chatter" instead of going cleanly from position No. 1 to No. 2. Hence, separate, though small and inexpensive, transformers are essential for grid-filament and plate voltage.

Once the fading signal has caused the bias on the 2A4G to drop below ignition potential, the tube passes a high plate current, and the grid loses control until the plate circuit is broken. So a second switch is mechanically built into the Guardian D100 magnetic switch so that when it operates, the plate circuit is broken for the instant necessary to cut off plate current, to be reclosed as soon as antennae have been changed to provide a more negative a.v.c. voltage so that the circuit will be ready to operate again when the signal in the selected antenna has begun to fade.

MC80 provides 150 volts a.c. for 2A4G plate power, through the second diode of the 25Z6 rectifier and a 12 mfd., 250 volt dry electrolytic condenser. It will be noted that both grid and plate rectifiers have no filter chokes, for they are not needed, since a.c. hum is not a problem at all, these circuits having nothing directly to do with the receiver, and so being incapable of causing hum in its output.

The internal assembly of the *Diversity Coupler* is clearly illustrated. On the panel at the right is mounted the 2000 ohm grid, or "sensitivity," potentiometer with its a.c. on-off switch. Directly below it, mounted on tie-lug strips, are the grid and plate filter condensers with the 3000 ohm grid voltage dropping resistor on its leads about them. To their left is the 25Z6, with behind it the 2A4G, tube. Still further to the left is a vertical partition, on the right of which are mounted the MC81 transformer at bottom and the MC80 at top.

Before turning to the illustration showing this partition assembly, the Guardian D100 magnetic switch may be profitably studied with a magnifying glass. At its left can be seen a black rectangle, which is the magnet operating bar, which, when the magnet pulls, breaks the contact between the two extreme left contact blades (silver studded) and so breaks the 2A4G plate circuit. To their right are a group of four blades. The extreme right one is the antenna switch actuating blade, raised and lowered by the clover-leaf cam seen at the top

right of the switch. Turning to the other illustration the ratchet and paul operating this cam from the switch magnet can be clearly seen, together with the auxiliary paul which locks the switch in correct position, preventing over- or under-travel.

The only trick about this switch is to make sure its contact blades are so bent that before the arm, or center blade, of the antenna switch has left one contact, it has closed the other. It is essential that this switch "make before break." Likewise, it is essential that the plate circuit breaking switch should not open its contacts until the movement of the magnet arm has almost fully completely its downward stroke or application of current.

Interior illustration shows clearly the three antenna binding posts, the 400 ohm rheostat and 150 ohm, ½ watt resistor, and the ½ mfd. and 12 mfd. condensers across the plate switch contacts and switch coil. The ½ mfd. condenser and 150 ohm resistor prevent sparking at the plate circuit switch contacts, while the 400 ohm rheostat and 12 mfd. condenser across the coil serve two purposes. The condenser stores energy from the short duration pulse due to instantaneous plate circuit make and break so as to cause the switch arm to complete its stroke, and also to filter the current so as to prevent noise introduction through d.c. circuit make and break so physically close to the antenna switching circuit.

In operation, no consciousness of the operation of the *Diversity Coupler* is had except a "click" every time the signal fades down. This is due to the antenna circuit switching, and is a very small price to pay for the elimination of fading and its steady, long-duration noise on downward fades. It can be eliminated completely by a simple noise silencer consisting of a 6H6 double diode with its diodes connected in parallel across the receiver's second detector, plate to cathode and cathode to plate. A biasing battery and potentiometer are the only other accessories needed for this noise squelcher, to adjust bias so the added diode cannot conduct, and so shunt the signal diode temporarily, until a noise voltage louder than the signal appears.

For code reception, where a continuous carrier is not present to hold the *Diversity Coupler* to antenna No. 1 or No. 2, and it would tend to switch antennae in following code carriers, the remedy is a delay circuit. A ½ megohm, ½ watt resistor in series with the 2A4G grid lead, and a ½ mfd. condenser from its grid to filament center-tap does the job nicely.

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## G.E. on Television

(*Continued from page* 17)

He told his listeners that vertical detail depends on the number of scanning lines and horizontal detail upon the ability of the electrical system to pass extremely high frequencies. A large television picture of high quality would require, at conservative estimate, a band width of 80 megacycles per program for its transmission, or 80 times as wide as the whole spectrum allocated to broadcasting in the United States.

