HUGO CERNSBACK
Editor

SHORT WAVE CRAFT

July

SPECIAL HAM NUMBER

WORLD'S LARGEST SHORT WAVE CIRCULATION

How to Build The
804 POWER
Oscillator
See Page 136

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IN U. S. AND CANADA

THE RADIO EXPERIMENTER'S MAGAZINE

THE *New* DOERLE

6-TUBE BANDSPREAD RECEIVER

Marvelous SENSITIVITY and SELECTIVITY

Only Found in the Higher Priced Models

Licensed under RCA and Hazeltine patents

- ★ Continuous bandspread tuning from 9½ to 625 meters.
- ★ An ideal DX receiver for the long distance SW fan or communications receiver for the transmitting amateur.
- ★ Beautiful, large, illuminated, dual pointer, multi-colored, airplane type dial of great beauty.
- ★ Operates from either single wire type aerial or noise-free doublet.
- ★ Volume control—stage aligning trimmer—and tone controls.
- ★ Unusually smooth acting regeneration control.
- ★ Headphone jack with speaker cut-off switch.
- ★ Highly efficient, low loss ribbed plug-in coils, are a large factor in the amazing sensitivity and selectivity of this receiver. Coils are of the large 3 winding variety and are color coded for easy identification.

The famous Doerle line of receivers *are now equipped with the new Octal sockets in which glass and metal tubes are interchangeable. For the first time* this quality receiver is available in KIT form for the short wave experimenter who prefers to "build his own."

Uses 6 of the latest hi-gain tubes (6K7G. 6K7G, 6C5G, 6C5G, 6F6G and 5Y3) in a highly efficient and selective circuit, using *two tuned* stages—electron coupled regenerative detector—POWERFUL 3 stage resistance capacity coupled audio frequency amplifier with power pentode output stage—full wave high voltage rectifier and self contained hum-free power supply. Built-in High Fidelity dynamic speaker capable of handling the entire 3 watts of audio frequency power output of the receiver.

Continuous bandspread over the entire range of 9½ to 625 meters is obtainable due to the use of a special type, multi-colored, airplane dial having 125 to 1 ratio and *two pointers*. Two knobs are provided and make possible either fast or slow motion tuning. ALL of the AMATEUR and FOREIGN SW BANDS are spread over a generous portion of the tuning dial, thereby simplifying tuning so that even a beginner can operate it to the utmost satisfaction. Entirely free from all traces of backlash.

The entire unit is contained in a large, black crackle finished metal chassis and cabinet of extreme beauty. All controls are mounted on the front panel and all parts are readily accessible. No adjustments whatever are necessary. Nothing to get out of order. Simply plug into your electric light socket and enjoy an evening of short wave thrills and entertainment such as you have never before experienced.

Mechanical specifications: Dimensions are 17½"x8"x8¾". Net weight 23 lbs. Shipping weight 33 lbs. Designed to operate entirely from 100-130 volts, 50 to 60 cycles AC house current. Shipment made same day as order is received. *Complete satisfaction guaranteed.*

DOERLE 6-tube AC BANDSPREAD RECEIVER, completely wired and tested, with set of 6 matched Arcturus tubes, 8 coils for 9½ to 200 meters, cabinet, instructions, and READY TO OPERATE. Licensed under RCA and Hazeltine patents ..... (Specify whether *metal* or *glass* tubes desired.)

LIST PRICE $34.95. Discount to Hams, Fans & Experimenters 20%. YOUR NET COST **$27.96**

less 2 Broadcast band coils, extending the range up to 625 meters, extra $1.45.

DOERLE 6-tube AC SW KIT, containing all necessary parts, including 8 low loss ribbed coils for 9½ to 20) meters, full size hi-fidelity dynamic speaker, beautiful cabinet, and 4 page instruction booklet, (less tubes, Broadcast coils, and unwired) **$17.96**

6 Arcturus matched tubes $3.12

Broadcast band coils (2) 1.45

DOERLE 6-TUBE BATTERY OPERATED RECEIVER. has same specifications as above except that economical 2 volt type tubes are used and operate entirely from dry batteries. Subtract $2 from price of electric model. (less batteries).

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I enclose $..... for which please send me .....
(On C.O.D. orders, send 20% deposit.)

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New 4-Tube Doerle Receiver

9 to 625 Meters

The 4-tube Doerle AC circuit employs one 6D6 as TUNED R.F. amplifier, one 6F7 (Twin dual purpose tube) as ultra sensitive screen grid regenerative detector, and first audio stage, one 38 as power pentode audio amplifier, and one 84 as full wave hum-free rectifier and self-contained power supply.

- ★ Full 5 tube performance.
- ★ Well shielded stages producing remarkable selectivity.
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- ★ Electron coupled regenerative circuit.
- ★ Two gang condenser, single dial control.
- ★ Band spread vernier control.
- ★ Extremely smooth operating regeneration and volume controls.
- ★ Large, low-loss, silver plated inductances.
- ★ Operates directly from your AC house current.
- ★ Beautiful, black crackle finish metal chassis, panel, and cabinet.

PRICE, complete, wired, with 8 coils for 9 to 200 meters, cabinet, tubes, and instruction booklet **$14.95**

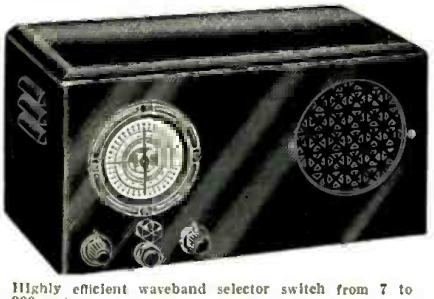
(Less broadcast band coils (2), extra $1.45)
(Amateur bandspread coils for 20-40-80-160 M. bands, extra $2.95)

DOERLE AC 4-tube kit, including 8 coils for 9 to 200 M. and instructions. (unwired, less cabinet, tubes, and RC coils) **$10.95**
Beautiful metal cabinet, extra $1.25
Set of 4 MATCHED RCA tubes 2.54
Wired and tested 1.50

4-TUBE DC DOERLE
Same as above except that it uses battery operated tubes 34-864-30-33. Subtract $1.50 from price of AC model. (Less batteries.)

NEW DOERLE 5-TUBE 6-IN-5 BANDSWITCH RECEIVER

7 to 900 Meters



This is undoubtedly one of the finest bandswitch receivers available. Covers the entire wavelength spectrum from 7 to 900 meters in a simple combination regenerative and super-regenerative circuit of high efficiency.

Uses one 6D6, one 6F7 (twin dual purpose tube), one 76, one 43, and one 2525 tubes, in a special circuit producing **FULL 6 TUBE PERFORMANCE.**

PRICE, complete, wired ready to use with 5 matched RCA tubes, cabinet, and 4 page instruction booklet **$25.95**

- ★ Highly efficient waveband selector switch from 7 to 900 meters.
- ★ Built-in high fidelity dynamic loudspeaker.
- ★ Headphone jack for use of phones when desired.
- ★ Hum-free in operation.
- ★ POWERFUL 2 stage audio amplifier with pentode output stage producing enormous volume on the majority of stations.
- ★ Illuminated, airplane type vernier dial.
- ★ Band spread tuning adjustment.
- ★ Operates from AC or DC house current.
- ★ Beautiful, black crackle finish metal chassis, panel, and cabinet.

DOERLE BANDSWITCH KIT, of necessary parts, including chassis, panel, speaker and instructions, less tubes, cabinet, unwired **$14.95**
Beautiful black finished cabinet, extra $2.50
5 MATCHED RCA tubes, extra $2.75

GUY STOKELY RADIO CORPORATION, 126 Liberty St., Dept. S-7, New York City

IN THIS ISSUE: PROMINENT SHORT-WAVE AUTHORS

Parsons • Schrage • Shuart • Cisin • Palmer • Hooton

SHORT WAVE CRAFT

Combined With

Official SHORT WAVE LISTENER

HUGO GERNSBACK
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Managing Editor

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Associate Editor

Contents for July, 1936

Features in the August "Fan" Issue

A Midget "FAN" Receiver, Using 4 Metal Tubes, by H. G. Cisin, M.E.

A Transmitter using the new "Beam" Tubes; All Bands with One Crystal, by George W. Shuart, W2AMN.

A Proven 5-Meter Super-Regenerator.

How to Experiment with New Circuits, by Willard L. Miles.

Radio is 100 Years Old!, by H. W. Secor.

All-Band Transmitting Doublet—How to Make and Tune It.

Certified Circuits

● **SHORT WAVE CRAFT goes to a large expense in verifying new circuits. When you see this seal it is your guarantee that such sets have been tested in our laboratories, as well as privately, in different parts of the country. Only "Constructional-Experimental" circuits are certified by us.**

When you see our certified seal on any set described, you need not hesitate to spend money for parts, because you are assured in advance that the set and circuit are bona fide and that this magazine stands behind them.

SHORT WAVE CRAFT is the only magazine that certifies circuits and sets.

OUR COVER

● **The cover feature this month illustrates a radically new Transmitter, employing the latest in tubes—the 804 power pentode. This tube is used as a high-power, crystal-controlled oscillator, and it is completely described on page 136.**

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HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

SHORT WAVE CRAFT

"What Interests Me Most in Short Waves"

The Results of Our Fifty Dollar Prize Contest

By Hugo Gernsback

● IN our last February issue, we announced a prize contest based upon the question:

WHAT ARE THE TEN THINGS IN SHORT WAVES THAT INTEREST YOU MOST TODAY?

The idea behind the prize contest was that we wanted to ascertain not only for ourselves from an editorial viewpoint, but for our readers themselves, exactly wherein their greatest interest in short waves lies.

It was realized that the short-wave art today embraces many fields of endeavor, which are becoming more numerous as time goes on. New discoveries are made almost weekly in which the instrumentality of short-waves play a part, and it was therefore of interest to know just how our readers felt about the art of short-waves in general.

Our readers responded in no uncertain tones. Several thousand entries were received from all over the world. The outstanding points about the contest were, that in the main, most readers agreed on what interests them and there were at least six subjects which were virtually duplicated in all of the letters. This is astonishing and at the same time very illuminating. The letters show that the readers of *Short Wave Craft* possess an accurate knowledge of what is going on in short waves. Indeed, most of the answers showed that the contestants were excellent students of the subject and but few of them are onesided in their endeavors. This is as it should be—at least *Short Wave Craft* has always made it a point to cover the entire art from every angle, and this we are happy to say has been reflected in the letters of the contestants.

We reproduce here the entries of the first, second, and third prize-winners. We take this occasion to congratulate the winners, as well as all contestants upon the uniformly high quality of the entries in this contest. We regret that only three letters can be printed.

WINNERS in $50.00 PRIZE LETTER CONTEST

First Prize Winner—$20.00.
William Cusick, 431 S. Locust, Ottawa, Kans.

Second Prize Winner—$10.00.
Allan E. Vosburg, Jr., 5247 Larchmont Ave., Detroit, Mich.

Third Prize Winner—$5.00.
Carl E. Swanson, Waverly, Nebr.

Fourth Prize Winner—$3.00.
William Roberts, 268 Gardner St., Plymouth, Pa.

Fifth Prize Winner—$2.00.
Louis Horwath, Jr., 936 N. Keystone Ave., Chicago, Ill.

Sixth to Fifteenth Prize Winners, Inclusive—$1.00 *Each.*
Merrill Lindley, W9AEA, 2659 Napoleon St., Indianapolis, Ind.
Carl F. Hooton, Arlee, West Va.
John T. Kelly, 778-7th St., San Pedro, Calif.
Marion L. Mizer, Milton, Ore.
C. P. J. Bester, 85 Main St., Somerset West, So. Africa.
Leo J. Vince, 2805 E. 117th St., Cleveland, Ohio.
Leslie A. Croutch, Parry Sound, Ont., Canada.
Adam Mazon, R.D. 4, Box 75-A, Latrobe, Pa.
I. E. Harper, 1218 No. Adams St., Mason City, Iowa.
C. Hansen, 3156 So. Illinois Ave., Milwaukee, Wisc.

First Prize Letter, by William Cusick

1. *Amateur Transmitters*—I am interested in the type of transmitters which can be built at a moderate price, and at the same time, are efficient and not really "flea-power" for example, the "SG3 transmitter." My interest is due to the fact that I expect to put a "rig" on the air soon.

2. *Short Wave Sets*—I am interested in A.C. receivers using four or five tubes. I build this type of set because I have found it is very efficient; is economical to operate; and the cost of building is low. This low cost enables me to build several sets at the same time, each using a different idea, and compare the results.

3. *Television*—I am interested in Television because it will only be a matter of time before it will be in use in every home, just as radio is today. My first view of a *television picture* gave me the same thrill as the first time I listened to a broadcast on the old-time "crystal set."

4. *Antenna Systems*—I am continually experimenting with short-wave antennae; your articles on this subject are very helpful. I am interested in this subject because I I have found that a receiver is no better than its antenna, and I am sure this is true for *transmitters* also.

5. *Ultra-Short Waves*—Reception and transmission below 5 meters interests me because, due to the fact that present radio channels are overcrowded, it seems to me that the logical solution will be the future use of waves below 5 meters.

6. *Short Wave Diathermy*—I am interested in this phase of short waves because it seems to me to be one of the outstanding developments of short waves. If short waves can bring about a cure for disease, another miracle will have happened.

7. *Airplane Radio*—This branch of short waves interests me because it is really the founda- (*Continued on page* 170)

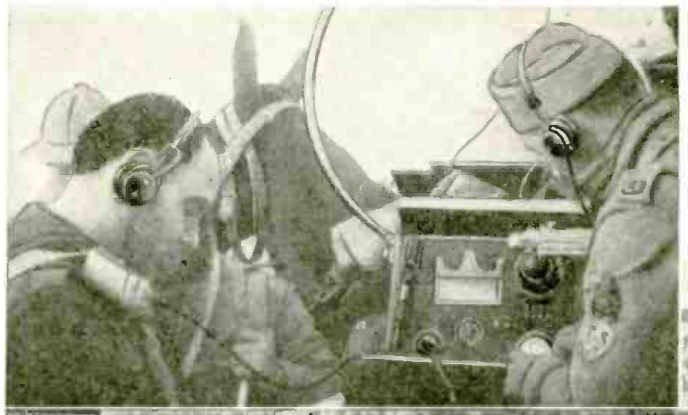
SHORT WAVE CRAFT IS PUBLISHED ON THE 1st OF EVERY MONTH

This is the July, 1936 Issue—Vol. VII, No. 3. The Next Issue Comes Out July 1

Editorial and Advertising Offices, 99-101 Hudson Street, New York City

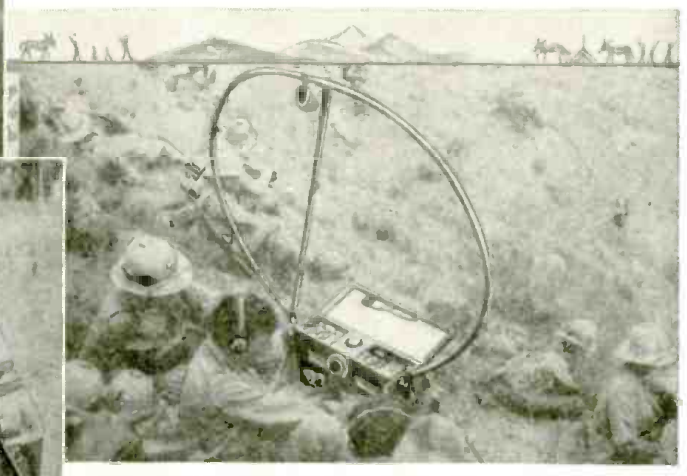
Short Waves in War and Peace

Short-wave equipment played an important role in the rapid advance of the Italian Army in Ethiopia. The Hindenburg, Germany's newest dirigible, found short wave valuable while flying the Atlantic.



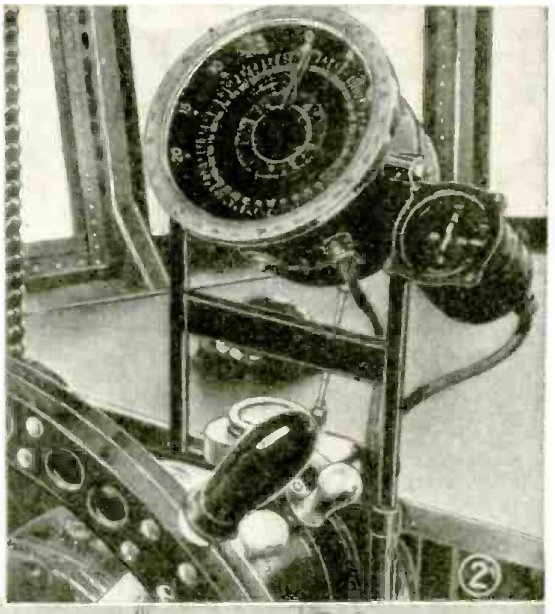
Top view shows portable mule-pack short-wave set in use by members of the Italian Army Signal Corps. The men in the upper photo are shown receiving a short-wave message from field headquarters.

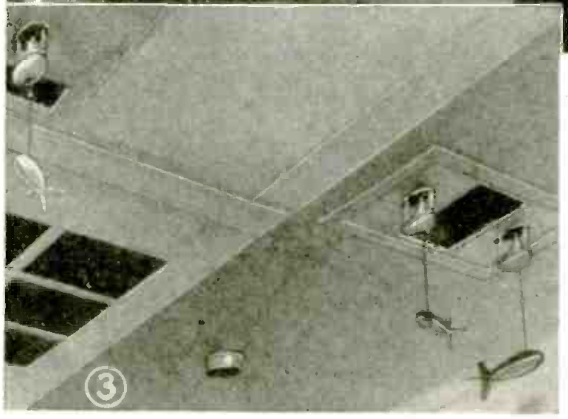
The photo just above shows still another type of short-wave transmitter and receiver carried by the Italian Army in Ethiopia.



Above—Italian Artillery unit using portable short-wave set for the purpose of locating the enemy's position. Some of these sets are operated by battery power, while others derive their power from dynamos driven by foot-power, similar to the pedals on bicycles.

Photos below show radio equipment aboard the "Hindenburg," giant German dirigible. Short waves play a very prominent part in keeping the huge airship in touch with important land stations.





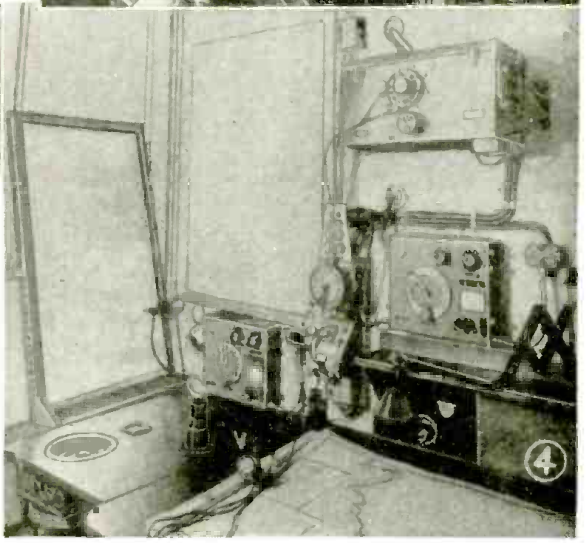


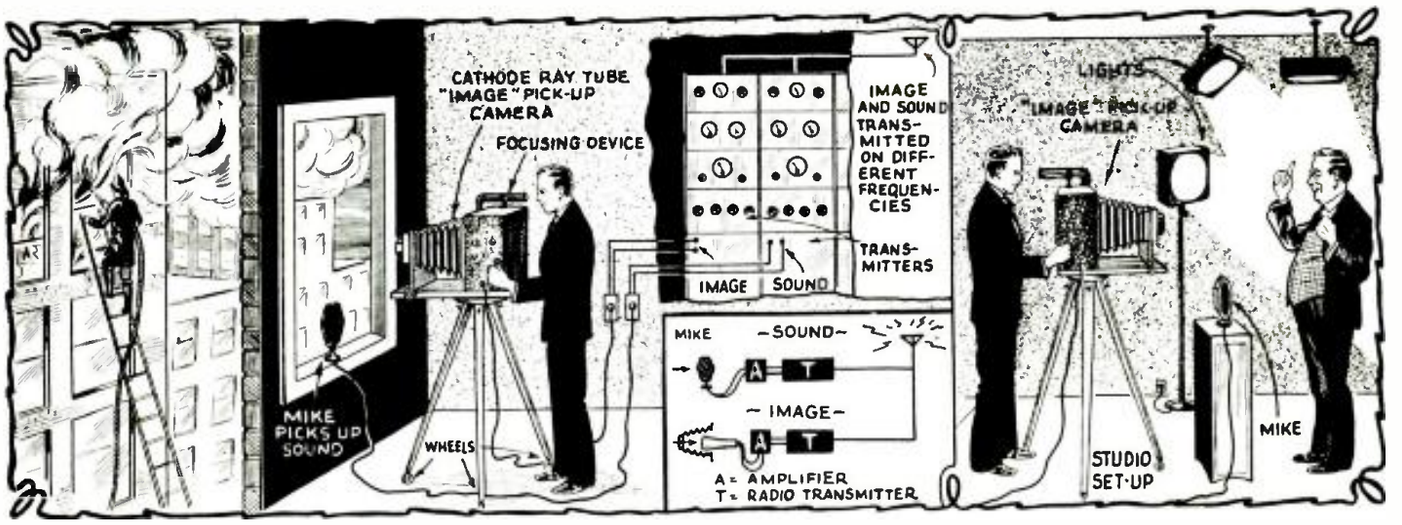
Fig. 1 shows interior of the radio station aboard the "Hindenburg."