"The problem of signal propagation in television is far more serious than that in sound broadcasting," Mr. Kaar said. "The exceedingly wide frequency channels required in television make it necessary that signals be transmitted in the ultra-short wave bands. At these frequencies there exists reliably only line-of-sight transmission, since there is no longer reflection from the Heaviside layer. Nevertheless, because of the very short waves employed, such objects as steel buildings and overhead wires provide efficient reflectors and give rise to 'ghost' images. The severity of this problem will be realized more fully when the public begins erection of receiving antenna on a large scale.

"It is not surprising that the great problem in the relaying of television signals is cost," Mr. Kaar said in conclusion. "The cost per mile of a coaxial cable is many times the cost of corresponding networks used in sound broadcasting, both as regards initial cost and maintenance. If radio relaying is used, the cost of the relay transmitters is very great. However the coming years are likely to bring great reductions in the cost of both methods, particularly the coaxial cable.

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## NAT. QSO Page

(*Continued from page* 48)

ized, diminished, or terminated, except upon a definite showing that the best interests of the membership would be served thereby.

In conclusion, I wish to commend you, the editor of RADIO NEWS, on your fair-mindedness in publishing this and other controversial communications.

(Sgd) Robert Akeridge Kirkman, W2DSY

■ **Thank you, W2DSY, for your clear, unequivocal statement of your stand and platform. We know the membership of your District will appreciate that you have taken them into your confidence (which is as it should be), and placed yourself squarely on record. If all the other Directors did as you have done, there would never be any doubt as to just what a man stood for in seeking election to the Board. We commend your action to the members of your District for careful consideration, and also to the membership at large.—The Editors.**

*[Since we received this letter, W2DSY has advised that he has been disqualified by the Committee. He also advises that he will file a protest. RADIO NEWS will faithfully report the results of the protest, next month. The Editors.]*

## C. G. Plane Radio

(*Continued from page* 35)

pilot by radio his exact position.

In the construction of the first radio direction finder, Coast Guard engineers took many tips from the successful marine radio direction finders—certain basic mechanical elements like an electrostatically shielded loop to cut off effects of rain, snow, and dust static, but they were still a far cry from perfection.

The process of determining location with the present day perfected loop radio direction finder and the established radio beam differs widely. In the first place, when riding the radio beam, the more accurate the airplane is on course, the louder are the signals over the ship's loud-speaker or pilot's earphones. The radio direction finder, on the other hand, employs but one broadcasting station, and when the rotatable loop is at exact right angles to that station, then the signals are weakest. In other words, this device acts as a warning, for the more off course the pilot is, the louder are the signals from his radio direction finder.

It is but a simple matter today for the pilot of a Coast Guard plane, presumably lost at sea, to slowly revolve the loop until the signals of the station he is contacting come in with the least intensity. A map before him shows the exact location of the broadcasting station, and by simple triangulation he can determine almost instantly his position and correct his line of flight.

After the effectiveness of the loop antenna was proved, Coast Guard engineers set upon the problem of discovering a method of insulating it. The various metal parts of the planes collected static electrically which interfered seriously with the reception. Finally a system of electrically connecting all the integral parts of the ship, known as "bonding," was developed. This method prevents the setting up of any static in the ship whatsoever, and greatly increases the efficiency of the radio direction finder. In addition to bonding, a

new method of shielding the loop from such natural disturbances as rain, snow, sleet, dust and even smoke, was perfected. Shielding, in essence, is accomplished by enclosing the entire electrical system in a metallic sheath which provides a common labyrinth of electrical paths.

The original loop and receiving apparatus was located in the forward part of the main compartment of the plane. This was found unsatisfactory because of certain mechanical faults.

The new system, now in operation, permits the installation of the vitally important loop antenna with its attendant receiving apparatus in the tail of the ship. The pilot rotates the loop by remote control, utilizing accurate, synchronized reduction gears.

—30—

## QRD?

(*Continued from page 34*)

is right around the corner? The latest developments of Big Business was the purchasing of the patent rights for use by RCA from the Don Lee-Mutual Broadcasting System, Harry Lubcke, Chief Engineer and designer of apparatus. . . . Scophone and Eddie Cantor working together to interest Big Business to back the Scophone Television equipment. . . . Xmtrs costing huge sums of money being built in the Chrysler Tower and Empire State buildings in N'Yoik and television receivers already on the market for sale. Don't say we didn't tell you.

* * *

SO, me hearties, 'tis indeed a pleasure to view the situation in shipping circles with many ships being put into commission again, fishing fleet deadlocks broken, technicians and ops being utilized for various jobs and several new fields to take up the slack of men. With this we say adieu, cheerio and 73 . . . ge . . . GY.

—30—

## Mobile Broadcast Unit

(*Continued from page 29*)

Conditions out on the job are variable, and for this reason the operating crew has a variety of equipment at its disposal. Recently, during a meeting of the Midwest Safety Council, the Mobile Unit trailed an announcer who traveled in one of the cars in a parade. Using the "boiler-maker-and-a-helper" idea, the announcer used a pack transmitter to send his comments to the Mobile Unit. The unit then re-transmitted over the 40-watt outfit to a receiver located on the Chicago Civic Opera building, from whence the show reached the local lines and hopped to the NBC studios. Back out of the studios, cues for the announcer were sent on local lines to two transmitters operating on top of the Chicago Daily News building, one transmitter (2 kw.) feeding the Mobile Unit on one frequency, and the other shooting out 50 watts on a different frequency to the cue receiver in the announcer's car. Also, the Mobile Unit tuned the program in on the regular automobile radio to see how the final broadcast was going on the air. In all, the operations were carried on over four different frequencies with nine transmitters and receivers entering the combination.

The setup can get more complex, or it can get simpler, depending entirely on what the circumstances may be. Broadcasting last spring when flood waters engulfed parts of Chicago's northwest side, the announcer worked right from the Mobile Unit, and the 40-watter punched out a signal for a centrally located receiver. Frequently adjacent telephone lines permit the unit to hook on directly without the necessity for using a transmitter. But, whatever the situation, there are enough varieties of equipment available so that a relay broadcast can be tied together with a minimum of trouble.

Operating almost on the order of a fire department unit, the NBC studio on wheels is available 24 hours a day. Rubber boots, sou'westers, weatherproof clothes, shovels, tow cables and pole climbers are a part of the equipment. When the shove off order gets to the crew, there's a minimum of delay between that order and the moment the driver pushes the starter button and roars off.



Statement of the ownership, management, circulation, etc., required by the Acts of Congress of August 24, 1912, and March 3, 1933, of Radio News, published monthly at Chicago, Illinois, for January, 1939. State of Illinois, County of Cook, ss. Before me, a notary public in and for the State and county aforesaid, personally appeared A. T. Pullen, who, having been duly sworn according to law, deposes and says that he is the business manager of Radio News 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 managers are: Publisher, W. B. Ziff, 608 S. Dearborn St., Chicago, Ill.; Editor, B. G. Davis, 608 S. Dearborn St., Chicago, Ill.; Managing Editor, K. A. Kopetzky, 608 S. Dearborn St., Chicago, Ill.; Business Manager, A. T. Pullen, 608 S. Dearborn St., Chicago, Ill. 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.) Ziff-Davis Publishing Company, 608 S. Dearborn St., Chicago, Ill.; W. B. Ziff Co., 608 S. Dearborn St., Chicago, Ill.; W. B. Ziff, 608 S. Dearborn St., Chicago, Ill.; B. G. Davis, 608 S. Dearborn St., Chicago, Ill. 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.) A. T. Pullen, Business Manager. (Signature of editor, publisher, business manager, or owner.)

Sworn to and subscribed before me this 21st day of September, 1938.
[Seal.] M. Gnass, Notary Public. (My commission expires February 26, 1940.)

## Frequency Standard

(*Continued from page* 10)

kc. would produce a harmonic at 56,000 kc. and another at 59,500 kc., both of which fall in the five meter band. Stability is easier to achieve on 40 than on 20 M.