At left, S-W transmitter with range of 15 to 75 meters. Two center cabinets contain receivers with range of 15 to 20,000 meters; the cabinets are air-tight and water-proof.

At right, transmitter with range of 600 to 2,700 meters, CW or phone.

Fig. 2 shows "blind landing" indicator beside steering wheel of the "Zep," which connects with the special receiver in the Navigation Room in Fig. 4.

Fig. 3, stream-lined counter-weights keep the antennas taut.



Technique employed in televising outdoor scene. The cut-out in the wall shows the control room and transmitters actually located in an adjacent room. Arrangement of lights, camera, and subject when televising a person in the studio is shown.

New TELEVISION EXPERIMENTS BY RCA

By M. Harvey Gernsback

A very interesting demonstration of the new RCA Television System was recently given at Camden, N.J. Images of outdoor scenes were picked up and the sound was also transmitted and received. Even though two different frequencies are used to carry the voice and image, the receiver has but a single tuning dial.

● LAST month a group of radio editors was invited to the RCA research laboratories in Camden, N.J., for a demonstration of the latest experimental "home" type television receiver developed by RCA research workers.

Scenes televised at the transmitter, a mile away from the receiver, were clearly reproduced, although they suffered from occasional blurring. Several of the radio editors were persuaded to appear before the television "camera" and were clearly seen and recognized by their colleagues when the images were reproduced at the receiver, which was housed in an attractive console cabinet, similar in appearance to one housing a modern phono-radio combination. Their voices were also heard as the system makes use of sight and sound channels. After this the Camden Fire Department gave a fire-fighting demonstration on a building adjacent to the studio. The television "camera" was moved to an open window and picked up the scene for the "viewers" at the receiver. This sunlit outdoor scene was reproduced with remarkable clarity. Autos passing by on the Delaware River Bridge, several hundred feet from the "camera," could be seen as well as the activities of the fire-fighters who were about 50 feet away. To conclude the demonstration a one-reel motion picture was televised. This also came through very well.

Cathode Ray System Employed

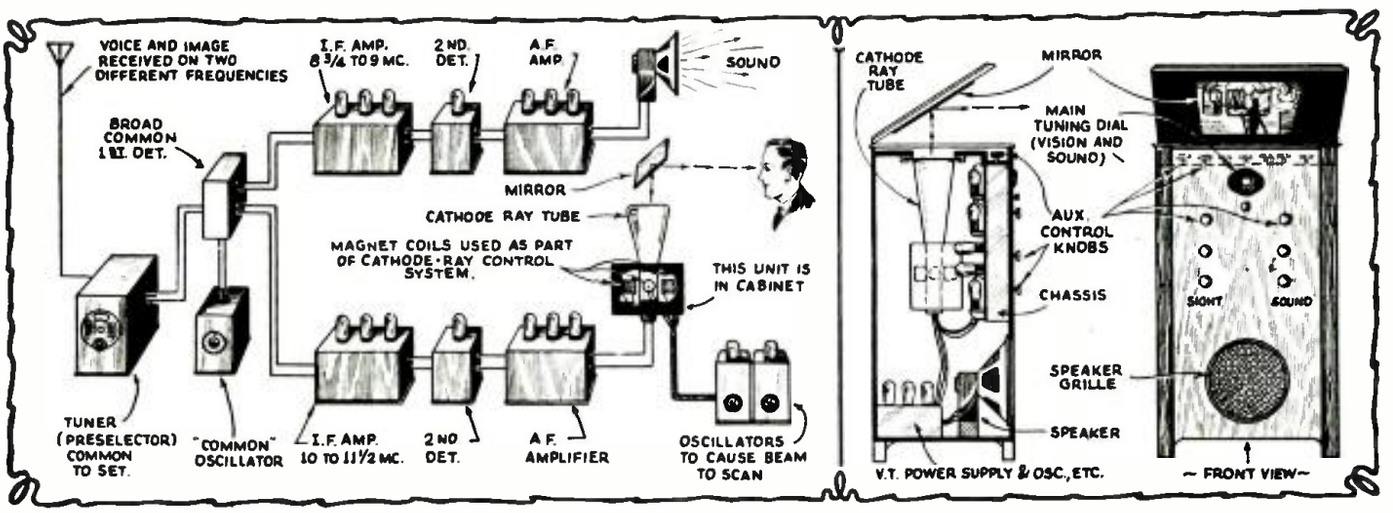
The cathode ray method of scanning is employed in the RCA equipment. Two ultra-short wave transmitters are employed, one for sight on 46 mc. and one for sound accompaniment on 48 mc. The television transmitter sidebands extend 1½ mc. on each side of the carrier or a total of 3 mc. The pictures contain 343 lines. Scanning is done at 30 pictures per second.

The television camera resembles a commercial photographer's camera, except that instead of having a sensitized photographic film inside it, there is a special cathode-ray tube for picking up the images and converting them into electrical impulses, which are carried by wire to the radio transmitter. The camera has an adjustable focus and requires the presence of an operator to adjust the lens for various distances as the subjects being televised move about.

Receiver Details

The receiving equipment consists of two separate receivers of the superheterodyne type, operating from a 110 volt, 60 cycle A.C. power-supply. Both receivers are in one cabinet. The receivers will tune from 40-80 mc.

The cathode ray tube is mounted vertically in the cabinet, with the end where the (*Continued on page* 173)



Block diagram of the sight and sound ultra short wave receiver employed in latest television demonstration. Note the common first detector-oscillator system and separate I.F. amplifiers for sight and sound. Sketch of console for sight and sound receiver appears at the right.

Details of HAM Sets That Will Flash Yacht Race News

In the last issue we described the "general plan" for reporting the sail-boat races on Long Island Sound this summer by a network of "Ham" stations. A description of the 5-meter Transmitters and Receivers to be used in this "net" is given herewith.

56 mc. Transmitter, with microphone and batteries, of the type to be used by "Ham" stations in reporting the yacht races on Long Island Sound.

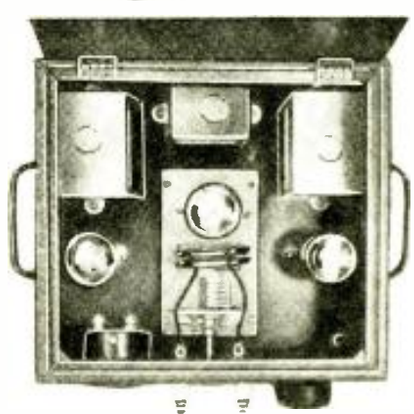
● THE general plan of operations whereby a *network* comprising 5-meter "Ham" stations, some of them on land and others located on sailing yachts, which will be used to report the positions of the boats during the races, was described in the last issue. In the present article a description is given of a typical 56 mc. transmitter to be used for making these reports over "Ham" phone channels. The particular transmitter shown was designed and built by the technical committee of the Garden City Radio Club of Long Island.

The transmitter is very compact and is entirely battery-powered. Either voice or I.C.W. may be used. This high frequency transmitter employs three 6A6 tubes; one as an oscillator, one as a modulator driver, and the other as a Class B modulator. In the top view of the transmitter, the shield cans at the back cover the microphone and Class B input and output transformers. The unity coupled inductance and tuning condensers are mounted on a strip of Victron.

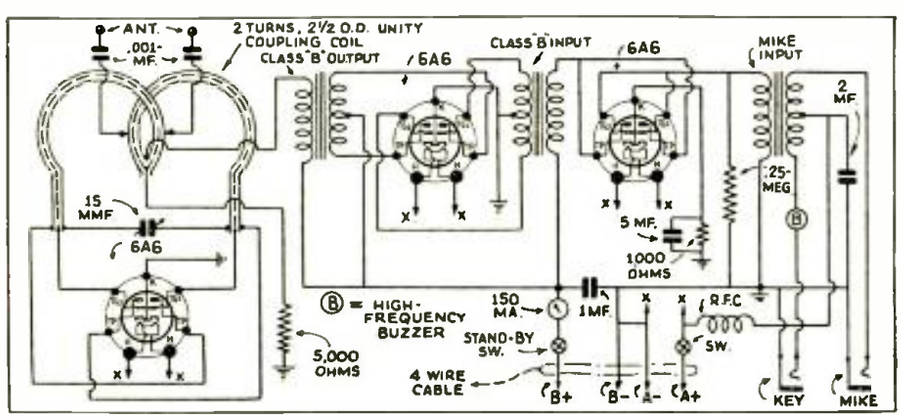
As described by Stanley P. McMinn of the Garden City Radio Club in the *New York Sun*, the plan in brief is to maintain contact between the sailing yachts in the various races and also between the yachts and their home yacht clubs. The details of the plan, one of the most ambitious ever attempted by the "Ham" fraternity, has been worked out by the Garden City Radio Club.

The transmitting equipment not only had to be light and portable but it also had to possess the quality of reliability and be sufficiently powerful to insure unbroken communication under practically all conditions. The transmitters and receivers will be of the separate type, so as to avoid any Q.R.M. which is frequently created by the use of 56 mc. transceivers. There will also be frequent need for duplex operation.

The accompanying photos and diagram give the reader a clear idea of the 56 mc. transmitter, as finally worked out by the technical experts of the G.C.R.C. The transmitter is built into a National S-W-3 metal cabinet measuring 9" deep, 9½" wide and 7" high. On the front panel there is the National midget tuning dial, a 0-150 milliammeter, a high frequency buzzer for ICW work, switches for the filament and B supplies and two jacks, one for the microphone and the other for the key. The handles were added in order to facilitate passing the rig around from ship (*Continued on page* 169)



Photos above show close-up and chassis views of the 56 mc. transmitter.



Wiring diagram of the 56 mc. Transmitter, of the type shown in the photos above.

He Talks Through His HAT—and Gets Paid for It! • • •

New "Silk-Hat-Transmitter" of the NBC which operates on a frequency of 270,000,000 cycles with an output of 2/10 watt.

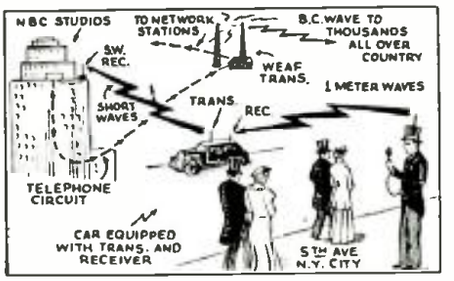
By W. E. Schrage

George Hicks, popular N.B.C. announcer wearing the latest style 1-meter transmitter "hat," by means of which he transmitted descriptions of the "Easter Parade" on Fifth Avenue, New York City, to the N.B.C. network.

This diagram shows the various component parts of the 1-meter transmitter, the batteries for operating it being carried on a belt around the waist.

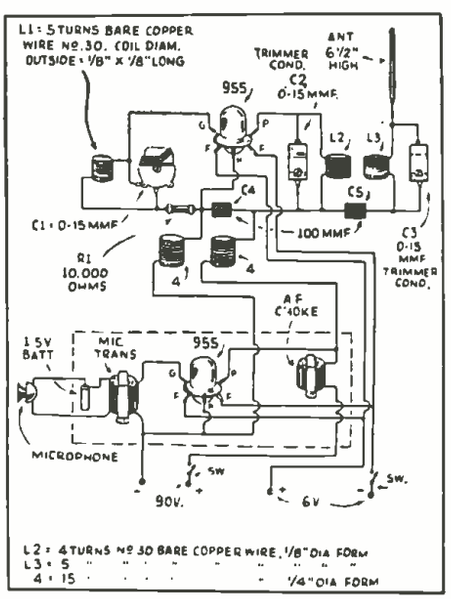
● TO EXTEND the scope of pick-up for present broadcasting networks, and to enable "foot-loose" radio reporters to carry a small microphone to any point desired, O. B. Hanson, chief engineer of the National Broadcasting Company recently designed a very interesting miniature transmitter, operating on a wavelength of about 1.1 meters (about 270,000,000 cycles per second). The output of this *ultra short wave* transmitter is about two-tenths of a watt, and the range covered is estimated to be about one-quarter of a mile. This transmitter has been installed in the crown of a silk top hat and has a weight of only 11 ounces!

The main trick in building this miniature broadcasting station lies in the use of extremely small radio tubes, well known to amateurs under the name of "Acorn" tubes, because they resemble an acorn in shape and size. It is not the first time that broadcasting stations have tried to utilize a tiny transmitter like this for their program features. The large dimensions of the "knapsack" sets used did not permit the announcer to move about freely in large crowds. This disadvantage of course reduced the entertainment value of these "spot-pickups," since the by-standers became "microphone-conscious" and the interviewed "man on the street" became infected with stage-fright and he gave a very poor performance in consequence.



A 1-meter receiver mounted in an automobile picked up the voice of the announcer as he walked along the avenue; in turn it was transmitted from the car on another wavelength to a receiver located in N. B. C. headquarters in Radio City.

Diagram at left, shows how the acorn tubes were hooked up in the 1-meter transmitter carried by the announcer.



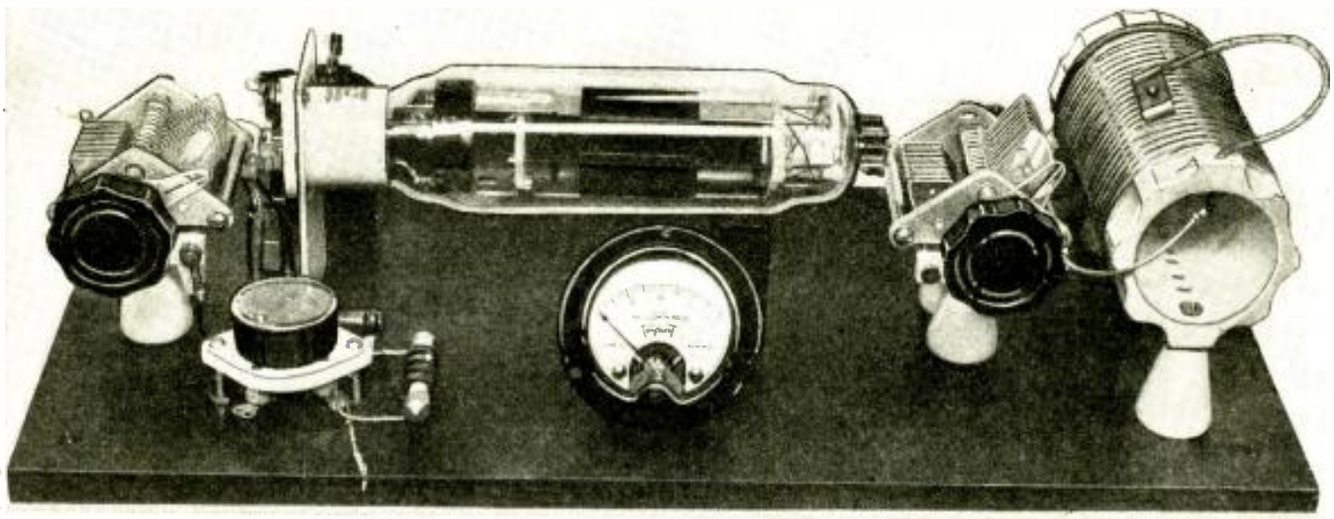
The experiment during the last Easter Parade on Fifth Avenue, New York, has shown that unlimited tricks of "broadcast reporting" are now possible, and that we shall have to watch out for the "secret radio reporter," who may, perchance, sit on a chair next to us, and transmit everything we say to our friends in the radio audience, thanks to the new 1 meter short-wave "silkhat" set.

The actual possibilities for "secret pickups" as sketched above, have been proven by actual experiment by the well-known NBC announcer, George Hicks, who walked with his "silk-hat" transmitter along Fifth Avenue on Easter morning, hiding under his cutaway of formal fashion a wide leather belt containing the "power-plant" of the tiny broadcasting station. A pocket-size microphone was connected through an inconspicuous looking cable with the power-plant, and the silk-hat transmitter completed the outfit. The only unusual accessary for a fashionably dressed Easter parade visitor was the hollow aluminum rod, 6½ inches in length, fastened atop the silk-hat, and operating as a so-called quarter-wave antenna.

The antenna can also be made inconspicuous by using a blackened piece of thin steel wire. Since the range of such a small transmitter hardly extends beyond a quarter mile, the automobile pickup and transmitting station which received and relayed (on a longer wave) the "voice" of Mr. Hicks to the broadcast studio, will of course be necessary for secret "spot" pickups in the future. But who (*Continued on page* 181)

How To Build the Very Latest—The

804 Power Oscillator



This photograph clearly shows the general layout of the 804 power oscillator.

● THOSE who read the article describing the 830-B amplifier in last month's issue, will recall that we mention the use of an 804 driver. The idea worked out so well that we thought it would be advisable to describe the unit in detail.

The 804 is, as many already know, an addition to the now tremendous line of R.C.A. Radiotrons. This new tube has many capabilities in so far as the amateur is concerned; the tube itself may be used as a complete crystal-controlled transmitter and with an output of around 75 watts. It will stand up to 1,250 volts on the plate and has a 7½ volt filament. It is exceptionally well constructed and shielded; so well shielded, in fact, that there is hardly a trace of reaction between the output circuit and the crystal when the two are resonant at the same frequency.

The unit as shown in the photo and the diagram is the well-known *tritet* circuit and can be used as we said before, either as a complete transmitter having an output of around 75 watts, or as a driver for a high-powered amplifier. In fact, this tube with full plate input should be capable of supplying excitation for more than one-half kilowatt amplifier. The oscillator as shown in the diagram was operated separately for a number of evenings on each of the three prominent amateur bands and provided a surprising number of "contacts." This outfit really demonstrated that an efficient transmitter can be built with a minimum of parts.

Ideal for Use With 830-B Amplifier

When used in conjunction with the 830B push-pull amplifier, only 750 volts were applied to the plate. Even this moderately low plate-voltage provided more than enough output to excite the 830-B amplifier when the plate circuit of the 804 was tuned to the second harmonic of the crystal. We can think of no finer combination as a medium-power transmitter than the use of the 804 in a tritet crystal-oscillator circuit, as described in this article, and the 830-B push-pull amplifier which was described last month. Over 200 watts can be obtained from the 830-B's in this combination and, needless to say, it is an extremely simple combination of apparatus and very economical to build.

In the tritet circuit we have a tapped, dual-wound filament coil consisting of 28 turns of No. 16 double cotton covered wire. These two wires are laid side by side and wound on a 1½" bakelite coil form. One of these windings is tapped at the 10th and 2nd turn from the filament end. When the switch is opened the coil functions with an 80-meter crystal. In this position, and with an 80-meter crystal, considerable output can be obtained on either the 80 or 40-meter band, merely by adjusting the plate circuit to those bands. Then, on the 40-meter tap, the coil functions with a 40-meter crystal and operation to be obtained on either the 40 or 20-meter band. On the last tap, the 20-meter tap, we use a 20-meter crystal and obtain considerable output on either the 20 or 10 meter bands.

Works on 10 Meters Too!

Those who are interested in 10-meter transmission will find this oscillator, in conjunction with one of the new Bliley 20-meter crystals, to provide an excellent driving unit for a pair of fairly high-power, ultra-high frequency tubes. In a circuit of this type, where we are operating the crystal in conjunction with a fairly high-power oscillator, it is necessary to keep the tuning capacity

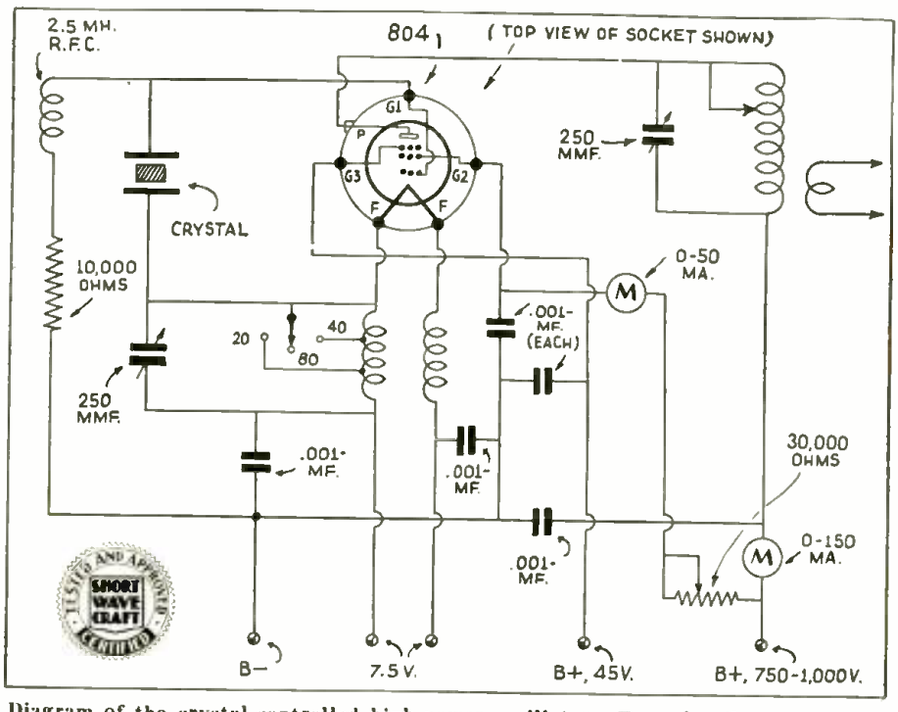
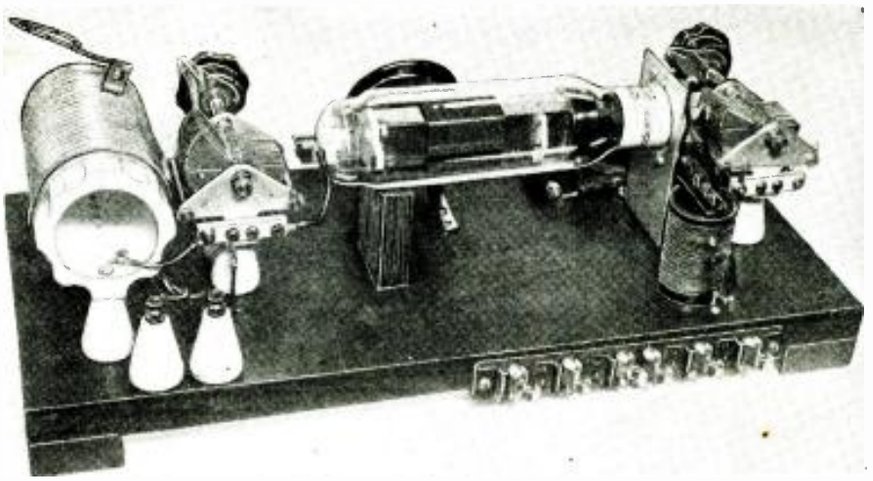


Diagram of the crystal-controlled high-power oscillator. Tapped coils are used to change bands.

Described By
Its Designer
George W. Shuart
W2AMN

In this article the new 804 power pentode is used as a high-power crystal-controlled oscillator. The unit as described may be used as a flexible transmitter, just as it is or, as originally suggested by the author, it may be used to drive the 830-B amplifier described last month.



Another view of the oscillator, clearly showing the double-wound filament coil.

across the filament coil quite large. We use a 250 mmf. condenser and the plates are nearly full meshed for each of the respective positions of the switch.

Low "C" in a circuit of this type is liable to result in high crystal current and, as a result, a fractured quartz plate. In order to simplify the construction of the "driver," we used a 26 turn National coil form and a 250 mmf. tuning condenser in the plate circuit. For 80-meter operation a coil would have to be quite large in physical dimensions in order to permit low "C," and it would thus make it more difficult to obtain efficient operation on 40 and 20, especially 20 meters.

We are not so much concerned with the capacity in the circuit on 80 meters, because the tube is operating very efficiently at that frequency. However, the variable tap when operating on either 40 or 20 meters, should include as many turns as possible, making an extremely low "C" circuit. Those adjustments found optimum were 16 turns for 40 and 8 turns for 20. When operating on 10 meters with a 20-meter crystal we had 2 turns in the circuit.

Use Plenty of By-pass Condensers

A very important item in a *power oscillator* of this type is *by-passing;* plenty of by-pass condensers should be used in order to keep the R.F. where it belongs. The filaments are by-passed on the transformer side of the coil with two .001 mf. condensers.

The screen, suppressor and plate are also by-passed with .001 mf. condensers. For low-power output where the oscillator is used to drive another amplifier not requiring a great amount of excitation the 45-volt positive potential need not be applied to the suppressor, although when using a 20-meter crystal and doubling to 10, bias on the suppressor is necessary in order to improve the plate efficiency. And, by all means, meters should be incorporated in the screen (*Continued on page* 185)

What Does It Cost to Become an Amateur?

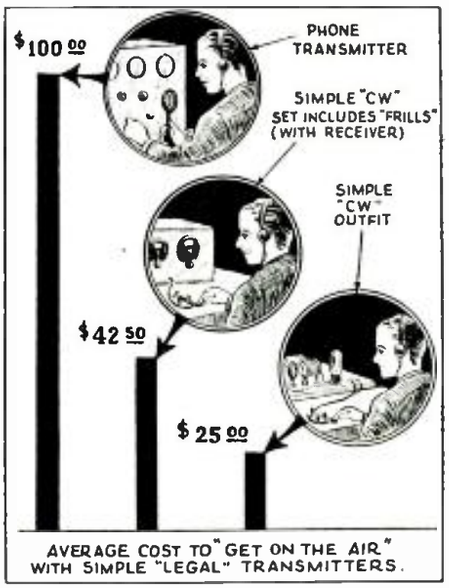
By Howard S. Pyle

● THERE are a large number of short-wave enthusiasts who, through listening to amateur conversations, have become imbued with the idea of joining the ranks of these transmitting hobbyists, and thereby enjoy the thrill of two-way communication.

Many books and pamphlets are available which serve to show the "new-comer" just how to go about entering this most fascinating hobby. Most books all leave a vague impression of the financial outlay involved, leaving the embryo radio amateur in a hopeless muddle, not knowing whether he must spend $10 or $100 to get on the air. It is in an effort to clear up this point that the following paragraphs have been written.

Parts for "CW" Receiver Inexpensive

We will assume that you are already a *short-wave listener*, and accordingly have a receiver suitable for amateur operation. In some cases however, such a receiver will be of a non-oscillating type, ideal for radio telephone work, but practically useless for the reception of continuous wave (cw) radio telegraph signals unless a beat oscillator is fitted to it. The cost of a *beat oscillator* averages about the same as the parts for a good two-tube A.C. short-wave receiver, so that you may choose between building a suitable receiver for the purpose or adapting your present receiver to such work by the addition of a beat oscillator. If you are interested in entering the amateur radio telephone field only however, your present receiver regardless of whether it is an oscillating type or not, will suffice. Should you however, elect to enter the radio telegraph field you may figure on an approximate outlay of $7.50 for parts for a receiver or parts to convert your present receiver if not now suitable for CW reception. This figure will also cover the total receiver cost for the enthusiast about to enter the field with no equipment whatsoever. A more elaborate receiver may be built or purchased, at a later date. in any price range that the user feels he can afford, but the simple little two-tube set will serve admirably while becoming acquainted with amateur operation. Many such receivers have been described from time to time in these pages and no attempt will be made here to discuss relative merits of circuits or equipment.

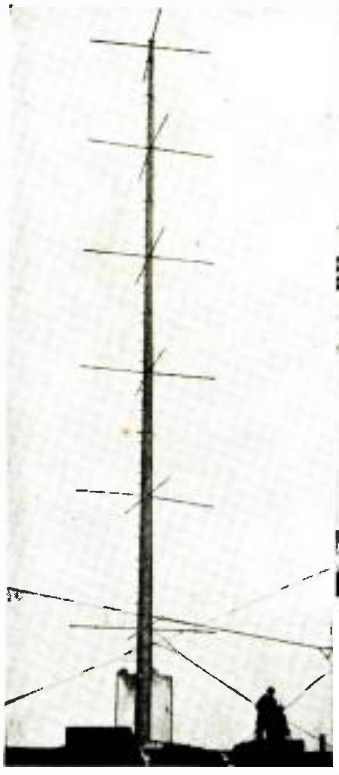


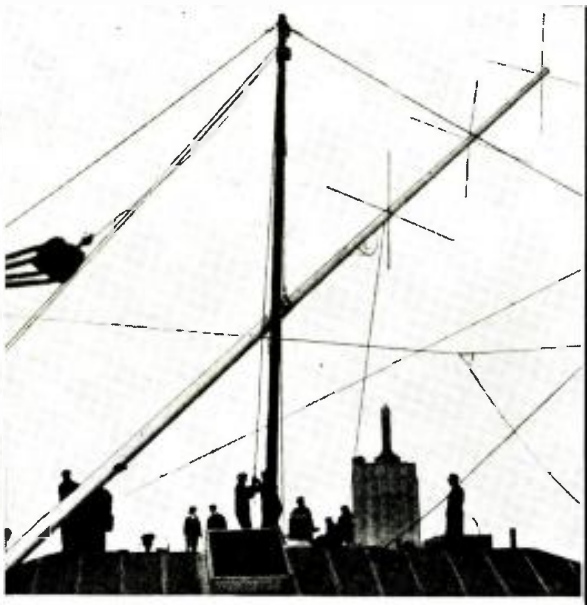
Graphs above show relative cost of becoming an amateur, with low-power transmitters of course.

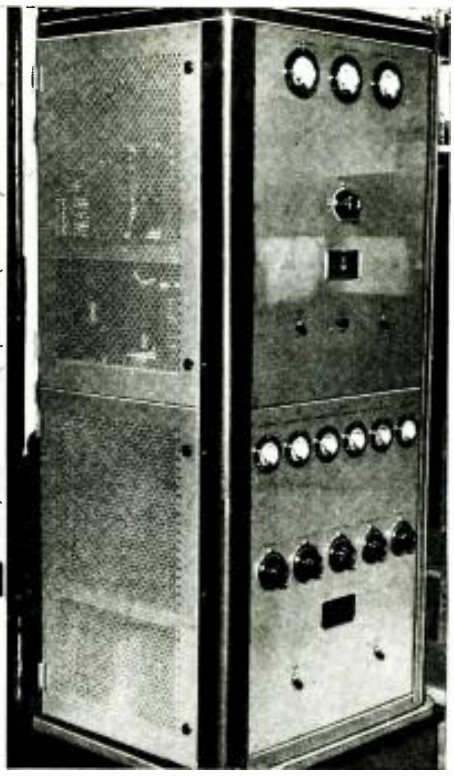
We can drop the receiver problem right now with just a passing word on the antenna. A good single copper wire about sixty feet long and as high as you can conveniently hang it, will work about as well as anything for a *receiving* antenna. This can be erected complete for a total cost of about a dollar. When you have really become proficient as an *amateur*, more elaborate types of antenna can be purchased or built up as your fancy dictates.

Cost of Low Power Phone

If it is your desire to erect a *transmitting* station at as little cost as possible you had better forget radio telephone for the time being. A good radio telephone—and neither the Federal Communication Commission nor other amateurs will tolerate other than a GOOD phone—is a comparatively costly piece of equipment. Remember, in addition to a GOOD "CW" (*Continued on page* 179)







Photos above and at the left show the new "turnstile" antenna array in use at short-wave station, W8XH, Buffalo, N.Y. A 70 foot steel pole supports the antenna array; above—aerial being erected.

Right—the 41,000 kc. transmitter used with the "turnstile" antenna.

"Turnstile" Antenna Array at W8XH

● THE accompanying photos show a very interesting and unusual new style high-frequency antenna, which has been named the *turnstile* aerial on account of its resemblance to the well-known turnstile. This antenna system was designed by Dr. G. H. Brown of the RCA Victor Company. A steel pole, 70 feet high, supports the array of antenna rods, and the maximum height of the antenna is 350 feet above the ground; it is mounted on the roof of the Hotel Statler in Buffalo. This novel antenna provides a strong ultra-short wave radiation with horizontal polarization. The transmitter shown in the accompanying photograph operates at present on 41,000 kc., in connection with the turnstile antenna and good broadcast reception on this high frequency is anticipated for a radius of twenty-five to thirty miles. There are quite a number of listeners already who have been tuning in on the 41,000 k.c. wave of W8XH.

Can 5 Meter Waves Extend Beyond the Horizon?

D. R. Parsons explains the peculiar behavior of 5-meter waves and some of the extraordinary things they do under certain operating conditions.

● IN THE early days of 5-meter working we were informed by the few experts available that radio waves propagated with a frequency of 60,000,000 cycles/sec. would obey quasi-optical laws, resulting in communication between points which were only visible from each other. The only way, therefore, of increasing the receiving range would be by raising the transmitter or receiver well above the surface of the earth. It was supposed that no reflection or refraction occurred from the Heaviside or Appleton layers, the direct ray being the only wave suitable for reception purposes. How far these early assumptions were correct will now be discussed at some length.

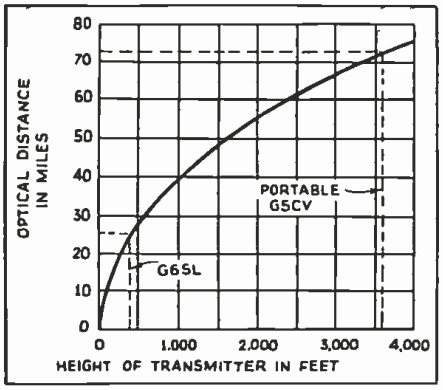


Fig. 1—Theoretical maximum range, on an optical basis, for various heights of the transmitter.

If we have a listener operating a receiver at ground level, then the maximum theoretical distance (still on the assumption of a purely visual range) over which he can receive signals from a given transmitter may be calculated from an extremely simple formula. Alternatively, it may be ascertained from Fig. 1, which shows the relation between the height of the transmitter above sea level and the distance over which signals can be heard on the horizon. It should be emphasized that this curve is definitely theoretical and is based on an elementary principle which most of us learned many years ago. It assumes that the intervening ground between the transmitter and the receiver is flat and that the power of the transmitter in question is sufficient to energize the

(*Continued on page* 187)

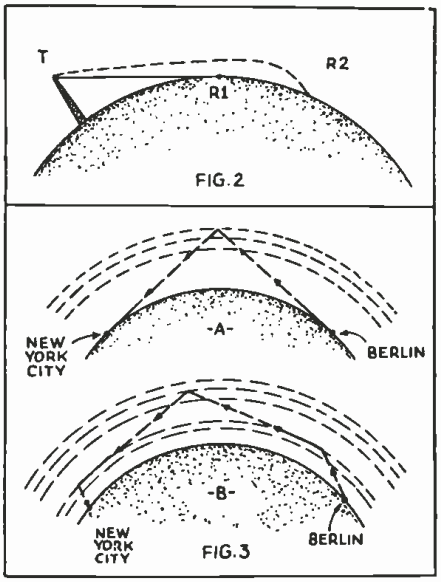
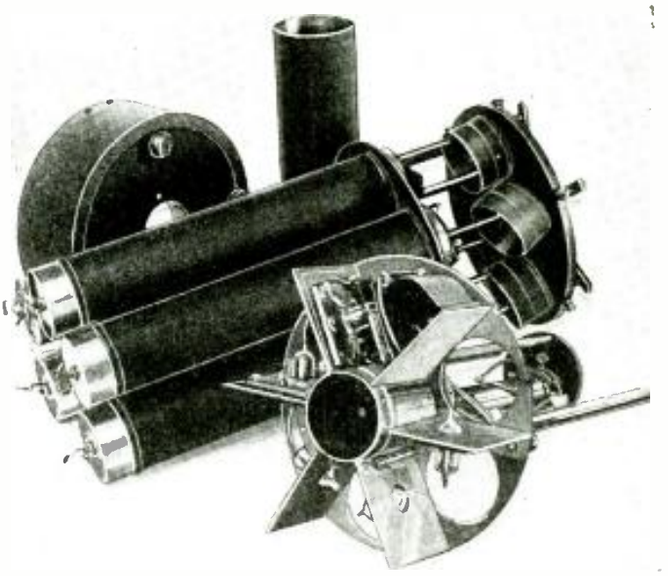


Fig. 2—Illustrating range (R1) of a transmitter T on the assumption of a straight optical path. R2 shows the increase of range of waves following a "bent" path. Fig. 3—Illustrating the effect of reflection from a single ionized layer, and of a combination of refraction and reflection by two separate layers.

New Ultra S-W Tuner Has No Coils

In the realm of ultra short waves, down in the region of 1 to 3 meter wavelengths, a brand-new departure in the tuning circuits is the adjustable concentric "resonant lines" system. When used instead of the familiar coils it provides a distinct gain in efficiency.



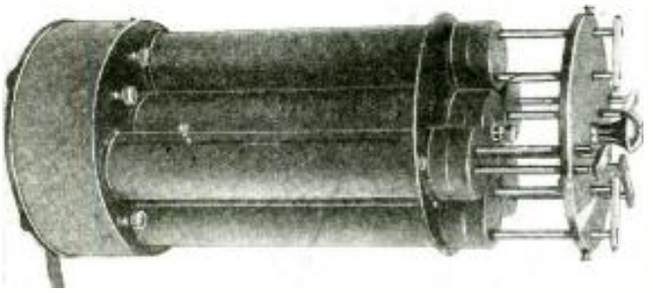


Photo above shows the new ultra short-wave tuning device which employs sliding brass tubes, instead of the familiar copper wire coils.

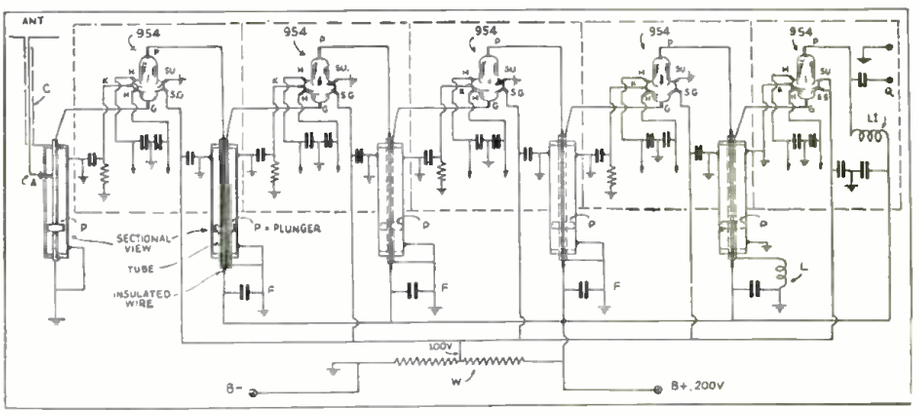
Right—Close-up view of one of the concentric "resonant line" tuners, showing plunger and sliding antenna input terminal.

Left—Assembled four-stage concentric line tuner: each circuit can be separately tuned.

● FOR the past year, concentric cables and parallel transmission lines have been used in transmitters. However, it remained for Frances W. Dunmore of the National Bureau of Standards, Radio Laboratory, to apply these successfully to a receiver.

The usual tuning condensers and coils have been replaced by the concentric transmission line, which—in brief—consists of brass tubes approximately twenty inches long and about 1¾ inches in diameter with an inner tube 3/16 inches in diameter. The instrument shown in the photograph employs five 954, RCA-Acorn tubes and five of these concentric tuning devices. The receiver tunes from 100 to 300 megacycles or from 1 to 3 meters. The tuning units are mounted around a drum-shaped head on which is also mounted the Acorn tubes. This provides very short leads and maximum efficiency on these very high frequencies. Each of these so-called "lines" is provided with a metallic plunger which permits tuning. In the finished receiver, all five circuits are tuned simultaneously which provides single control. However, to compensate for any discrepancies in the circuits, each line can be adjusted individually. Tuning is accomplished by shifting the ground position within the line. In

(*Continued on page* 172)



Wiring diagram for four-stage concentric "resonant line" tuner.

Cathode-Ray Tube Tester

Newest apparatus set-up for testing the luminosity, degree of vacuum, cathode beam intensity, etc., of cathode-ray tubes.

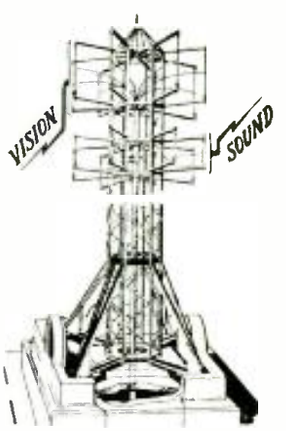
● THE accompanying photo shows a very interesting device for making measurements on cathode-ray tubes, and and it was designed by the well-known German radio experimenter, Baron Manfred Von Ardenne of Berlin.

With the somewhat complicated looking apparatus shown in the accompanying photo, it is now possible to accurately and quickly determine the most suitable plate voltage to be applied to the cathode ray tube under test. By means of this instrument, the complete tube characteristics can be promptly ascertained and recorded for future reference and study. Among other factors which can now be measured and recorded

(*Continued on page* 172)

New Television and Sound Antenna

● ACCORDING to the reports appearing in the English radio television magazines, television is about ready for their public. The accompanying photo shows the very interesting design of *dual* antenna, whereby the vision or image waves are radiated in all directions from the upper array of antenna rods, while the accompanying sound waves are broadcast on a different wavelength, in this case a shorter one than the image wave, by the lower array of antennas.



These two antennae are fed with current by two concentric "transmission lines," which can be seen passing up through the center of

(*Continued on page* 172)

400 Megacycles Used by French "Hams"

By C. W. Palmer

While the ¾ meter band is open to American "Hams", not very much use has been made of it so far, perhaps due to a dearth of literature on the subject. The accompanying article describing a 400 mc. amateur radio transmitter and receiver will therefore undoubtedly prove of interest.

Fig. 5—400 mc. set in use as a "portable" on a car, with antenna arranged in a parabolic reflector.

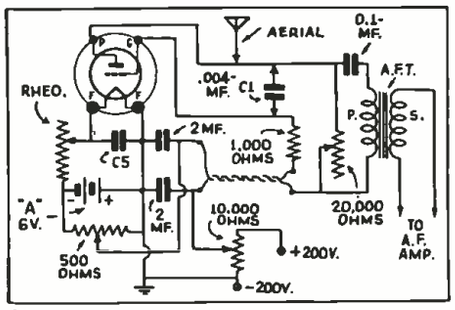


Fig. 1—Above we have the diagram of a 1-tube 400 mc. receiver.

● WHILE amateur radio throughout the world has been shifting to higher and higher frequencies, as exemplified by the activity on the 56 mc. (5 meter) band and even on higher frequencies in this country, development in other countries has not lagged.