This oscillator is an ordinary electron-coupled affair with a rather high capacity tank circuit, and its tuned circuit contains additional semi-variable condensers for limiting the frequency span of the calibrated variable condenser. A 30 mmfd. midget condenser with a controlling knob on the front panel serves to reset this oscillator to make the calibration conform to the reference points, in case of drift. This condenser is connected between the cathode tap on the coil and ground, giving a range of a few kilocycles at the fundamental.

The tank coil is "air wound" with 12 turns of No. 8 hard drawn copper wire and is 1⅜" inside diameter and 2¼" long. The cathode tap is soldered on three turns from the grounded end. 125 mmfd. of semi-fixed capacity across the coil limits the maximum frequency which the oscillator is allowed to reach. The minimum frequency is determined by the additional capacity which enters as a combination of the variable condenser and the semi-fixed capacity in series with it. The series condenser must be insulated from ground since both sides of it are above ground electrically. Its purpose is to reduce effective maximum capacity of the variable condenser to a value which covers the exact span of frequency desired.

The parallel capacity actually in use is about 125 mmfd. and the series capacity is almost all the available 200 mmfd. to give the desired 700 kilocycle spread between 6900 and 7600 kc. The tuning condenser is a 100 mmfd. Hammarlund transmitting type having all the desired features as outlined previously. The frequency coverage necessary is obtained through harmonics and sub-harmonics of frequencies between 7000 and 7500 kc., with a little leeway at either end. Therefore the instrument has been adjusted to cover 6900 to 7600 kc., making it useful in checking frequencies between 3450 and 3800 kc., 6900 to 7600 kc., 13,800 to 15,200 kc., 27,600 and 30,400 kc., 55,200 and 60,800 kc. etc. All the ham frequencies could be covered by changing the series and parallel capacities and the size of the coil, but then the high frequency bands would be spread over a smaller portion of the dial. Since these bands offer the major attraction to this particular ham, those portions of the low frequency bands not covered are disregarded as excess baggage.

In the following few paragraphs, the author's chosen maximum and minimum frequencies are referred to merely for the sake of clarity. Probably

many hams would choose to have their meter cover 7000 to 8000 kc. If so, the only difference is in adjustment of tank circuit constants.

The tuning-up process is simpler than might be supposed. Assuming that WLW is used for the standard frequency, that station is tuned in on a convenient broadcast receiver. The 800 mmfd. semi-variable condenser is turned to near maximum capacity until a strong beat note is heard between WLW and a harmonic of the 100 kc. oscillator. If the frequency meter is well shielded, it will probably be necessary to connect a small piece of wire to the "output-input" binding post on the meter to get a loud enough signal to give a strong beat. The broadcast set is then tuned to some other station operating on a harmonic of 100 kc. (600 kc., 800 kc., 1100 kc. etc., except 1400 kc.). A beat will be heard every 100 kilocycles if there are broadcast stations operating there within range. If not, the harmonics are loud enough to be heard as unmodulated carriers. If the harmonics do not occur with 100 kilocycle separation, the oscillator is probably operating at either 87½ kc. or 116⅔ kc., either frequency being capable of producing a harmonic at 700 kc. The space between the harmonics will indicate whether they are 87, 100 or 116 kilocycles apart, but if the specifications are followed no trouble should be experienced.

The plate current variation of the detector is checked when the oscillator is turned off and on, giving an indication of oscillator output. Normal plate current with the oscillator off is about 20 ma., dropping to about 16 ma. with the oscillator on. Less variation is likely to give weaker "reference points."

The high frequency oscillator is then switched on and its output may be checked in the same manner. In this case however, the variation should be only about 1 ma. Then the large dial is turned to the point at which 7600 kc. is to appear (condenser practically open) and the parallel semi-fixed condenser is adjusted until the ham receiver or all-wave broadcast set indicated that the frequency is close to 7600 kc. The headphones are plugged into the output of the frequency meter's detector and the same parallel condensers are carefully adjusted until a strong beat note is heard. The weaker beats are disregarded for the time being. The only requirement of the receiver is that it must indicate whether the high frequency oscillator is on 7500, 7600 or 7700 kc. when the loud beat at the high frequency end of the dial to be calibrated indicates an integral number of hundred kilocycles. The beats at exact multiples of 100 kilocycles are much louder than those inbetween, unless the coupling between the high frequency oscillator is too close, and no confusion is likely to result.