In fact, amateurs in France have been outdoing each other in attempts to use the very high frequencies.

Let us look at a few photos and circuits which appeared in recent issues of *Radio-Ref* (Paris), the official publication of *L'Union Internationale des Radio-Amateurs* (The International Radio Amateurs' Union). These photos and circuits cover the 400 mc. (¾-meter) "rig" of amateur station HB9AO.

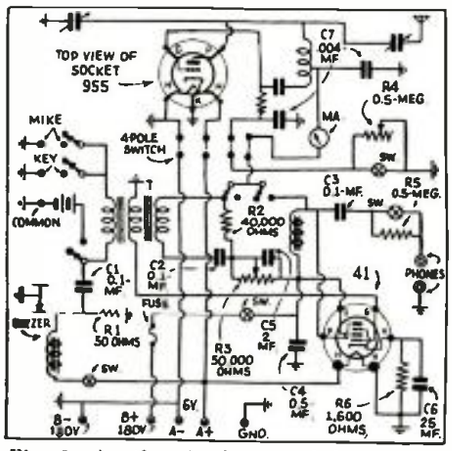


Fig. 2—Another hookup used for the 400 mc. operations, showing both transmitter and receiver.

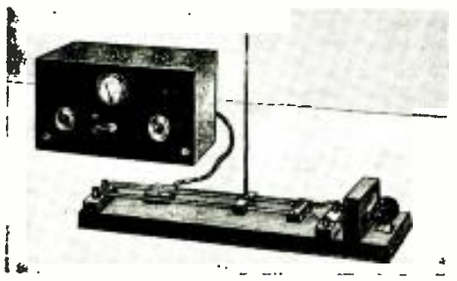


Fig. 3—The 400 mc. receiver with Lecher wire tuning system.

The receiver uses a *dynatron* circuit, shown in Fig. 1. The tube is a metal triode made by the Philips tube company (Holland). The grid and plate are connected to a typical Lecher wire tuning system, with the plate and grid supplies applied through a twisted-wire transmission line. The appearance of the set is shown in Fig. 3. This photo shows the antenna, Lecher wires and the set itself, installed in a neat metal cabinet.

As in the dynatron circuits used on longer wave lengths, the grid of the tube is driven at a high positive potential from the "B" battery, while the plate is connected to a lower source of potential and may even be at a negative potential with respect to the filament. This variation in plate potential is obtained by connecting the plate supply line to the arm of a 500-ohm potentiometer shunted across the filament battery.

Because of the circuit arrangement in this set, M. Luthi, who made it, says: "In these conditions, the action approaches super-regeneration." This accounts for the high efficiency claimed by the author for his receiver on the frequency of 400 mc., as well as on higher frequencies in the centimeter range.

The single tube shown in the receiver circuit, Fig. 1, is the detector, which is followed by several stages of A.F. amplification to bring the sound level up to the desired point.

The transmitter used by HB9AO uses an American tube—the R.C.A. Acorn type 954. This transmitter, shown in Fig. 4, uses a horizontally polarized dipole aerial coupled to a Hartley oscillator. This transmitter is battery operated, the battery circuits being isolated from the high frequency circuits by chokes and filter condensers.

The circuit of the transmitter, or rather the transceiver, for the "emetteur" is actually a combined sending and receiving unit designed for mobile work in a car, shown in Fig. 2. The values of the parts are indicated on the circuit for those ambitious hams who might wish to duplicate the experiments of HB9AO—or, in fact, try some new ones on their own hook.

An interesting view of the rig used by HB9AO when set up in a car, in conjunction with a parabolic reflector for "beaming" the output is shown in Fig. 5.

HB9AO has worked mainly with another amateur, HB9RDL, at distances up to about 35 km. (22 miles).

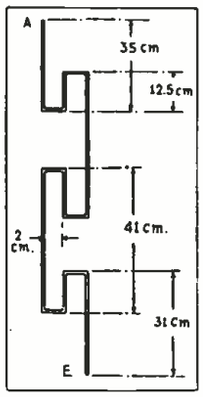


Fig. 7—At left above is shown one form of special antenna used; A is the free upper end, and E is coupled to the transmitter. Fig. 4 at right shows dipole antenna used on one form of 400 mc. transmitter.

In the course of the experiments of these two hams, whose names are R. Luthi (HB9AO) and A. Raviglione

(*Continued on page* 178)

Fig. 6—Portable beam antenna of parabolic shape used by HB9RDL. The chord of the parabola is 3 meters.

Fig. 8—Curtain antenna for 400 mc. Each section of the radiating and reflecting units of the antenna network is tuned to ¼ the carrier wave length. The outer sections of the network are reflectors, while the inner (cubes) are the radiating units.

The All-Wave "AIRCRAFT 3"

An Ideal Portable S-W Receiver

By H. G. Cisin, M. E.

This extremely neat 3-tube portable covers not only short-waves but the *broadcast* and *long-wave* radio beacon channels as well. It operates on batteries, with most any type of aerial, and can be set up at a moment's notice. It uses three type 30 tubes.

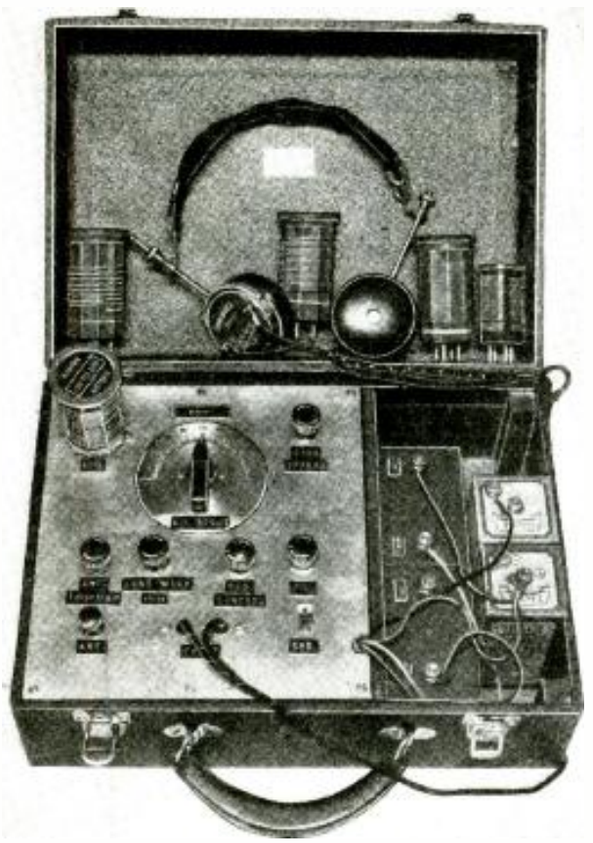


Photo at left shows the all-wave "Aircraft 3" portable receiver opened and ready for tuning in stations. It is a dandy headphone job, but will also work a sensitive magnetic speaker on the stronger stations. Rear panel view, showing the elastic bands used to hold the tubes firmly in their sockets, is shown in the photo below.

● THE All-Wave Aircraft Three was designed especially for use aboard private planes, motor-boats, canoes, or in camps, etc. However, it is so complete, light and compact that it is suitable for almost any kind of portable use. It takes up about as much room as a portable typewriter, but weighs very much less, weighing only 9 pounds, complete with all equipment, *including batteries!* Hence, it can be used in a canoe just as conveniently as in an airplane. It is also well suited for automobile trips, for camping, for fishing trips, and for use on hundreds of other outdoor excursions.

This up-to-the-minute receiver permits the air-minded traveler to sit at ease on a long air journey and tune in radio beacons, weather reports and other information from the various airports passed over by the plane, commercial code stations, standard broadcast and also a full coverage of the short-wave stations from 17 to 200 meters.

How Long Waves are Tuned In

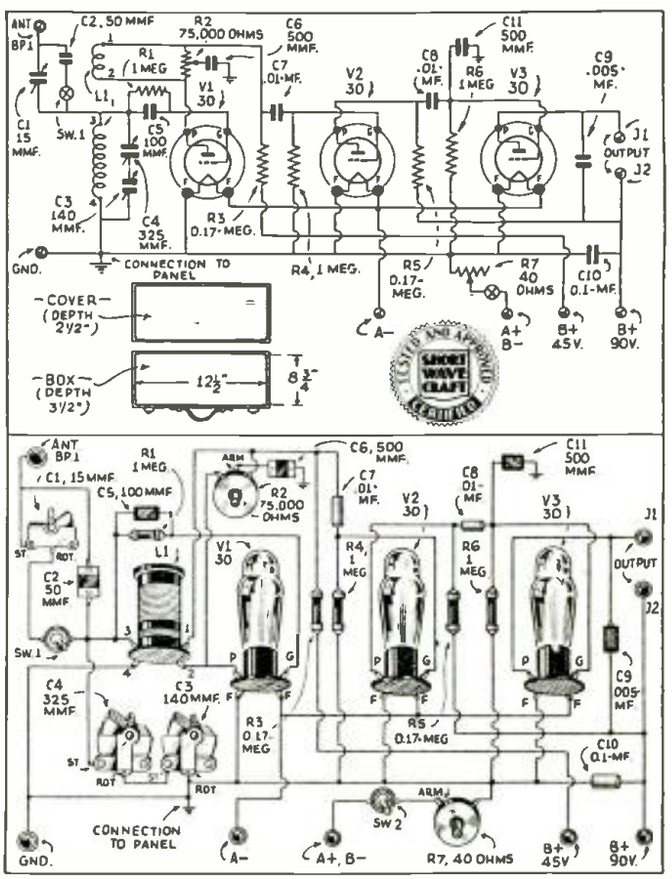
Radio beacons, conversations from airports and other similar signals are received on the so-called "long" waves, by means of a special long-wave coil unit, in conjunction with a long-wave switch which throws a .00005 mf. condenser in parallel with the antenna trimmer condenser. The long-wave switch is closed only when the long-wave coil is used. When the other coils are being used, the switch is left open.

Aside from this *long-wave* feature, which adds to the usefulness of this set for aircraft reception, this receiver is notable especially for its clean-cut, compact design. It uses a regenerative detector and two resistively coupled, audio-frequency stages. Low-drain 30 type tubes are used in all three stages. To cover the broadcast band and short-wave bands, five separate Hammarlund plug-in coils are used. The long-wave coil is a special one available commercially, or it may be wound by the set constructor. The data for this coil is as follows: coil form 1¼ inches diameter; tickler 40 turns No. 38 enamel wire; secondary 245 turns No. 38 enamel wire; space between secondary and tickler 1/16".

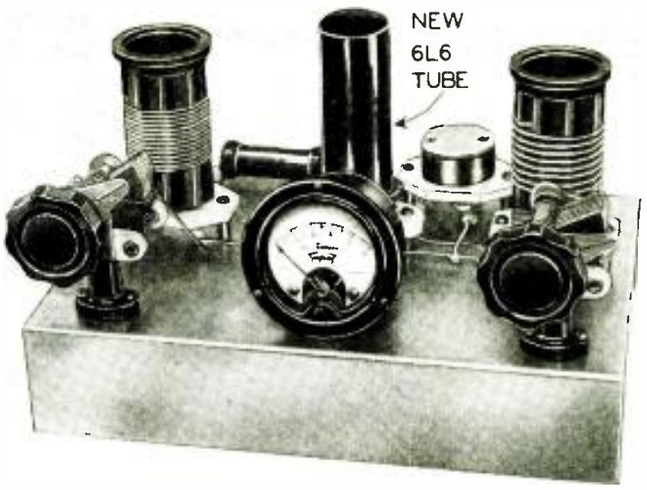
Examination of the schematic diagram discloses several variations from the usual design, necessitated chiefly because of the introduction of the *long-wave* feature. It will be seen that the .00014 mf. tuning condenser is in series with a second .000325 mf. condenser, which, in this case, is effective as an aid in tuning in "long-wave" stations. The way in which this works is as follows: The 15 mmf. antenna trimmer is shunted by a second 5 mmf. fixed condenser when the long-wave switch is thrown. This permits the capacity of the antenna trimmer condenser to be in-

(*Continued on page* 189)

Complete wiring diagrams, both schematic and picture form, for the "Aircraft 3" battery receiver are shown at the right.



1-Tube— 1-Crystal— 4-BANDS!



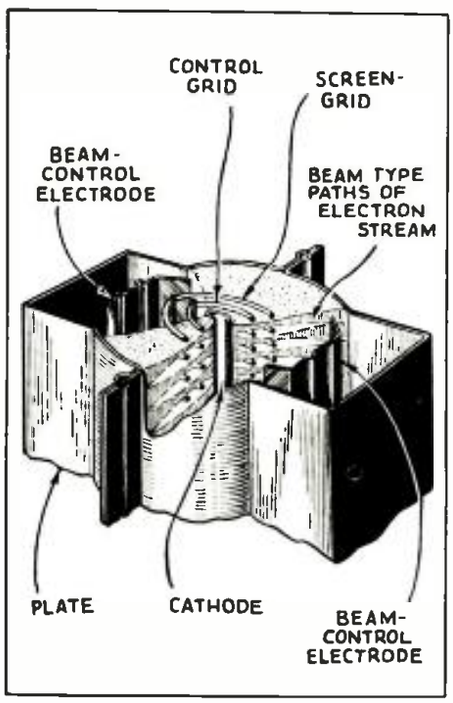
The new Beam-tube oscillator that made history.

The new 6L6 Beam tube recently announced by R.C.A. represents one of the greatest advancements in radio tube design. Its possibilities at the present time are beyond comprehension. In this article Mr. Shuart, our associate editor, describes the new tube and some of the tests run on an oscillator using it. Imagine a one-tube oscillator-doubler with 30 watts input providing from six to seven watts of R.F. output at 20 meters, the fourth harmonic of an 80-meter crystal! This represents an approximate plate efficiency of over 20 per cent, which is not much less than the ordinary triode oscillator when operated at the fundamental frequency of the crystal.

It is now possible to quadruple from 80 to 20 meters, with sufficient power output to excite a fairly "husky" amplifier. Subsequent articles will be published in forthcoming issues describing further sets featuring this tube.

● UNDOUBTEDLY one of the greatest advancements in vacuum tube design is represented in the new *Beam Power Amplifier*, R.C.A. type 6L6. This tube is of the all-metal variety and designed primarily for audio purposes.

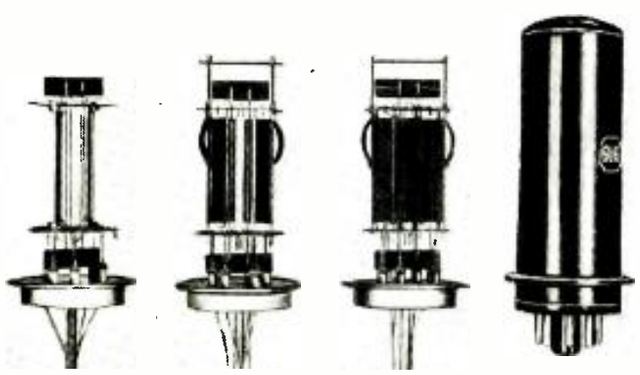
Although designed for audio frequencies, this tube will undoubtedly make history as an R.F. oscillator and frequency multiplier as well as R.F. amplifier. The most distinctive feature of this tube is its electrode arrangement. The electron stream is *beamed* by placing the screen and grid so that the *cross-bars* of the two are directly in line with each other. This procedure causes a number of horizontal streams of electrons. Then, on each side of the tube we have a baffle which is connected to the cathode. The field thus set up around these two baffles tends to focus the electron stream in two directions (sidewise). The high electron density brought about by arranging the electrodes in this manner, results in extremely low screen power, and suppressor action is automatically brought about by the space-charge effects introduced between the screen and plate; no actual suppressor is necessary. The tube is a *Tetrode*. The other features of this design are very high-power handling ability and high efficiency, together with high-power sensitivity, permitting a large amount of power output with no grid current flowing in the input circuit.



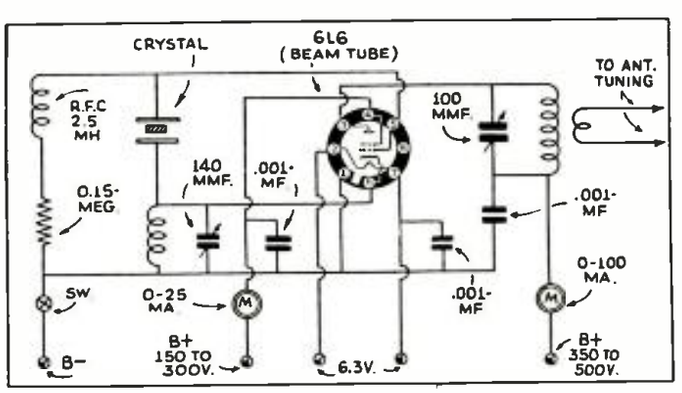
This drawing clearly indicates the electronic action in the 6L6. Note that the electrons are beamed in two directions and are also beamed in horizontal layers, due to the grid and screen wires being in alignment horizontally. This beaming results in the outstanding performance described in the article.

According to the engineering data available on this tube, the *second harmonic* distortion is intentionally high, in order to minimize a higher order of harmonics. The specifications of the tube are as follows: Heater voltage A.C. or D.C., 6.3 volts, heater current .9 ampere; the base is a small octal 7-pin. As a straight single tube, Class A audio amplifier, with 375 volts on the plate and 250 volts on the screen, this tube will deliver 11.5 watts. The maximum single plate current is 65 ma. and maximum signal screen current 6 ma. with an output load resistance of 4,000 ohms.

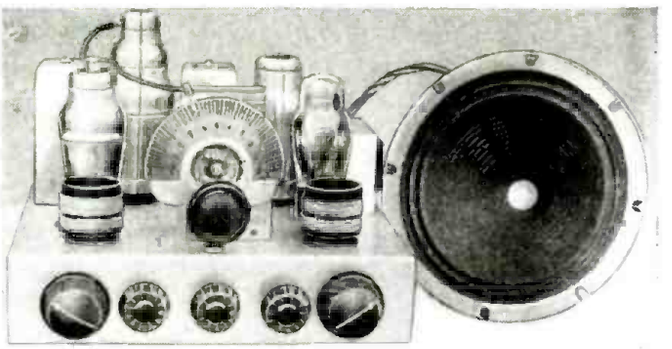
Never before have we been able to obtain a tube with such *plate efficiency* as a Class A amplifier. Of course, for push-pull circuits, the output is correspondingly increased. For Class A-B operation where no grid current flows during any part of the input cycle, it is possible to obtain 23 watts of audio! This is with 400 volts on the plates and 300 volts on the screens, with a maximum signal plate current of 156 ma. For Class A-B (*Continued on page* 177)



The 6L6 Beam tube in four stages of production.



Hookup of Oscillator which makes "quadrupling" possible.



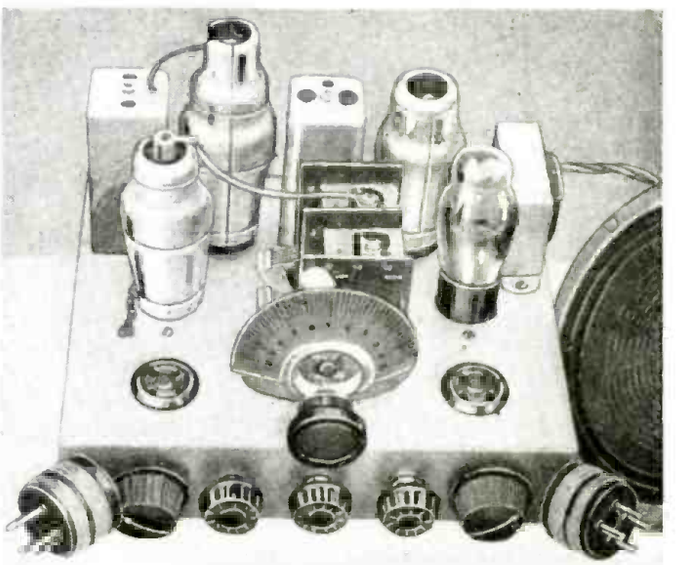
Front view of 2-volt super-het receiver with loudspeaker

2-VOLT Short Wave Superheterodyne

By Harry D. Hooton, W8KPX

This Month's $20.00 Prize Winner

A 4-tube set, giving 5-tube results and operating on 3 dry-cell "A" batteries. Works phones or speaker.



Close-up view of the 4-tube super-het chassis, with two of the plug-in coils.

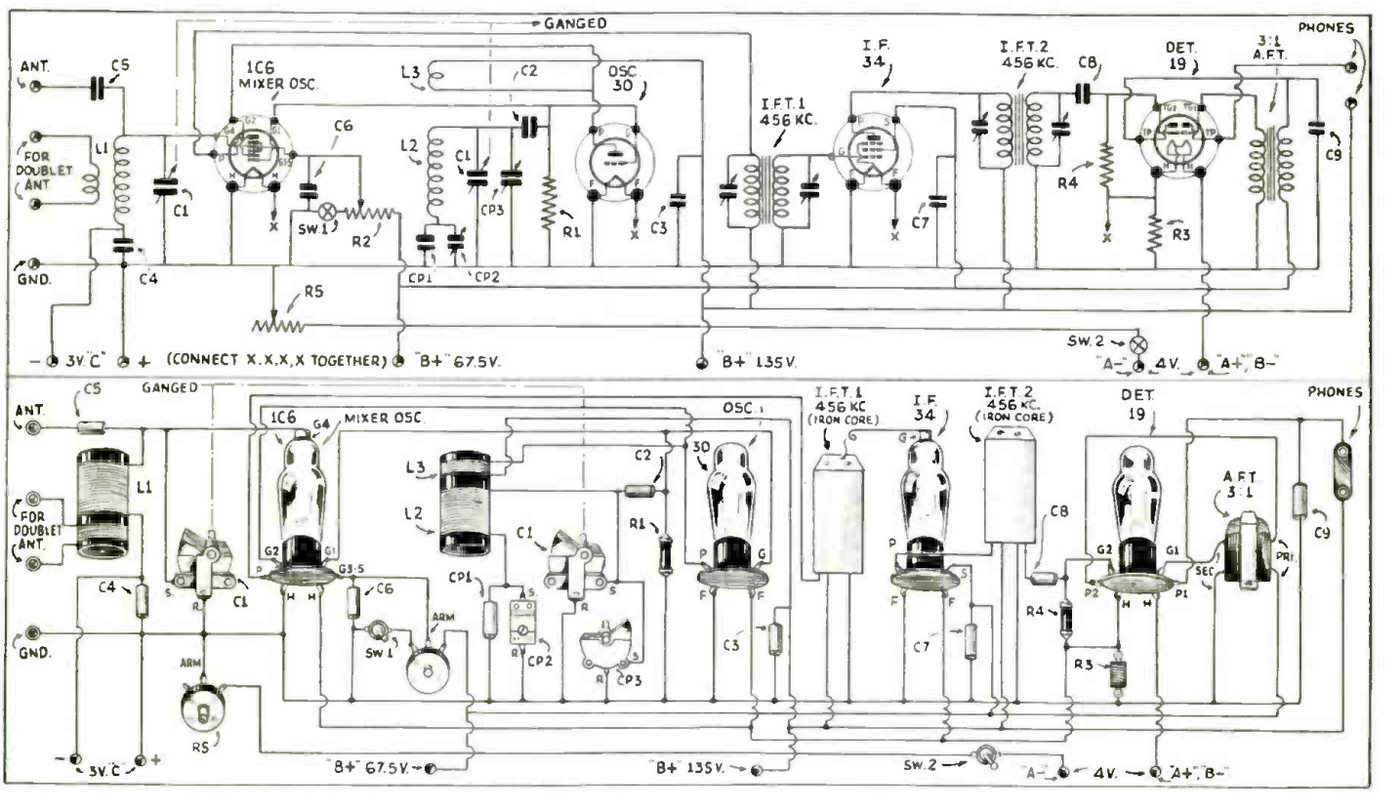
● IN developing this little two-volt short-wave super-heterodyne the author's primary purpose was to provide a receiver which would insure good reception of short-wave broadcasts from every corner of the globe, but would include no "frills" or parts not absolutely essential to the proper operation of the set. This receiver had to be simple and inexpensive to construct and operate and above all designed in such a way that the oscillator and I.F. circuits could be brought into correct alignment with the minimum of adjustments. The result is the receiver here described.

As Fig. 1 shows the circuit is quite conventional. A 1C6 is used as mixer-oscillator, a 30 as oscillator, a 34 as I.F. amplifier and a 19 as combined second detector and audio amplifier. Plug-in coils are used for complete coverage of all wavelengths between 15 and 200 meters. This range may be extended to include the standard 200-550 meter broadcast band, if desired, by using the proper coils.

Iron-Core I.F. Transformers Used

It will be noticed that the 30 is not a separate oscillator in itself but is in parallel with the oscillator elements of the 1C6 tube. In this circuit both the 30 and the oscillator section of the 1C6 are producing oscillations. This arrangement provides a much higher *conversion gain* than can be obtained with the 1C6 alone and assures powerful oscillation on the higher frequencies.

Both of the 456 Kc. I.F. transformers are of the new *iron-core* type, which boosts the gain and increases the selectivity considerably. These (*Continued on page* 174)



Wiring diagram of the 2-volt short-wave "super-het" receiver. It uses iron-core I.F. transformers. Bandspread is obtained, when desired, by using one of the new double-needle "bandspread" dials, such as the Crowe type.

5 and 10 Meter

By George W. Shuart, W2AMN.

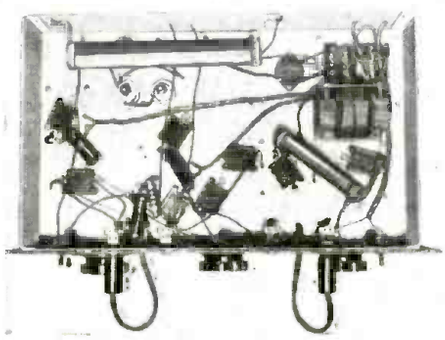
With the constant increase in the number of stations operating on the ultra high frequency bands, modern transmitting equipment becomes a necessity. The transmitter described in this article, is crystal-controlled and may be operated on either the 5 or 10-meter bands. On 5 meters an output of approximately 10 watts is easily obtained. On 10 meters the output is much higher, being nearly 20 watts.

During tests on the air in the 5-meter band, a transmitter of this type definitely proved worthwhile. The signal emitted was perfect in quality, even on the most selective of superheterodyne receivers. With the constant increase in the probability of DX transmission and reception on the 5-meter band, crystal-trolled transmitters are, of course, the next step. DX can be accomplished more easily with a crystal-controlled transmitter and a selective and sensitive receiver.

The older type modulated-oscillator, suffering from wobbulation, will not only stand less chance of covering great distances, but will spoil the chances of other transmitters because the former type emits such a broad wave.

Left — W2AMN operating the new crystal-controlled 5-meter transmitter. The crystal microphone, together with the "high fidelity" modulator, permitted "broadcast" quality to be obtained.

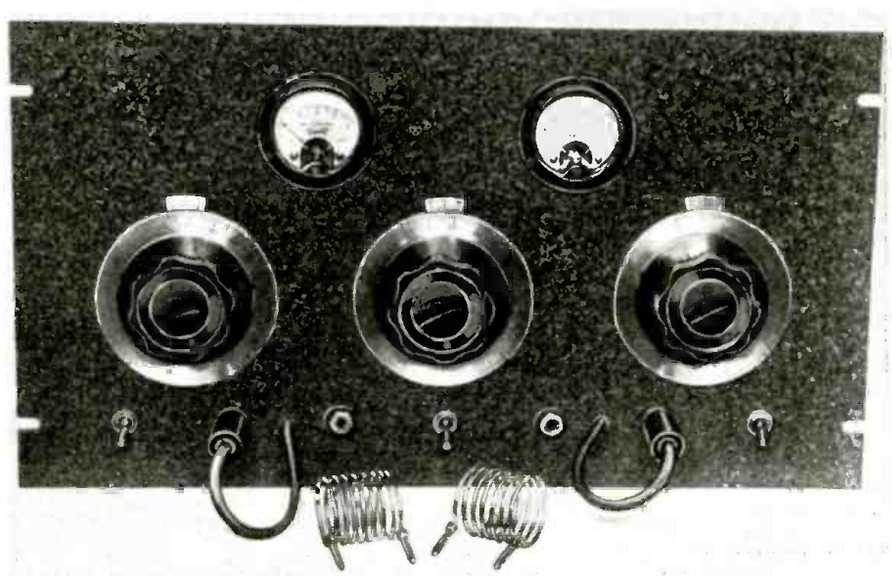
Below—Bottom view of the transmitter, together with closeup, showing how the instruments are placed on the front panel.



● FOR a number of years, ultra high frequency transmitters have been of the more simple variety. These transmitters have served their purpose excellently, and permitted the healthy growth and development of the ultra-high frequency bands. However, the expansion of the ultra high frequency bands has been tremendous, and present-day conditions demand that the transmitters be of the more modern variety. There are many who comment on the uselessness or the lack of necessity for a crystal-controlled ultra-high frequency transmitter. Many claim that they are *not* necessary *because* they do not notice *frequency modulation* on the present receivers. This is true with a good many of the present receivers, simply because the receivers are so *broad* that they will *tolerate a tremendous amount of frequency modulation!* However, the writer has found that even a really selective super-regenerator will show up poor modulation and certainly, some day, we are going to have receivers that are more selective than the so-called "resistance-coupled" super-heterodyne or the super-regenerator. But the fact is that we could provide space for hundreds of times the present number of stations now operating, and still have no Q.R.M. (interference) should the transmitter be crystal-controlled and the receiver a really selective one. Some think that this condition will never come about, but it only remains for some fortunate "Ham" to make a qualified long-distance contact; then watch the rush for the improved apparatus. (Such as the recently reported 5 meter QSO between Troy amateurs and England.)

Starts With 20 Meter Crystal

The transmitter described in this article and shown in the photo is of the crystal-controlled variety, starting out with a 20-meter Bliley crystal. In the oscillator circuit we have a 6C6, which is used as a tritet oscillator-frequency multiplier. Here we double to 10 meters in the oscillator stage. And for operation on 10 meters we have an 802 buf-



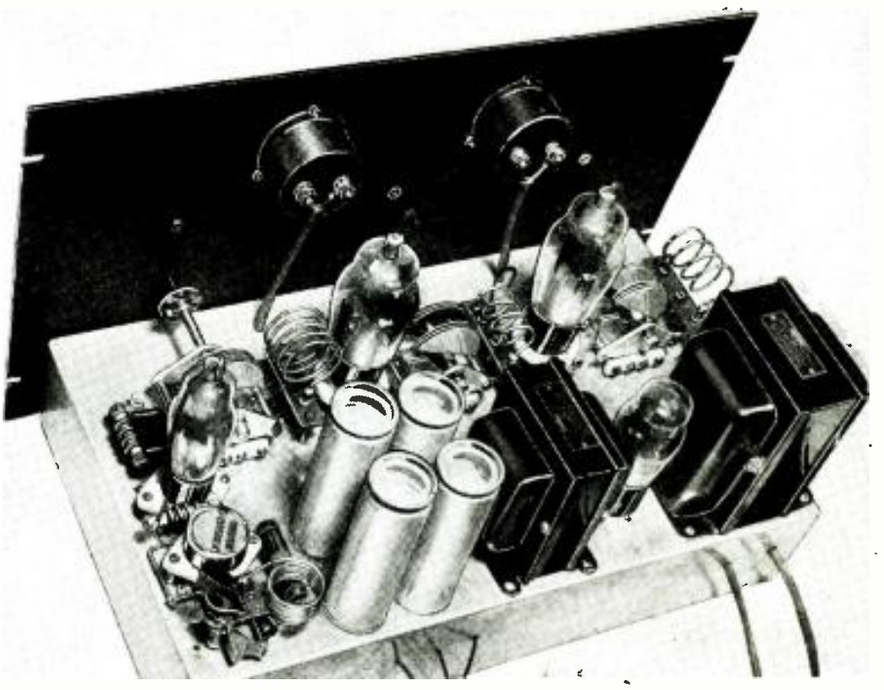
Crystal Transmitter . .

fer and an 802 final amplifier. With 500 volts on the plate of the amplifier, it is possible to obtain nearly 20 watts output on 10 meters. For operation on 5 meters, the first 802 doubles from 10 to 5, and the final 802 is again used as a straight amplifier having an output in the neighborhood of 12 watts. In this transmitter we endeavor to utilize conventional circuits and practice, to see just what efficiency might be obtained without the use of special ultra-high-frequency tubes and special circuits. Of course, the 20-meter crystal greatly simplifies the transmitter and reduces the number of stages over those necessary for use with another crystal of lower frequency.

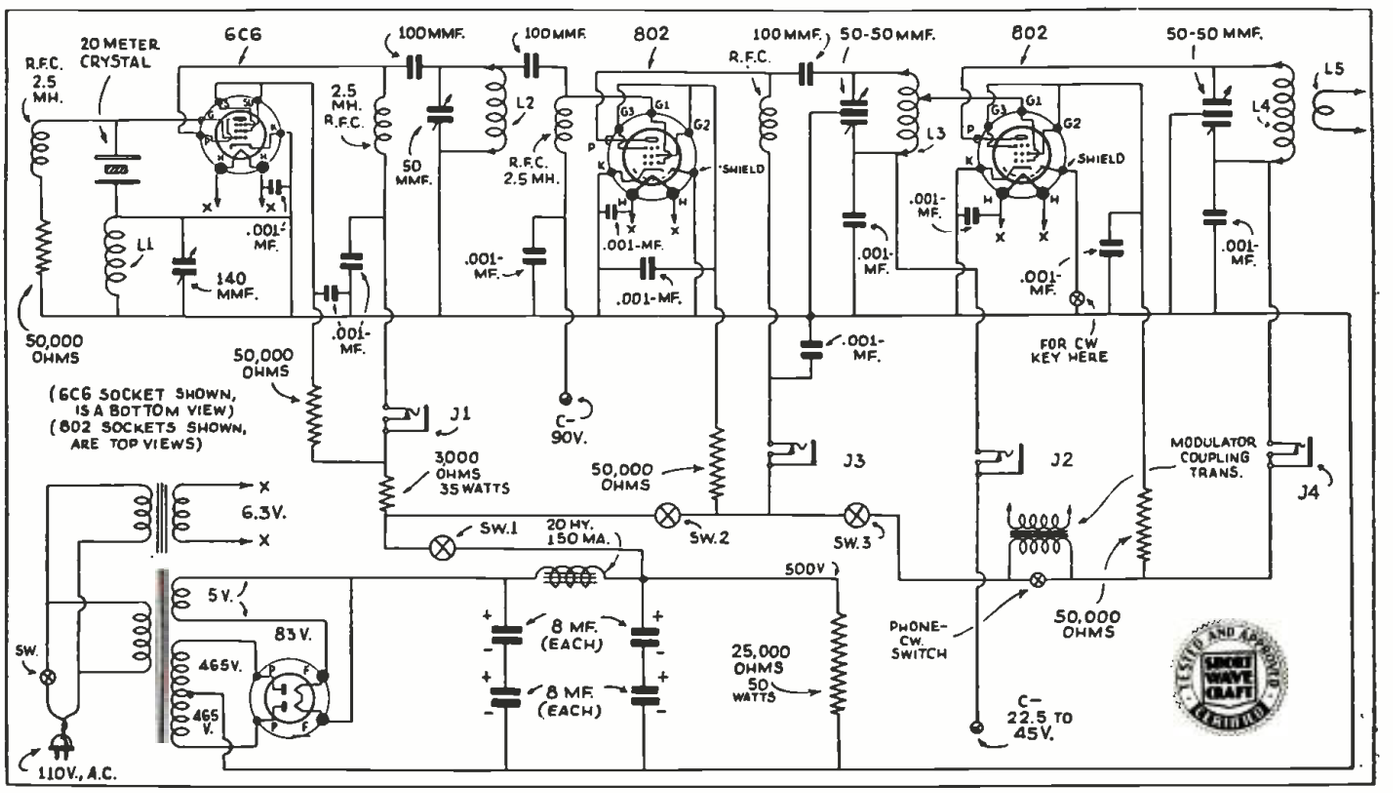
Screen and Suppressor Connected Together

While each of the three tubes in this transmitter is a pentode, we connect the screen and suppressor together making them tetrodes. Careful measurements have proved that this connection proved more efficient than the pentode connection. In each of the four tuned circuits, it will be noticed that the rotors of the condensers are at ground potential. In the two amplifier stages, split stator condensers were used in order to maintain this feature and thus eliminate the necessity of insulating the rotors from the chassis. Plenty of by-pass condensers are used and they are absolutely necessary wherever indicated in the diagram.

Operating a series of amplifier stages at relatively high frequencies, especially when they are all on the same chassis and there are no shield compartments, deserves careful attention as to by-passing. In the transmitter as described, there was no indication of harmful reaction between the stages, although separate compartments for each stage were not used. The plate tank coils of the oscillator and two amplifier stages are of the "plug-in" variety as can be seen in the photo. Bandana type plugs are soldered to the coils, thus facilitating band changing. We have provided jacks for (*Continued on page* 184)



This rear view clearly shows the constructional details.



Wiring diagram of the crystal-controlled 5 and 10-meter transmitter, which starts out with a 20-meter crystal. Three screen-grid stages are used and modulation is applied to the plate and screen of the "final" amplifier.

SHORT WAVES and • • • Our Readers Forum. LONG RAVES

CRACK MAINE PHONE STATION, W1IUV

● HERBERT WILMAN, W1IUV of Skowhegan, Maine, sends us a photograph of his very neat phone station, not forgetting that Mr. Wilman appears in the photograph with a young lady who, we presume, is his "Missus" or XYL.

Apparently, this is one time when "Ham" radio did not disrupt the tranquility of the home—at least we believe so, noting that the XYL was induced to pose with the radio. Maybe she takes her turn at the mike, who can tell?

The transmitter consists of a 47 crystal oscillator, 46 first buffer, 210 second buffer and a 203A final amplifier, which in turn is modulated by two 210's in class B, with the necessary speech amplifiers and drivers to work in conjunction with a double-button microphone. The receiving equipment consists of a Stewart-Warner, 9-tube all-wave affair, and a National SW-3.

Mr. Wilman credits W1KL for helping him in constructing the transmitter. W1IUV has contacted all United States districts, which is quite remarkable, having worked Los Angeles and California and Fort Worth, Texas, as DX contacts. 350 cards were received in a period of 10 months.

F. B. Herbert and the XYL—we hope to hear from you again.

STEPHEN CASEY, W2IIR, PERTH AMBOY, N.J., HAS A-1 STATION

This Months Prize Winner

Editor, SHORT WAVE CRAFT

I have been a subscriber and reader of *Short Wave Craft* for the past five years and I should take this opportunity of thanking you for the "FB" informations and diagrams published in every issue.

Noting your request for "Ham Station" photos I am sending a picture of my Xmitter.

Using a 47 crystal-controlled oscillator, 46 first buffer, two 210's in push-pull as second buffers and a pair of 211 *heavy-duty* tubes in the "final," with about 500 watts input.

RCA D.B. microphone, 56 single speech, Xformer coupled to a pair of 50's in push-pull; then coupled to a pair of 2A3 drivers and using a pair of 242A's in class "B."

Using a Zepp antenna, with Collins impedance-matching system.

The receiver is a seven tube superhet and having a two-stage pre-selector in a separate cabinet.

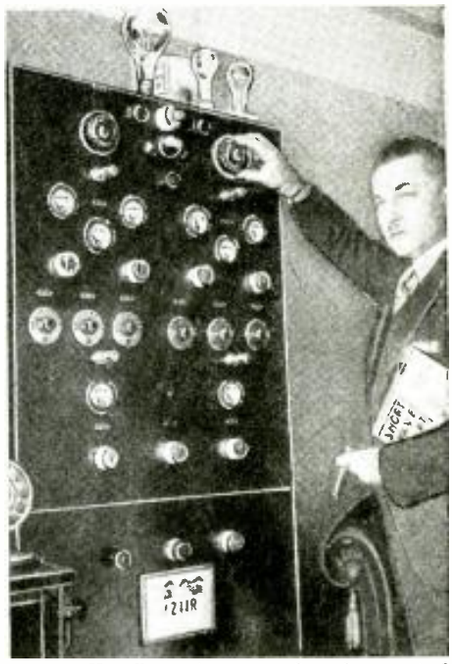
So far I worked on 160 meters only, having many pleasant contacts with VE 1, 2, 3, W1, 2, 3, 4, 5, 8, and 9th Districts.

Expect to be on 20 meters shortly and hope to have some nice QSO's with foreign stations. I am able to speak four different languages.

Also I am enclosing a diagram for a power Xformer supplying the class "B" and the final stage with very good voltage regulation.

Many fellow amateurs use only one X-

(*Continued on page* 177)



Crack "Ham" station owned and operated by Stephen Casey, W2IIR, Perth Amboy, New Jersey

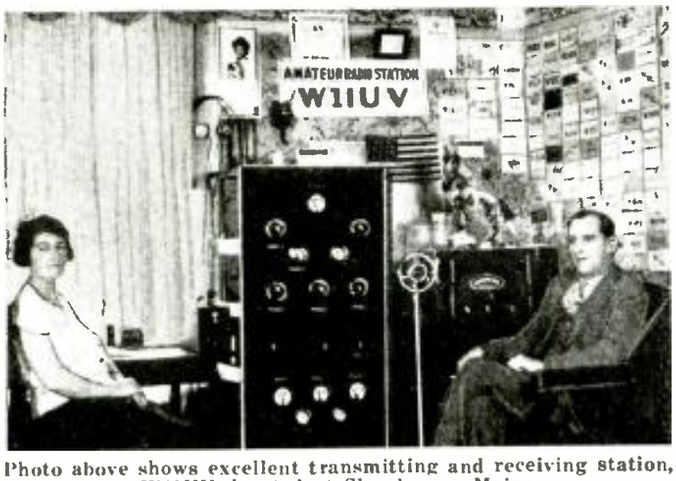


Photo above shows excellent transmitting and receiving station, W1IUV, located at Skowhegan, Maine

GOOD NEWS FROM RHODESIA, SOUTH AFRICA

Editor, SHORT WAVE CRAFT

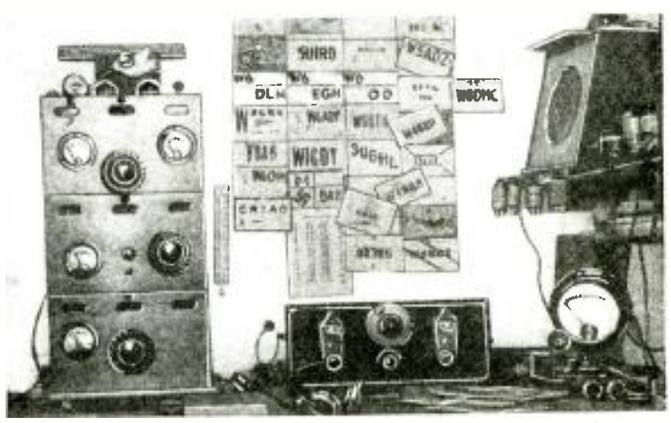
Herewith is a photograph of my transmitter which is operated under the call signal of ZE1JN. The transmitter used to slide into a dustproof cover, but it was removed so often for improvements and alterations that the cover was discarded.