After this high frequency limit of the oscillator is set and marked temporarily, the large dial to be cali-

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brated is slowly rotated toward maximum capacity of the condenser, and the loud beats (every one hundred kilocycles) are counted to determine whether the coverage is more or less than the desired 700 kilocycles. If too much, the capacity in series with the tuning condenser is too high and should be reduced. The parallel capacity is readjusted to again bring 7600 kc. at the same spot as before, as there is some interlocking between the series and parallel capacities. The above procedure is repeated until the 700 kilocycle span falls exactly within one complete revolution of the dial. If the full dial revolution fails to cover the full 700 kilocycles, even with the series capacity at maximum, the coil is too small and must be replaced with a larger one and the entire procedure of tuning up repeated.

When the desired 700 kilocycle span is obtained, the 100 kc. oscillator is re-checked for accuracy for zero beat with our friend the broadcast station, and the loud beats are marked permanently on the dial scale 7600, 7500, 7400 etc. to 6900 kc. The intermediate beats of somewhat less strength, halfway between the 100 kilocycle divisions are marked 7550, 7450, 7350 kc. etc. The comparatively weak spots, next in the order of strength, are 7566⅔, 7533⅓, 7466⅔, 7466⅓ kc., etc. If other weaker beats are present, as determined by the coupling, those next in the order of strength are 7575, 7525, 7475, 7425 etc. Also, the fifth harmonic of the high frequency oscillator is capable of producing still weaker beats at 7580, 7560, 7540, 7520 kc., etc. After these reference points are spotted on the dial all of them need not be utilized unless desired) the remaining space in between may be divided up into five kilocycle divisions with excellent accuracy.

This method of obtaining many points of known frequency in the hams' own territory, and the ease in determining which is which, offers frequency measuring precision without requiring extraordinary stability, mostly with parts out of the junk box.

—30—

## A 20 watt Transmitter

(*Continued from page 37*)

ling.

With the R.F. section operating satisfactorily, attention can now be focused on the speech amplifier and modulator. This circuit is perfectly straightforward and most of the connections can be made to the resistors and condensers themselves, which simplifies the wiring and saves time, as well as helping to maintain short leads. Both the grid and plate leads of the three speech amplifier stages should be shielded to prevent pickup and feedback. This also applies to the leads going to the gain control.

The amplifier can be tested before connecting it to the modulator by placing a pair of phones in the plate circuit of the 6N7 driver stage in place of the driver transformer primary winding. The total plate current drain of these three stages can be checked if desired and should be approximately 15 ma. The 6N7 Class "B" modulator may now be connected and should draw about 30 ma. when idling, and up to 100 ma. on peaks. The audio output can be checked by means of a 10-watt lamp used as a load across the secondary of the modulation transformer.

The proper tap to use on the secondary winding of $T_2$ is the one which will most nearly match the load impedance presented to it by the 807 amplifier stage.

The load impedance is equal to the plate voltage on the 807 (or RK39) divided by the current that it draws when loaded to the point at which it will be operated.

There are several constructional details, which have not been mentioned before, but which are important to the person contemplating construction of this unit.

Condenser does not appear on the circuit diagram as it is used only on the four lower frequency bands. It is mounted inside the coil form for each of these bands, and is automatically plugged in or out of the circuit with each coil. The connections for $C_{25}$ are shown on the coil chart.

Two antenna insulators are provided for use with link coupling to the amplifier stage. The link cannot be connected to any of the prongs of the coil form, as they are used for other connections; so it should therefore be attached to the insulators.

All leads of the R.F. tank circuits should be made with No. 14 ga. solid tinned wire and be insulated by rubber grommets where they pass thru the chassis.

The socket used for the plug-in crystal has 6 prongs. These prongs should be connected, three in a row on each side, so that the crystal will always make the proper connections; no matter which way it is inserted in the socket.

Any other details can be clarified by a perusal of the circuit diagram.

-30-

## Bench Notes

(*Continued from page 27*)

store. He asked for a set-up to enable his waiters to call their orders from table-side to kitchen, in order to save time and get away from the effect of a busy subway platform.

I laid out the wiring; designed arrowhead niches for the mikes in the plaster posts; provided small snap-switches to permit an operator at any of the 14 talking positions to take control of the amplifier and kitchen speaker. The owner and I were both enthusiastic, and I planned to have photographers go to work in the store for me the day it opened—taking photos of the system in operation. A honey of a job, and one I would be glad to refer future customers to—so I thought.

The wiring was installed, and the equipment—a purse-warming sight because the owner had stuck to my generous specifications—was delivered. I was very happy when I gave it a preliminary workout with one mike, and went home that night feeling I was quite a sales engineer.

The next day the head-waiter told me he didn't like the arrangement. He said the management had gone to great pains in training the staff according to the routine he himself had inaugurated years ago, and that the new equipment would undo all the previous schooling; the old run-and-call routine was better than the new stand-and-call. He would see to it his methods were used, or he would quit.

I told him angrily he wasn't paying for the job, and referred him to the numerous restaurants and cafeterias wherein mikes meant the difference between old-fashioned chaos and modern quiet procedure. I also told him that if he wanted to quit because of a cock-eyed opinion, he wouldn't need *my* permission.

Later, after I had cooled off, I instructed several of the staff members how to use the mikes; how to snap them on, announce, and time their trips to the counter so the food would be waiting when they got there. Then I confidently asked what they thought of the new routine. Although they wouldn't speak against it for fear of appearing dumb, it was easy to see their old teachings had become so ingrained that they were forever poisoned against any other method, however efficient. Still hopeful, I explained my system to the chef, hoping his endorsement would support my plan. After an elaborate description, he said he wouldn't object to the speaker hanging on the wall, provided I kept the volume low enough so the music would not interfere with his taking orders over the counter!

The head-waiter had been right. In this isolated case, the unusual restaurant routine had been established so long and firmly in the employees' minds that my apparatus could not possibly be operated to its best advantage. I made an appointment with the owner, told him I had sent the parts back to the distributor, and asked him for fifty dollars. His response was prompt.

"You're nuts!" he said.

"Perhaps," I answered, "but neither the distributor nor I wish to be identified with an expensive installation that is certain to be mismanaged into a lemon. There are plenty of other installations where we'll be thanked for good engineering, without having to force it into operation against our judgment."

"What about the wiring?" he complained. "I laid out about $150 for it—on your say-so. Do you want me to stand that loss?"

"Why not?" I replied. "Everything you go into isn't a success. I remember you got out of that Harmon Street restaurant location quickly enough after it promised to be a weak link in your chain. Besides, I'm saving you more than $150 by calling the job off. We are *all* losing money—but it's the best way out!"

"Then what's the fifty for?"

"Half to the jobber for his profitless co-operation, and half to me for mine," I answered. "There's no law requiring you to pay us, but it's only fair, considering the money and headaches we are saving you."

"Perhaps you're right," he admitted, "but you do some funny things!"

We talked for about fifteen minutes, and he finally agreed to settle the deal with $20 and a bottle of scotch. The distributor got another twenty on my recommendation, and its receipt was a pleasant surprise they will remember the rest of their business lives.

I believe that, had the original plan gone through, we would not nod—as we do now—when we pass on the street. I might have lost a few dollars on the deal, but I have more than compensated for the loss since then: the owner is now one of my best customers, and—what is more important—he respects my opinions over those of my competitors. I have sold him equipment totaling much more than the amount of that first mike job.

I didn't forget to give the head-waiter an earnest apology after I backed out, either. He was very surprised and flattered when I confessed he was right. Today, although he won't *fire* an employee for not trading with me, the pressure is there.

**Augury?**

The following stencil might be pointing to a new servicing field. During a public display of commercial radio facsimile equipment last week, a transmitter and receiver were running demonstration pictures; between them, an idle receiver was laid open for inspection. On a terminal strip shield, the manufacturer's notice read:

"This printer unit is a delicate mechanism, and should be adjusted only by a skilled serviceman."