The bottom stage is the crystal-controlled oscillator, a 2A5 valve is used as oscillator with 350 volts on its plate. The second stage is the frequency-doubler stage; here a 2A5 valve is used, connected as a pentode. The output of the frequency doubler is link-coupled to two 46's in push-pull, with 550 volts on their plates; the input to the final is 40 watts. Several aerials are used, depending upon which band the transmitter is working and also which crystal is used.

From Bulawayo, North America, is the easiest country to communicate with both on 7 mc. and 14 mc.; all the divisions have been worked except W7, which division has not even been heard. The VE's are also very rare, but have been worked from here. At 1,200 hours GMT, the eastern divisions can be worked on 14 mc.; similarly at about 1900 hours on the same band. The W6's are worked on 7 mc. in the afternoons; at 1500 hours GMT and the eastern side on the same band at 0600 GMT, if my 40 watts is able to break through the QRM over there at that time. To show you how easy it is to communicate with North America, ZE1JB worked 28 W's in one night and lost no sleep. Tropical storms are our QRM over here and bad lightning has curtailed many a FB QSO with a W.

We are only allowed to use 50 watts input to the final amplifier over here, and as far as I am concerned the restriction is an excellent one. There is not much qrm from the local stations and we all get a fair share of the band. There are five stations all within a circle of about a mile in diameter, all using 50 watts, and we all use

(*Continued on page* 177)



R. Jubb, ZE1JN, South Rhodesia, South Africa, has a dandy station.

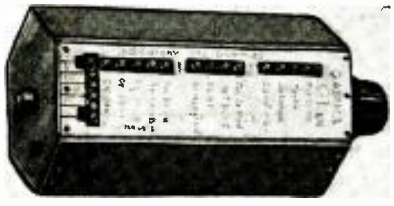
WORLD-WIDE SHORT-WAVE REVIEW

—Edited By C. W. PALMER

A French All-Wave Tuner

● AN IDEA of the progress in the design and manufacture of all-wave receiver components in France can be obtained from the accompanying picture from *Machine Parlantes Et Radio* (Paris).

The hexagonal container combines a shielded compartment for the coils for each band and a switch for changing from one band to another. This coil assembly combines all the coils for a superheterodyne set, covering the wavelengths from 10 to 100 meters and the "broadcast" band.



The container shown incorporates a shielded compartment for the various coils, and also a switch for changing from one band to another.

This unit is a fine example of how compact and complete such a coil assembly can be made.

An Ultra High-Frequency Transceiver

● TRANSCEIVERS, which have found much popularity among hams for mobile work have now graduated into the ultra-high-frequency class.

In a recent issue of *Radio-Amateur* (Vienna) several interesting circuits of this type were described. One of these is reproduced here for anyone who may wish to try it.

The tubes used are of American origin, being two double triodes of the 19 type with a triode, which may be a type 30.

For transmitting, one 19 acts as the oscillator while the 30 and the second 19 act as modulator and speech amplifier, respectively. When receiving, the 19—which was the oscillator—becomes the detector, followed by the 30 as first A.F. amplifier and the second 19 acts as a push-pull second A.F. stage.

A system of switches, operated simultaneously by a single toggle change the circuits from the *transmit* to the *receive* position. Dry batteries supply both the "A" and "B" voltage.

The inductances for the grid and plate circuits depend on the frequency at which the unit is to be operated; for 5-meter work, they consist of one turn wound to a diameter of about 3 ins.

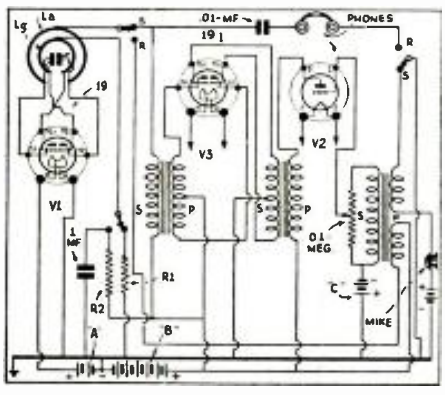
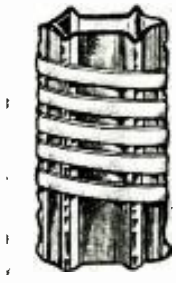


Diagram of an interesting ultra-high frequency Transceiver.

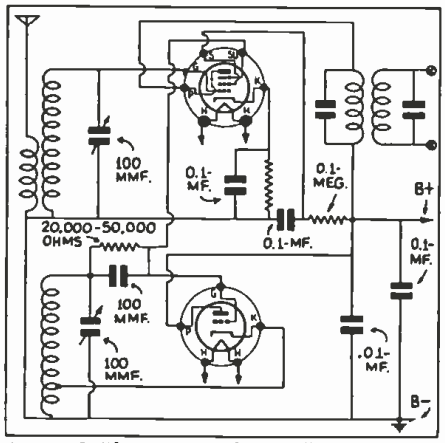
● The Editors have endeavored to review the more important foreign magazines covering short-wave developments, for the benefit of the thousands of readers of this magazine who do not have the opportunity of seeing these magazines first-hand. The circuits shown are for the most part self-explanatory to the radio student, and wherever possible the constants or values of various condensers, coils, etc., are given. Please do not write to us asking for further data, picture-diagrams or lists of parts for these foreign circuits, as we do not have any further specific information other than that given. If the reader will remember that wherever a tuned circuit is shown, for instance, he may use any short-wave coil and the appropriate corresponding tuning condenser, data for which are given dozens of times in each issue of this magazine, he will have no difficulty in reconstructing these foreign circuits to try them out.

A New German S.W. Coil

● A NEW line of S.W. coils designed to have an unusually low R.F. resistance (high Q) was shown in the latest issue of *Radio Bildfunk Fernsehen Für Alle* (Stutgart).



As shown, the coils are wound with flat silver ribbon on deeply ribbed forms. Thus the high frequency resistance of the conductor is extremely low (skin effect, etc.) and a very small amount of insulation is inserted in the coil's field.



A novel "frequency changer" circuit for use with superhets.

Frequency Changer in S.W. Superhet

● IN A recent discussion on the design of short-wave superheterodyne receivers which appeared in *World-Radio* (London) some interesting circuits and comments were presented.

The circuit preferred most by the author for producing the I.F. beats is the one shown here. It consists of a pentode frequency-changer or first detector, which is connected in conventional fashion between the aerial (or previous R.F. tuner) coil and the first I.F. coupler.

The oscillator is an electron-coupled or cathode feed-back unit which is chosen for stability. This oscillator is fed into the suppressor grid circuit of the first detector, since this supplies the most stable operation and has the least effect on the operating conditions of the detector tube.

All-Wave Frequency Meter

● IN designing and operating high-frequency apparatus such as transmitters, etc., it is important to know the exact frequency at which a circuit is resonating to keep on a given waveband—or in the case of frequency doublers, and tank circuits, the efficiency of the transmitter depends on the care with which the various circuits are tuned.

A recent type of German frequency meter having a range of 150 kc. to 60 mc.

A frequency meter which is very useful for such purposes was shown in a recent issue of *Der Qualitätsmarkt* (Berlin). It contains coils covering the frequency band between 150 kc. and 60 mc.

A meter indicates the output and a neon indicator gives a visual check on the signal intensity. The various coils, covering the wide frequency range mentioned above are connected by means of a band switch. The dial is a full-vision airplane type indicator, with all scales plainly marked.

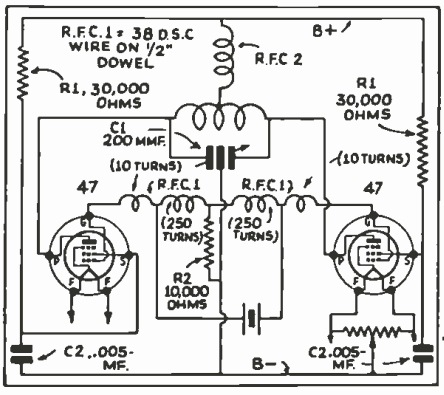
An instrument of this type is as useful to the transmitter as an all-wave oscillator or frequency generator is to the receiver.

A Simple Crystal-Controlled Portable Xmitter

● IN THE *T & R Bulletin* (London), which is the official magazine of the Radio Society of Great Britain and the British Empire Radio Union, a simple yet effective scheme for operating a transmitter on either 7 or 14 mcs. was presented.

The circuit of the fundamental unit is shown with values to permit the reader to

(*Continued on page* 185)

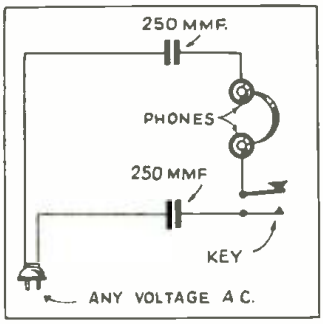


A new English circuit of interest to "Hams"—a crystal-controlled transmitter.

$5.00 Prize

ANOTHER CODE PRACTICE KINK

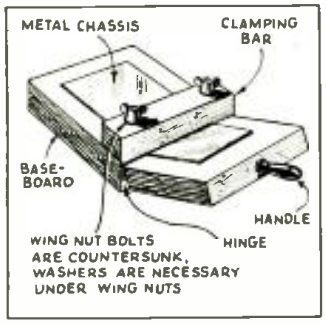
By joining the earphones a key and two 250 mmf. condensers in series and connect them across the A.C. line, we have a simple code oscillator. However, extreme care should be exercised in order to avoid coming in contact with the A.C. line.—Donald Rose.



▼ ▼ ▼

CHASSIS BENDER

For a number of years I have been constructing radio receiving sets and have always experienced considerable difficulty in forming the chassis or bases. The drawing clearly illustrates how I simplified the chassis problem. No dimensions are given, as they will depend upon the dimensions of the chassis to be formed. With an arrangement of this sort, it is a simple matter to make sharp bends. The result is a neat and square chassis.—Cecil Dunsmore.



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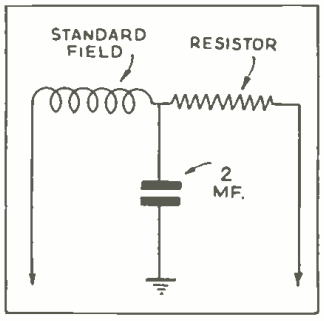
SPEAKER HINT

I have been confronted with the problem of replacing the dynamic speaker with one that would not have quite the same field resistance. This was easily overcome by inserting a resistor in series with the field. The resistor, of course, should be equal to the difference between the two fields. This only works when the field resistance of the new speaker is less than the old one.

The diagram clearly illustrates the idea. This procedure will result in applying the same voltages to the tubes as with the original speaker.—J. E. Riley.



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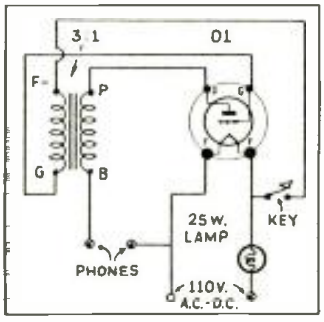
ALL-ELECTRIC CODE OSCILLATOR

Building the "code practice" oscillator has always been quite a problem. The one illustrated in the diagram operates from either A.C. or D.C., 110 volts. It is of the self-rectifying type and of course the note will be modulated by the A.C. Of course, approximately 110 volts will be applied to the plate of the tube and the filament of the 201A receives its power through the 25-watt lamp, which serves as a potential dropping resistor. This is a simple arrangement which can be operated any place where the line voltage is available. No batteries have to be renewed.—Ed. Toogood.



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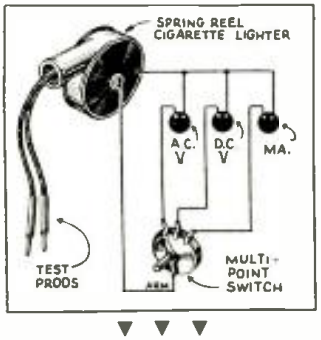
HANDY TESTER KINK

Having difficulty in finding a place for the "test leads" on my home-made tester, I struck upon the following idea: A spring-reel cigarette-lighter was remodeled and connected, as shown in the drawing. When the test leads are no longer in use, simply release them and they will wind up automatically in the spring-reel.—W. L. Irwin.



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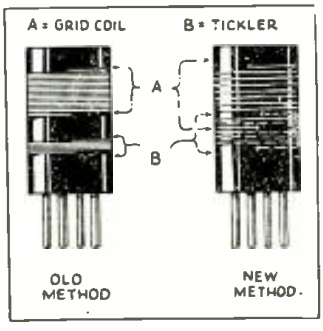
COIL WINDING SUGGESTION

Many times builders of short-wave receivers who wind their own coils have been unable to make the set oscillate around frequencies between 14 and 20 megacycles. The writer overcame this trouble by threading a portion of the tickler winding into the B negative side of the grid coil. The drawing will convey the idea more clearly. With this arrangement, there was absolutely no trouble in obtaining regeneration or oscillation at the very high frequencies.—Carl Smetka.



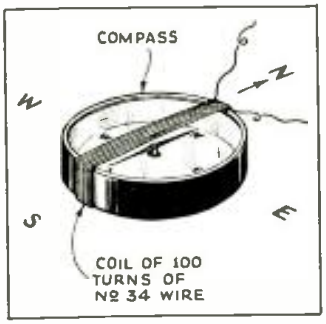
$5.00 FOR BEST SHORT-WAVE KINK

The Editor will award a five dollar prize each month for the best short-wave kink submitted by our readers. All other kinks accepted and published will be awarded eight months' subscription to SHORT WAVE CRAFT. Look over these "kinks" and they will give you some idea of what the editors are looking for. Send a typewritten or ink description, with sketch, of your favorite short-wave kink to the "Kink" Editor, SHORT WAVE CRAFT.

HOME-MADE GALVANOMETER

Although this "kink" is not original by any means, though there are undoubtedly a great number of new-comers to radio who are not familiar with this idea, and therefore, I think it should be published in the "kink" department.

It consists merely of winding wire around a small compass. It will serve to check continuity. It is only necessary to use a small battery for operating the meter. When current passes through the coil, the needle will show a deflection depending upon the amount of that current.—Jack Chancellor.



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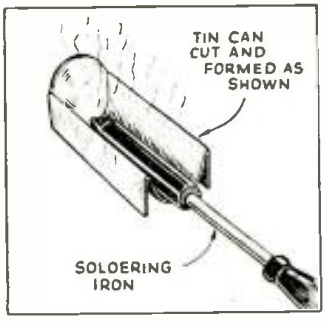
SOLDERING IRON

It is a simple matter to construct an efficient soldering iron holder from a discarded tin-can. The drawing clearly illustrates just how the holder is formed. This is a very simple arrangement and easy to construct and will provide a convenient rack for the soldering iron, which is the most permanent tool used by a short-wave "Fan." This holder may be mounted in some out of the way place underneath a bench, which means that the iron will always be handy, but not in the way when not being used.—John Berner.



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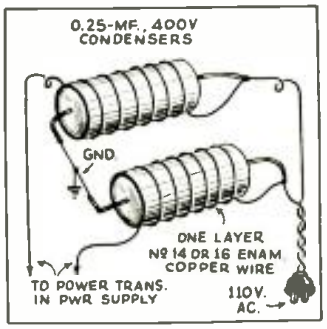
HOME-MADE LINE FILTER

I am submitting the following "kink" for your very interesting page. Living in the neighborhood where line-noise interference is exceptionally high, I tried the following in order to eliminate the trouble. I was very much surprised to find that it overcame the majority of the noise and made reception more satisfactory. As the drawing shows, two ¼ mf. 400-volt condensers are connected in series across the line and the center-tap grounded. Over each of these tubular condensers a layer of No. 14 or 16 enamelled wire is wound; these windings form the chokes. Any one trying this will undoubtedly experience fine results as I have.—Clair C. Gould.



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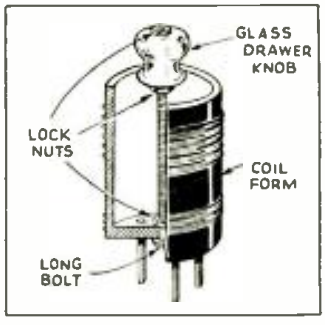
COIL HANDLE

I wound coils on tube bases and in order to provide a handle for them, selected a glass knob. A long screw holds the glass knob to the tube base. Of course, there may be some slight losses due to the screw running through the coil. However, practical tests showed no appreciable difference with or without the screw.—John Daugila.



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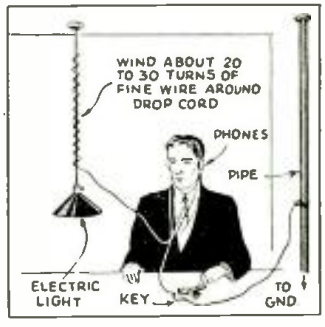
CODE PRACTICE TRICK

It is not necessary to go to all the trouble of building a special code oscillator if one is satisfied with a low frequency tone. Merely wrap one wire around the outside of the drop cord, attaching it to earphones, and then between the other connection of the earphones on the ground, insert the key. The light does not need to be lit during operation, but will strengthen the signal.—Ferrell Turner.



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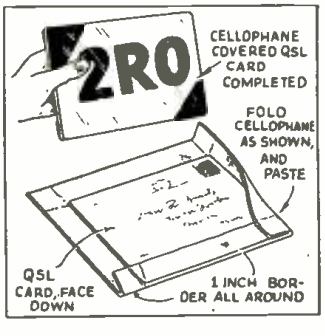
PRESERVING QSL CARDS

Here is a "kink" which keeps my QSL cards clean and free from dust. This will also prevent the edges from becoming frayed and the lettering illegible, thus improving the appearance of your listening den.

The QSL card is placed face downward on a sheet of cellophane, leaving a one inch border on each of the four sides. You then lap the borders over the reverse side of the card and paste them down. The drawing clearly illustrates the stages explained above.—Arnold Goldberg.



SHORT WAVE . . SCOUTS

TWENTY-EIGHTH "TROPHY CUP"

Presented to

SHORT WAVE SCOUT

HAROLD E. BISSELL, JR.
Toms Road, Stamford, Conn.

For his contribution toward the advancement of the art of Radio

by

SHORT WAVE CRAFT

Magazine

28th TROPHY WINNER

65 Stations—48 Foreign

● THIS month we salute Harold E. Bissell, Jr., of Toms Road, Stamford, Conn., for his fine list of short-wave stations heard and verified. This excellent "log" of short-wave stations was received over a 30-day period on a 16-tube Midwest all-wave receiver. Three different type doublet aerials were used, depending upon the frequency of the station which was being received. The antenna switch-over was accomplished by means of a gang switch mounted on the side of the receiver cabinet. Mr. Bissell mentions that it is very interesting to note the great improvement in signal strength, when the proper length doublet is used.

Mr. Bissell further remarks that in order to obtain the long list of verifications here reported, he wrote 105 reports to the various stations. He also points out that quite a number of the verification cards were received from the stations with wrong dates on them, and also that some of the cards bore no date at all.

We would like to stress the point once more to our many short-wave friends and aspiring "trophy winners," that no matter how sure you are of the program and date on which it was heard, if the "veri" card is received with a wrong date on it or possibly no date, do not fill in the date yourself, but return it to the station and ask for another one and request that the exact date be filled in by them on the card. (It is also a good idea to send another Postal Reply Coupon.) Quite a few cards have been altered or dated by the contestant in the past, and if these are detected by the judges, they will, of course, be rejected. The list of stations in Mr. Bissell's Trophy winning "log" appear below:

(*Continued on page* 182)

Honorable Mention Awards

J. Wendell Partner, 3618 So. Fawcett Ave., Tacoma, Wash.
Carlos Irizarry, 46 Johnson St., Brooklyn, N. Y.

● **ON this page is illustrated the handsome trophy which was designed by one of New York's leading silversmiths. It is made of metal throughout, except the base, which is made of handsome black Bakelite. The metal itself is quadruple silver-plated, in the usual manner of all trophies today.**

It is a most imposing piece of work, and stands from tip to base 22½". The diameter of the base is 7¾". The diameter of the globe is 5¼". The work throughout is first-class, and no money has been spared in its execution. It will enhance any home, and will be admired by everyone who sees it.

The trophy will be awarded every month, and the winner will be announced in the following issue of SHORT WAVE CRAFT. The winner's name will be hand engraved on the trophy.

The purpose of this contest is to advance the art of radio by "logging" as many short-wave phone stations, amateurs excluded, in a period not exceeding 30 days, as possible by any one contestant. The trophy will be awarded to that SHORT WAVE SCOUT who has logged the greatest number of short-wave stations during any 30-day period.