—30—

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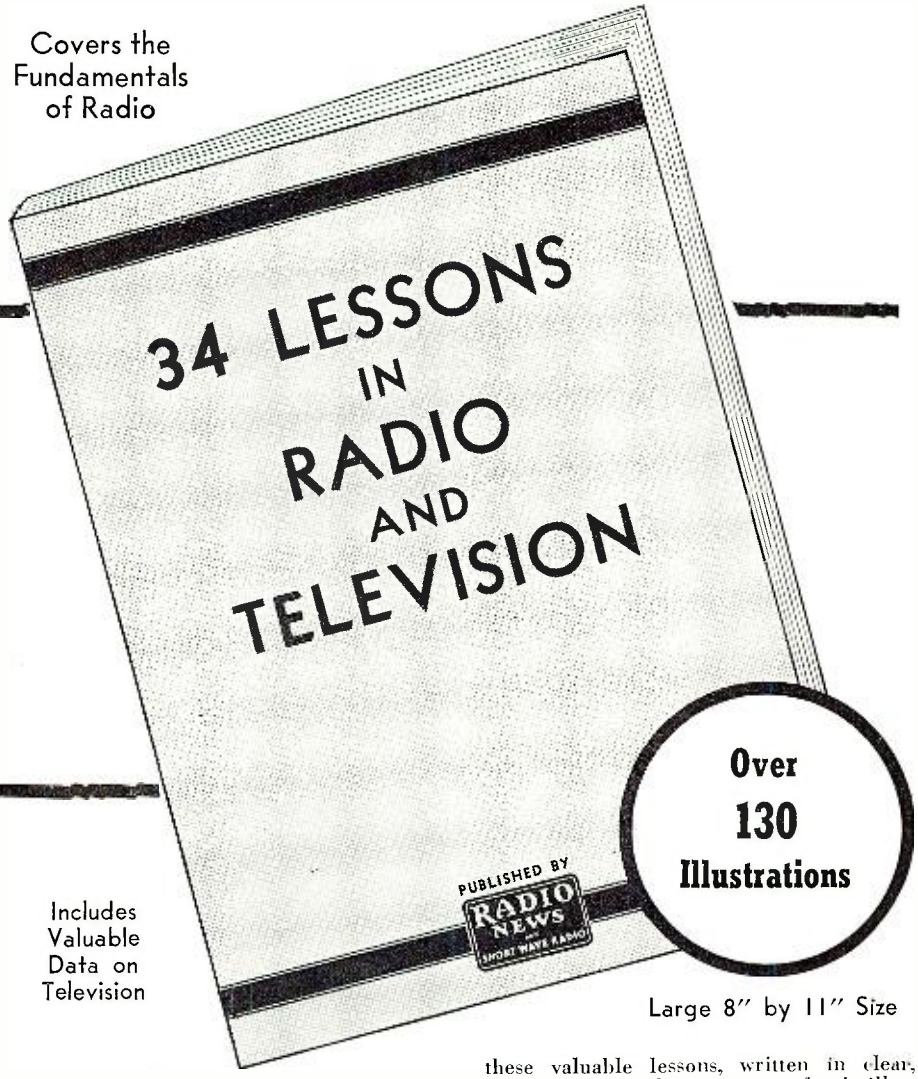


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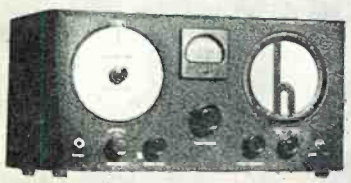

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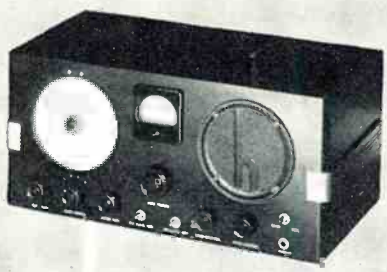

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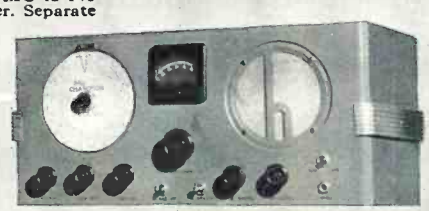

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In every state of the Union and on every continent on the globe, SKYRIDER receivers are providing dependable communications reception for amateur and commercial radio stations.

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See them at your Hallicrafters Dealers. Compare them, feature for feature. Judge their performance! Only then can you appreciate their value!

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Diversity Reception for the amateur for the first time! Two receivers, each with its own antenna in a different phone, produce a constant signal level with fading practically reduced, and a stronger signal with lower noise level than any single receiver. Opens a new era in short wave reception.

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