Trophy Contest Entry Rules

● **THE rules for entries in the SHORT WAVE SCOUT Trophy Contest have been amended and 50 per cent of your list of stations submitted must be "foreign." The trophy will be awarded to the SHORT WAVE SCOUT who has logged the greatest number of short-wave stations during any 30 day period; (he must have at least 50 per cent "foreign" stations). This period need not be for the immediate month preceding the closing date. The complete list of rules appeared in the September issue of this magazine.**

In the event of a tie between two or more contestants, each logging the same number of stations (each accompanied by the required minimum of 50 per cent "foreigns") the judges will award a similar trophy to each contestant so tying. Each list of stations heard and submitted in the contest must be sworn to before a Notary Public and testify to the fact that the list of stations heard were "logged" over a given 30 day period, that reception was verified and that the contestant personally listened to the station announcements as given in the list.

Only commercial "phone" stations should be entered in your list, no "amateur transmitters" or "commercial code" stations. This contest will close every month on the 25th day of the month, by which time all entries must be in the editors' hands in New York City. Entries received after this date will be held over for the next month's contest. The next contest will close in New York City June 25th; any entries received after that date will be held over till the next month.

The winner each month will be the person sending in the greatest number of verifications. Unverified stations should not be sent in, as they will not count in the selection of the winner. At least 50 percent of the verifications sent in by each listener must be for stations located outside of the country in which he resides! In other words, if the contestant lives in the United States at least 50 percent of his "veries" must be from stations outside of the United States. Letters or cards which do not specifically verify reception, such as those sent by the Daventry stations and, also by commercial telephone stations, will not be accepted as verifications. Only letters or cards which "specifically" verify reception of a "given station," on a given wave length and on a given day, will be accepted! In other words it is useless to send in cards from commercial telephone stations or the Daventry stations, which state that specific verifications will not be given. Therefore do not put such stations on your list for entry in the trophy contest!

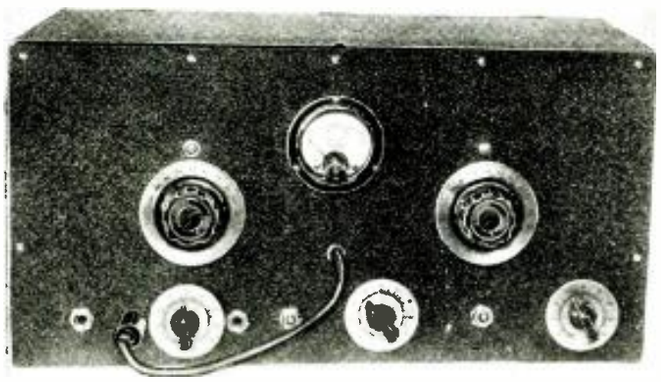
SHORT WAVE SCOUTS are allowed the use of any receiving set, from a one-tuber up to one of sixteen tubes or upwards, if they so desire.

When sending in entries, note the following few simple instructions: Type your list, or write in ink, pencilled matter is not allowed. Send verification cards, letters and the list all in one package, either by mail or by express prepaid; do not split up the package. Verification cards and letters will be returned, at the end of the contest, to their owners; the expense to be borne by SHORT WAVE CRAFT magazine.

In order to have uniformity of the entries, when writing or typing your list, observe the following routine: USE A SINGLE LINE FOR EACH STATION; type or write the entries IN THE FOLLOWING ORDER: Station call letters; frequency station transmits at; schedule of transmission, if known (all time should be reduced to Eastern Standard which is five hours behind Greenwich Meridian Time); name of station, city, country; identification signal if any. Sign your name at the bottom of the list and furthermore state the type of set used by you to receive these stations. State total No. stations.

WHAT'S NEW In Short-Wave Apparatus

The short-wave apparatus here shown has been carefully selected for description by the editors after a rigid investigation of its merits



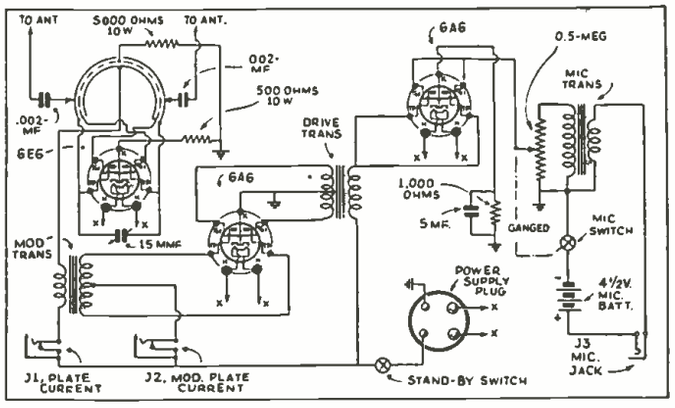
Front View of 5 Meter Transmitter and Receiver

5 Meter Xmitter and Receiver Portable

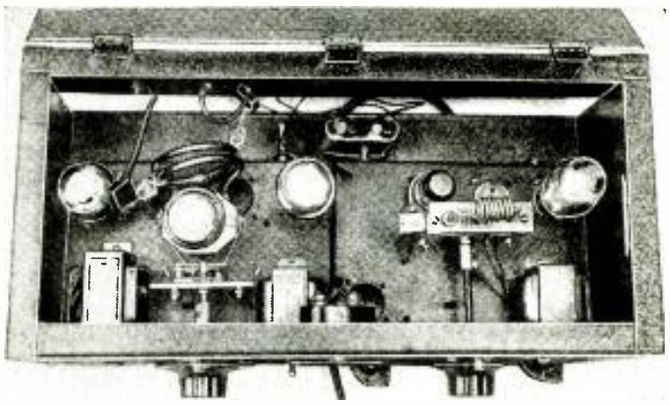
A five meter portable mobile duplex transmitter and receiver

By Irving Rosenburg, W2CQI

● ACTIVITY on the five meter band for the past year has increased by leaps and bounds, as one can readily determine by listening for a few nights on this frequency. Inasmuch as it is legal to operate portable mobile transmitters by licensed operators on this band, much more activity is noticed during the warm summer months. This duplex portable station about to be described can be operated in an automobile, yacht, motor-boat or airplane using a 6 volt Genemotor capable of supplying 300 volts at 100 mils it can be operated also as a permanent fixed station in the shack, connected to an a.c. power supply capable of delivering 300 volts at 150 mils. The power output of this transmitter is rated at ten watts.



Hook-up of 5 Meter Transmitter (No. 546)



Top View—Looking Down Into the 5 Meter Set

The "Eagle Duplex Minuteman transmitter and receiver" consists of (transmitter) 1 6A6 class "A" parallel connected speech-amplifier and driver, 1-6E6 unity coupled push-pull oscillator. The *receiver* used in this portable station is the one already described in the April issue of *Short Wave Craft*. Both units are contained in a black crackled cabinet 17x8½x8 inches with panel to match. The panel contains the plate milliammeter, two nickel-finished dials—one for the oscillator and one for the receiver. Plug-in arrangements are provided for current reading on the modulator and oscillator. Also incorporated on the panel are two "stand-by" switches, one for the transmitter and the other for the receiver. Another jack is provided for the microphone as well as a *gain-control* for same. A red bullseye lights up when the power is on. All controls are symmetrically aranged and present a very pleasing appearance.

The 6E6 dual triode was chosen for the oscillator, due to its inherent stable characteristics and its higher efficiency on the ultra high frequencies. The 6A6 class (*Continued on page* 166)

NEW WORLD TIME CLOCK

● THE handsome appearing clock shown in the accompanying illustration is available with an electric movement, for operation on 60 cycle 110 V. A.C. circuits, or with an 8-day spring movement.

As the name implies, the purpose of this clock is to give the time in various parts of the world in relation to the time at the place where the clock is situated. For example—if the clock is set for New York City time, by merely looking at the face thereof, a person can tell the time in any other part of the world. If the clock shows that it is 11 p.m. in New York, it will also indicate that it is 4:00 a.m. in Ethiopia. This result is obtained without mental calculation of any kind merely by reading the face in the same manner as in reading the time from an ordinary lock.

With the use of this clock, it is possible to quickly tune-in a foreign broadcasting station on any particular program at any given time. For example, if the English Premier is scheduled to speak from a London station at 8 p.m., London time, by reference to this clock, one can quickly see that his radio must be tuned in at 3 p.m. the same day. Another example—if Mr. Smith at his home in New York, desires to hear "foreign" music on his radio set at 9 p.m., a glance at the clock dial proves that it would be useless for him to tune in on Rome, because it would then be 3 a.m. the following day, and that he would more likely be able to get Honolulu, Hawaii, where it is 3 p.m. the same day.

With this world time clock on his desk, Mr. Jones, a New York City business man, will note that to get Mr. Smith on the telephone in Rio de Janeiro at 4:30 p.m., Rio de Janeiro time, he must call him at 2:30 p.m. New York time.

Our Information Bureau will gladly supply manufacturers' names and addresses of any items mentioned in *Short Wave Craft*. Please enclose stamped return envelope.

This World Time Clock is constructed to show at a glance the relative time in any part of the world. This fine looking timepiece is available in electrical or mechanical movements, and the mahogany case measures 8¼" across the base and 8¾" high. Very useful for students, business people, and by all means S-W Fans and Hams. (No. 547)

Names and addresses of manufacturers of apparatus described on this and following pages furnished upon receipt of 3-cent stamp; mention No. of article.

The appearance of the RX-14 short wave receiver, suitable for "Fan" or "Ham," may be noted from the accompanying photo. It is a very smooth working job.

The RX-14 S-W Receiver For "Fan" or "Ham"

By Guy Stokely, E.E.

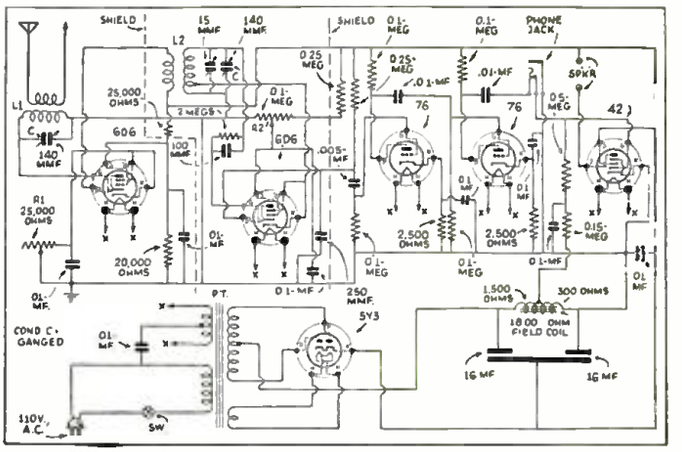
● THE Model RX-14 short-wave receiver incorporates many of the features which are found only in the finest of tuned radio-frequency receivers. Designed for the short wave "fan" *or* the transmitting amateur who requires extreme selectivity and sensitivity, it should prove to be a thoroughly reliable and dependable receiver.

A glance at the circuit diagram indicates the use of six of the high-gain type of tubes, i.e., 6D6-6D6-76-76-42-5Y3 functioning as tuned R.F. amplifier, tuned electron coupled screen-grid regenerative detector, powerful 3 stage resistance-coupled audio-frequency amplifier, full-wave high-voltage rectifier and a complete "built-in" power supply.

Either a noise-eliminating doublet or single wire type of antenna may be employed, with equally good results. Volume is controlled by means of the potentiometer R1, which controls the negative grid bias on the R.F. tube. The output of the R.F. stage is electro-magnetically coupled into the grid of the detector, which uses an electron-coupled regenerative circuit. Regeneration is controlled by means of the potentiometer R5, which has a specially tapered resistance curve and results in an exceptionally smooth oscillation control. Adequate by-pass condensers are used at all necessary points in order to keep radio frequency currents in their proper places. The output of the detector is fed into a 3-stage audi-frequency amplifier, having a power pentode output tube capable of delivering as high as 3 watts of audio power to the built-in dynamic loudspeaker. The use of 3 stages in this amplifier insures ample volume on *all* stations. No traces of audio feedback or instability are present, due to a careful choice of circuit constants.

A type 5Y3 tube is used as the rectifier, due to its low internal voltage drop under full load. Full-wave rectification and an exceptionally good filter system results in a totally hum-free power supply. All traces of tunable hum are eliminated by the proper use of by-pass condensers at points where such effects generally originate.

Excellent shielding, cadmium-plated for high electrical conductivity, and a proper arrange- (*Continued on page* 171)



Wiring diagram of the RX-14 receiver. No. 543

The "Transceptor"

A New 5-Meter Portable

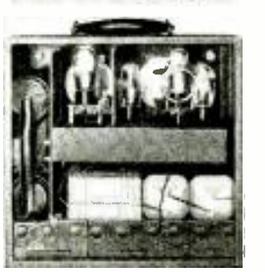
By Frank Lester, W2AMJ

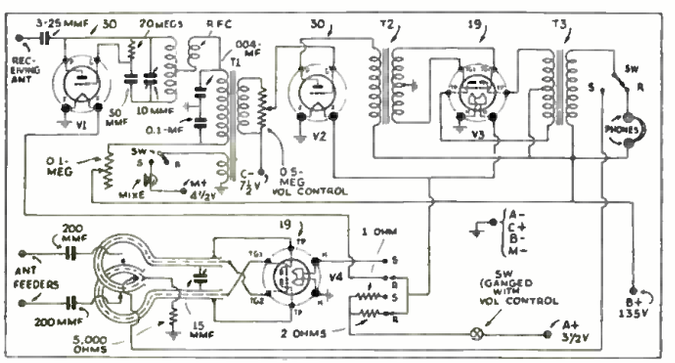
● THE transceiver, which has been extremely popular in the 5-meter field, suffers from one serious shortcoming which becomes more and more objectionable as the user becomes more proficient in 5-meter technique. Inasmuch as the same antenna is used for both transmitting and receiving, and practically all of the other parts of the instrument likewise serve a *dual* purpose, some compromise in adjustment becomes unavoidable. This is especially true of the extremely important adjustment of antenna coupling. The best coupling for transmitting unavoidably proves too tight for receiving purposes, and prevents the receiving portion of the transceiver from super-regenerating properly. Some intermediate value of coupling must be chosen which will permit the circuits to function in both the receive and transmit combinations; this means that the transceiver rarely gives the best performance of which it is capable.

In an effort to improve this situation and at the same time to preserve the highly desirable features of compactness and portability which have made the transceiver so widely accepted, the writer has designed a new 5-meter portable rig which is known as the Lafayette "Transceptor." This instrument represents a logical advance in portable 5-meter practice, and evolved from the experience gained in the building of hundreds of transceivers, which are giving excellent performance in many parts of the world.

This new "Transceptor," which is shown in the accompanying illustrations, measures only 15x15 inches square, by 7½ inches deep, and is therefore just a trifle larger than a portable typewriter. Unlike all previous transceivers, this is fitted with a hinged cover which *fully protects tuning con-* (*Continued on page* 171)

Above—The "Transceptor"—a new 5-meter transmitter-receiver of the portable type shown in use by Mr. Lester. Photos at right show set closed up and below—a rear view, revealing the chassis. No. 544





Hook-up of the new 5-meter transmitter-receiver

Names and addresses of manufacturers of apparatus described on this and following pages furnished upon receipt of 3-cent stamp; mention No. of article.

NEW APPARATUS FOR THE "HAM"

Piezo-Electric Calibrator—H-52

I.F. Wave-trap—H-49

I. F. WAVE TRAP, H-49

● MANY amateurs and short-wave experimenters have experienced difficulty in reception due to *code interference* coming into the receiver at the intermediate frequency. This new Aladdin high permeability wave-trap is designed to minimize this type of interference. In many cases, where the interference is coming in directly over the antenna system, connecting this device in series with the antenna will eliminate the interference. The wave trap is tuned to the interfering signal.

SECTIONAL CABINET RACK, H-50

● THERE has been a long-felt desire among amateurs and builders of public address systems for a cabinet type rack which can be built up in sections. Starting out with a fundamental unit, the constructor may add sections as the size and scope of the apparatus is increased. The basic unit is shown in the photo the base of which measures 20x15⅜x2½", and the top 20x14¾x1¼". To construct this single complete panel rack, two sectional side walls and the back of the same height of the panel are used. The sectional side walls and backs are available in standard panel dimensions of which there are ten different sizes.

To make a multiple rack, it is only necessary to add additional side walls and backs of the same height as the panel which is being used.

This I.C.A. cabinet should interest our "Ham" readers.

POWER TYPE SWITCH, H-51

● THIS new Ohmite switch, as can be seen in the photo, has 7 heavy duty contacts and is applicable to band switching, in transmitters, or as a selector switch of any type where considerable rf. power is being handled. The base is an all porcelain vitreous enamelled unit, to which are fastened the heavy straps. The moving contact consists of a special graphite shoe which was developed particularly for this purpose.

PIEZO ELECTRIC CALIBRATOR, H-52

● THE amateurs are at last provided with a portable Piezo-Electric Standard by which they may check frequencies from 100 kc. to 20,000 kc. in 100 kc. steps and 1,000 kc. to 50,000 in 1,000 kc. steps with an accuracy of a .05 per cent of 100 kc. and 1,000 kc. This instrument is complete as shown in the photo and includes power supply crystal and the 955 Acorn Tube.

It will operate from a 110-120-volt, 50-60 cycle, A.C. source; or for un-modulated operation, if desired, may be operated from a 90-135-volt D.C. plate supply.

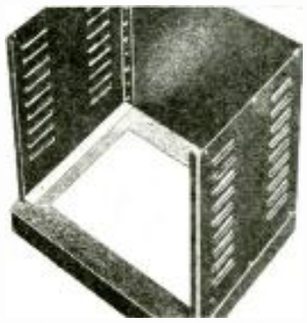
This R.C.A. crystal-controlled calibrator offers a compact and useful unit for the amateur.

TRANSMITTING AND RECEIVING RF. CHOKES, H-53

● SEVERAL new transmitting and receiving rf. chokes have recently been introduced by the J. W. Miller Co. In the photograph we

(*Continued on page* 168)

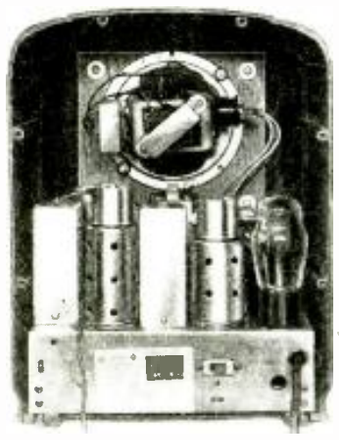
High Power Switch—H-51



New Style Rack—H-50

Transmitting and Receiving R.F. Chokes.

New 5-Tube A.C.-D.C. Super-Het Has Dual Range



Rear view of the "dual-band" 5-tube receiver; it has an out-put of 1 watt.

● WITH a moulded bakelite cabinet of handsome appearance, the new Pilot model "200" series double band receiver gets away to a "flying start." The set has a very neat appearance and it tunes with very comfortable sharpness; at the same time it gives very high quality output.

This new receiver has an improved A.C.-D.C. circuit and works on 110 volts, 60 cycles. A cabinet of bakelite measures 12¾" high x 9⅜" wide and 6 9/16" deep. The front of the cabinet is decorated with heavy chromium striping. A longwave model for use in European countries is supplied also with a range up to 2,142 meters. The standard model covers the wave length range of 16 to 52 in one band, and 178 to 550 meters in the second band. The long wave model, intended for European use, covers the wave length ranges of 178—550 and 789—2,142 meters.

The circuit employes a class A pentode out-put, triode detector circuit, and the tubes employed are a 6A7, 6D6, 75, 43, and 25Z5.

Complete shielding on all necessary parts is carried out in a design of this excellent set and the loudspeaker is a special 5" dynamic. The undistorted power output is 1 watt, and the set weighs but 11 pounds.

An extra fine performance is given by this set, thanks to the use of multi-purpose tubes and a tone control switch is provided on the chassis also.

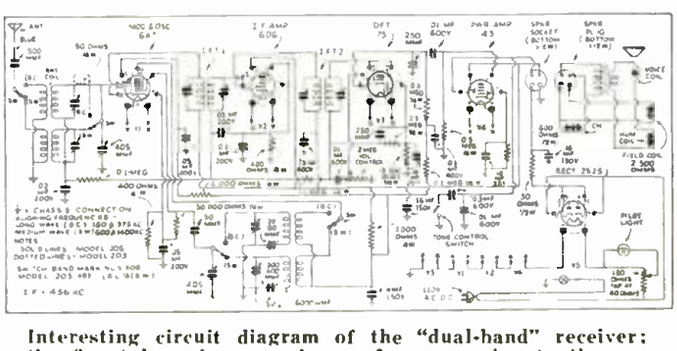
A special antenna kit is available for use with this particular set or it can be used with a standard antenna of the doublet or other type. The antenna kit designed for use with this set employs the doublet principle with a twisted pair lead-in.

The tube lineup. By referring to the diagram we see that a 6A7 pentagrid converter is used. This is followed by a 6D6 I.F. amplifier which, in turn, is followed by a 75 duplex diode triode detector. This serves as the diode rectifier or detector, and one stage of audio frequency amplification. To this is resistance-coupled a 43 pentode which feeds the loud-speaker. Automatic volume control is incorporated in this receiver, permitting a fairly constant level reception of fading signals.

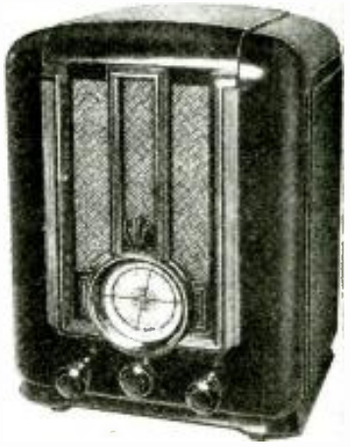
There is also a tone adjustment permitting either high or low frequency reception. In the low frequency position this control reduces the ill effects of the scratching and crackling noises which sometimes accompany short-wave reception.

This set is very economical and uses but 45 watts from the A.C. or D.C. lighting circuit.

This article has been prepared from data supplied by courtesy of Pilot Radio Corp.



Interesting circuit diagram of the "dual-band" receiver; the five tubes give superior performance, due to the use of several multi-purpose tubes.



Front view of the new dual-band, 110-volt A.C.-D.C. receiver. No. 545.

Names and addresses of manufacturers of sets described on this and following pages furnished upon receipt of stamped envelope; mention No. of article.

The New HAMMARLUND "Super Pro"

By Donald Lewis

This latest type receiver, suitable for the most critical "Ham" or "Fan," embodies all of the features one might ask for. The bands are switched "in" and "out" with a positive mechanism, the range being from 20 mc. to 540 kc. The set works on 110 volts, 60 cycle A.C., and has many new features which the expert operator will like.

Front view of the Hammarlund "Super Pro" receiver which has a range of 20 mc. to 540 kc. (15 to 555 meters.)

View of the chassis of the 14-tube receiver.

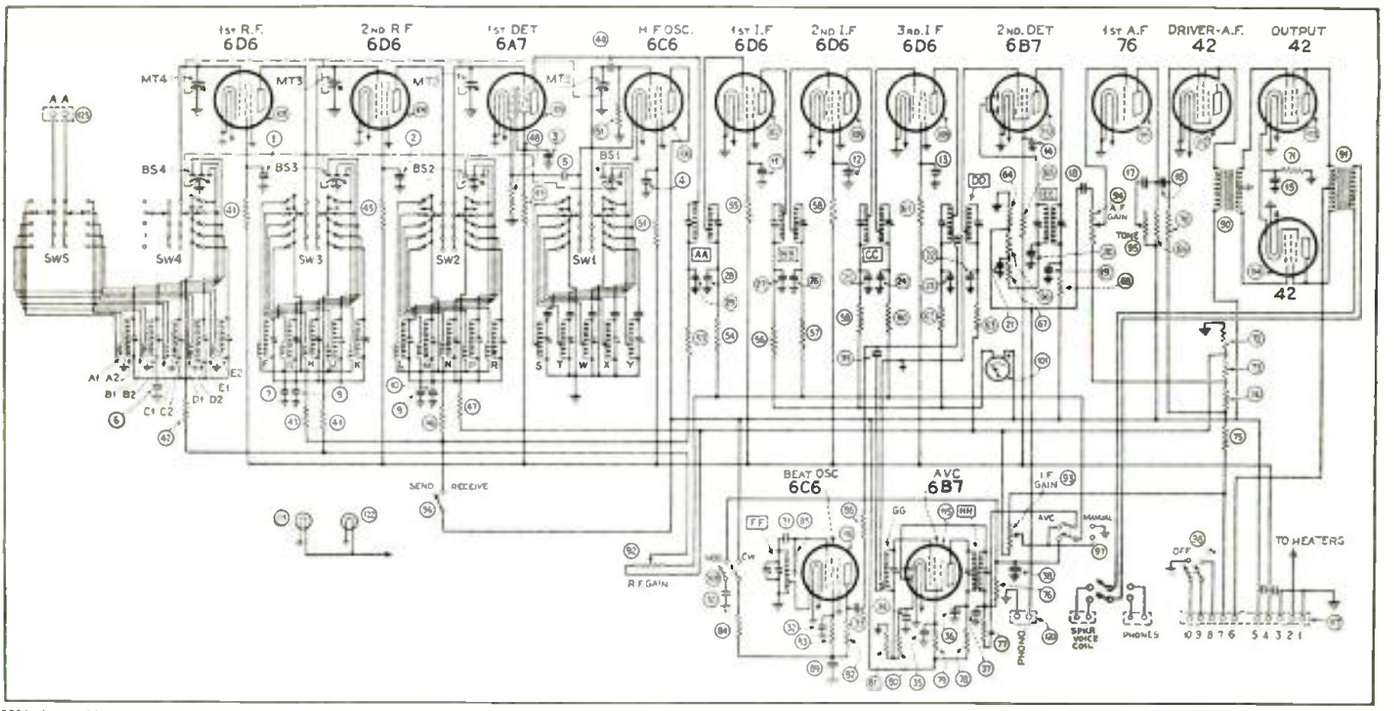
● AFTER months of painstaking research and study, the engineers of the Hammarlund laboratories have developed and designed an amateur-professional superheterodyne receiver that is replete with unusual features. It has been designed to meet every rigid precision specification of the professional operator, advanced amateur and critical listener-in.

The receiver is known as the "Super Pro," and its features are numerous. For instance, there is an electro-statically shielded input; a special silver-plated five-band, eccentric-cam switch; four air-tuned I.F. transformers; continuously variable selectivity; two tuned R.F. stages on all bands; three audio stages; visible tuning meter; accurately-calibrated tuning dial in megacycles and kilocycles; band-spread tuning dial; audio frequency gain control; radio frequency gain control; intermediate frequency gain control; selectivity control; variable beat oscillator control; tone control; speaker-phone switch; send-receive switch; AVC-Manual switch; CW-Modulation switch, separate power-supply unit, etc.

As mentioned above, the "Super Pro" incorporates a most unusual switching arrangement. This switch utilizes an entirely new design and was chosen since it proved to be absolutely fool-proof, noiseless, and exceedingly effective throughout the entire band of frequencies from 20 megacycles to 540 kilocycles. A complete description of the switch will be given later on.

A well-designed superheterodyne, is, in reality, a combination of two distinct receivers of specific design which, when combined together, offer an unusually efficient radio receiving system. The first part of such a system is connected to the receiving antenna and selects and amplifies the incoming signal, delivering it to the first detector or mixer, where it is heterodyned by the local high frequency oscillator to produce a new frequency called the *intermediate* frequency.

The second part of the system is a complete and highly efficient radio receiver with *fixed* tuning, which responds to the signals of the intermediate frequency produced by the first unit. The tuning and all other adjustments on the "Super Pro" are fixed. Therefore, it is obvious that its performance can be more exactly controlled than in the case of a receiver which must be tunable over a relatively wide frequency range. Generally speaking, most of the gain and selectivity of the entire receiving system are obtained from this fixed tune (*Continued on page* 167)



Wiring diagram of the 14-tube "Super Pro" receiver, which possesses the salient features demanded by the expert short-wave "Ham" operator or the critical S-W Listener.

THE RADIO AMATEUR

Conducted by Geo. W. Shuart

Radio Amateur Course

ELEVENTH LESSON

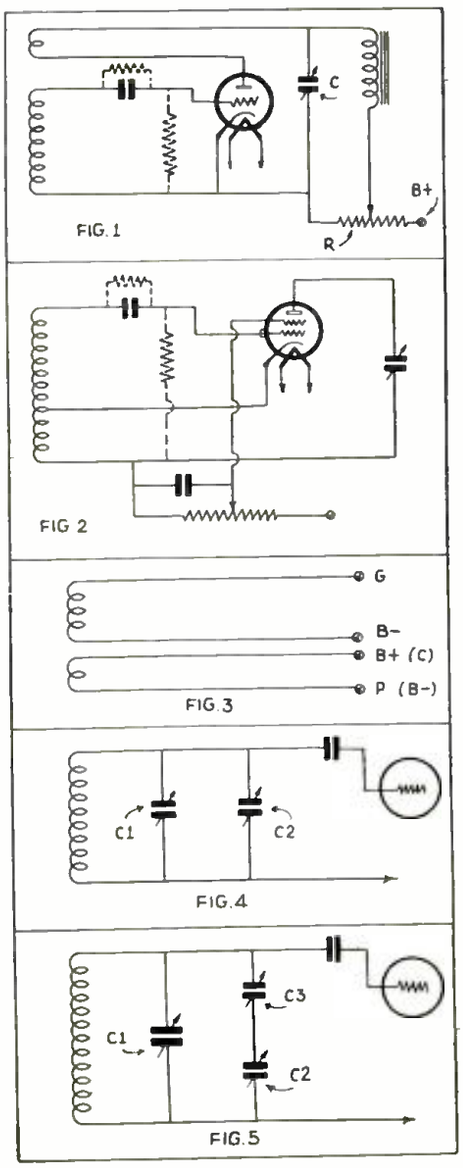
In the eleventh lesson of our Course simple short-wave receivers are discussed. The interesting items such as "band-spread," "regeneration," and "methods of coupling" are clearly explained.

● THIS lesson of our "Amateur Course" will be devoted entirely to a discussion of *simple receiver* circuits, in so far as various types of feed-backs, regeneration controls, and many other minor details are concerned. The theory of the circuits will not be discussed, because this was given in previous lessons.

The most important consideration in simple regenerative detectors is the method by which *regeneration* is obtained. This may be done in a number of ways. The two most prominent are the *plate feed-baek* method, as shown in Fig. 1, and the *cathode* method, shown in Fig. 2.

Controlling the regeneration of any receiver may be accomplished either by a *variation in voltage* of one of the elements of the tube or by *varying the degree of feed-back coupling*. In Fig. 1, we show both the throttle condenser control of regeneration which is indicated by condenser "C", or the variation of plate voltage by the potentiometer "R". For any detector circuit using a triode there is an optimum range of plate voltage within which the detector operates most efficiently and smoothly. It is strongly advised that both the resistor "R" and condenser "C" be employed to obtain best results. Resistor "R" may be a part of the power supply, and when once adjusted regeneration may be further controlled with the throttle condenser "C". The *number of tickler turns* is also very important. No definite rule can be given for the number of tickler turns which will work satisfactorily for all conditions. If the throttle condenser "C" has a maximum capacity of 140 mmf. the tickler turns should be adjusted simultaneously with the plate voltage for maximum sensitivity, with the plates of your condenser "C" about ¾ meshed. This will allow smooth control of regeneration with the remaining 25 per cent of the capacity of the condenser.

An example of what might happen and a situation which in many cases has prevented the experimenter from obtaining a high degree of sensitivity in the receiver follows: For instance, suppose the tickler turns were considerably greater than the number necessary to bring about oscillation with a plate voltage of say 45. This would mean that the voltage on the plate would have to be reduced considerably below this value in order to stop oscillation, thus resulting in operation of the tube at a plate voltage which does not permit maximum sensitivity. This holds true with the screen-grid detector as shown in Fig. 2. In this case, the screen voltage is the critical potential. The diagram shown employs the cathode tap, or so-called *electron-coupled* arrangement. This tap should be varied exactly the same as suggested for the tickler turns in diagram 1.



In the above drawing we show various methods of obtaining regeneration and band-spread tuning.

In Fig. 3, we endeavor to show the proper connections for plate and cathode feed-back where separate coils are used. For instance; starting at the top of the coil form, and providing the two windings are both wound in the *same direction*, we have the terminal going to the grid or grid condenser and grid-leak. This is the grid coil, the lower terminal of which connects to the "B" negative

Feed-back Connections Important

Now for *plate feed-back*, the B plus connects to the top of the tickler and the plate of the tube to the bottom. If we are using *cathode feed-back* with this coil, the top connection of the tickler will go to the cathode, and the bottom connection will go to the B negative.

We trust that the reader will familiarize himself with the above statements regarding coil connections. It is surprising the number of mistakes made in the connection of the coils.

Going back to Figs. 1 and 2, we find that the grid-leak is shown both across the condenser and directly from grid to "B" negative; each has its advantage. The grid-leak being across the condenser is not a parallel shunt to the tuned circuit and introduces no losses. However, it can easily be seen, and many will recall, that when the plug-in coil is removed the grid circuit is open and in nearly all cases a tremendous howl or hum will result. Connecting the grid-leak directly from grid to the "B" negative side of the circuit, instead of across the grid condenser, eliminates this irritating occurrence of noise. Practically, there will be no noticeable decrease in efficiency of the detector because the resistance is so high it offers extremely small losses in the tuned circuit. Therefore, the writer believes that it is the most logical connection.

Band-spread Problem

Band-spread has always been a considerable problem and dozens of methods have been put forward. In Fig. 4, we have the parallel condenser arrangement which consists of a fairly large tuning capacity "C1" which is used for setting the range of the smaller condensers "C2". For a fair degree of band-spread when "C1" is 140 mmf., "C2" should be around 20 to 35 mmf. However, with this arrangement the degree of band-spread is not the same for different settings of "C1". In other words, the band-spread is considerably greater when "C1" (the *band-setting* condenser) is at maximum capacity than it is when "C-1" is at minimum. This can be overcome with the arrangement

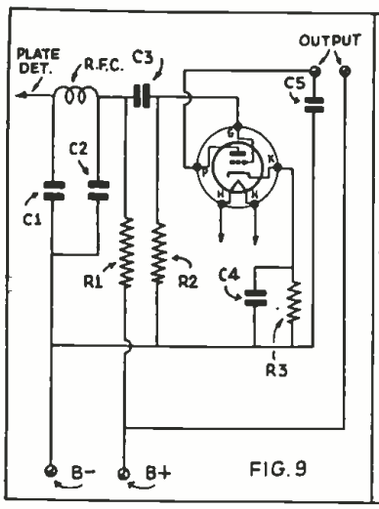


FIG. 9

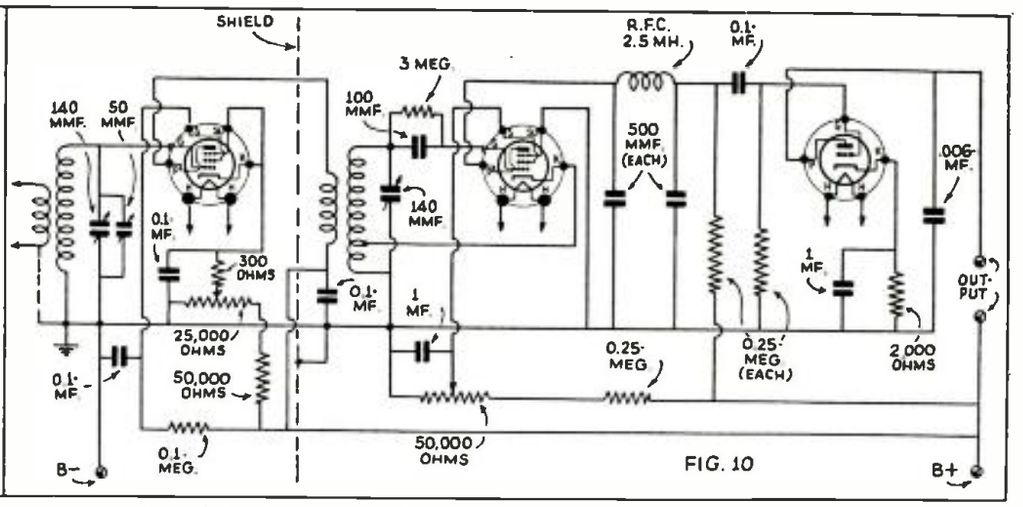


FIG. 10

Above—we have the audio coupling arrangement used in the average short-wave receiver, together with a complete working model diagram, embodying the various features discussed in this lesson.

shown in Fig. 5. Here we have "C-1" the regular *band-setting* control, and "C2" the band-spread unit, with another large condenser similar to "C1" in series with it. This condenser is "C-3". By proper adjustment of "C3" and "C1", exactly the same amount of *band-spread* may be obtained at any point of the entire tuning range of the circuit. For great band-spread, "C3" will have a small amount of capacity and for a small amount of band-spread, "C3" will be increased in capacity. This undoubtedly is the most satisfactory method of the two, if a *constant* band-spread ratio is to be maintained.

Coupling R.F. Stage to Detector

Coupling the R.F. stage to the detector also provides a number of problems. Undoubtedly the most satisfactory for general use is the *inductive* method. However, each will be discussed so that the reader has a clear picture of just what they consist of.

In Fig. 6, we have the original method which was used many years ago; the so-called *tuned impedance coupling*. The tuned circuit between the detector and R.F. stage is connected in the plate circuit of the R.F. stage. And in this case, the grid-leak *must* be connected between the grid and the "B" negative for best results. This method, of course, does not provide a good match between the two tubes, and is usually fairly broad in response when the detector is in the non-oscillating condition. In this case, the tuning condenser rotor and stator both have high-voltage applied to them and must be insulated from the metal panel, should one be used. In Fig. 7, we have another variety of the same idea. However, in this case, we have incorporated the tuning condenser and coil in the grid circuit in the usual manner, and the plate of the R.F. tube is coupled through a condenser directly to the grid of the detector. Voltage is fed to the plate through an R.F. choke coil. For general short-wave reception, this usually consists of the conventional 2½ mh. choke.

In Fig. 8, we have the latest and most popular and, undoubtedly, the most efficient method of coupling an R.F. stage to the detector or to provide coupling, for that matter, between any two tubes. Here we have the plate coil usually interwound with the grid coil and the inductance of the plate coil is usually proportioned to provide maximum efficiency over the entire tuning range of that particular grid coil. The

The next lesson of the "Radio Amateur Course" will be a continuation of the receiver discussion.

connections of a coil of this type, having three windings, all wound in the same direction, will be identical to those shown in Fig. 3, with the addition of the connections for the plate coil, which are exactly as indicated in the diagram. The *top* of this coil is connected to the *plate*, i.e., the terminal nearest the grid end of the grid coil, and the other terminal of the plate coil is connected to the "B" plus.

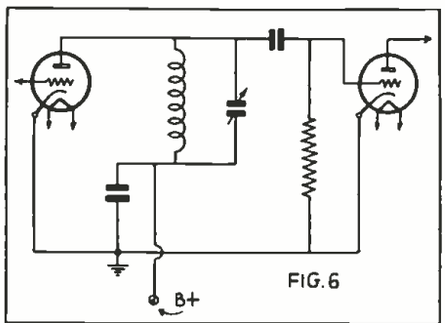


FIG. 6

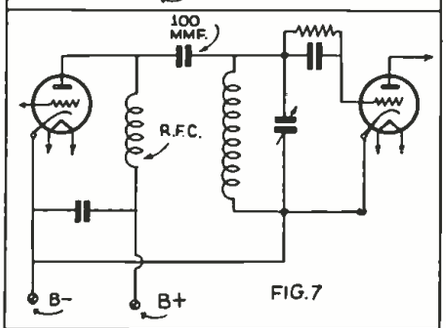


FIG. 7

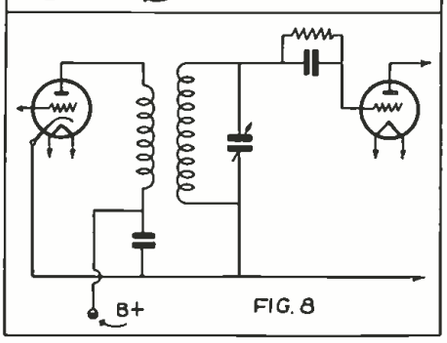


FIG. 8

Various types of coupling between two stages of a receiver are illustrated above.

Coupling Detector to Audio Stage

Coupling the plate circuit of the detector to an audio stage may be done either with a transformer or through the use of resistances and condensers. In Fig. 9, we have the resistance-capacity coupling, which is usually employed with pentodes. For triodes, such as the 56 for example, or some battery-operated triode, then resistor "R1" and "R2" would be replaced respectively by the primary and secondary of a transformer and condenser "C3" would be eliminated. In many cases where additional audio amplification may be desirable with pentodes, resistor "R1" may be replaced by a high-impedance choke coil; one having an inductance from 300 to 700 henries is entirely satisfactory. It may also be found necessary to connect a ¼ meg. resistor across the A.F. choke in order to stabilize the circuit.

Resistance coupling, as shown in Fig. 9, may be used for triodes as well as pentodes. In this case, "R1" would be anywhere from 50,000 to 100,000 ohms. 250,000 ohms is the proper value for screen-grid pentode tubes such as the 57 and 58.

The audio amplification of a simple receiver offers no problem whatsoever. Here an indirectly heated cathode type tube is used. Bias is usually obtained by inserting a resistor in series with the cathode, by-passing it with a high capacity low voltage condenser; in the diagram these are indicated at "C4" and "R2." The resistor, "R3," will depend in size upon the type tube used. Condenser "C4" should have a capacity of from 5 to 25 mf. Electrolytics having a working voltage of around 50 volts are entirely satisfactory.

The R.F. filter circuit shown in Fig. 9, consisting of R.F.C., C1, and C2, is really necessary for stable operation. The capacity of "C1" should be about .0001 mf., while that of "C2" is about .0005 mf., for the general short-wave bands from 45 to 200 meters.

In Fig. 10, we have endeavored to incorporate all the various features men-

(*Continued on page* 178)

SHORT WAVE LEAGUE

HONORARY MEMBERS

Dr. Lee de Forest
John L. Reinartz
D. E. Replogle
Hollis Baird
E. T. Somerset
Baron Manfred von Ardenne
Hugo Gernsback

Executive Secretary

Here's Your Button

The illustration herewith shows the beautiful design of the "Official" Short Wave League button, which is available to everyone who becomes a member of the Short Wave League.

The requirements for joining the League are explained in a booklet, copies of which will be mailed upon request. The button measures ¾ inch in diameter and is inlaid in enamel—3 colors—red, white, and blue.

Please note that you can order your button AT ONCE—SHORT WAVE LEAGUE supplies it at cost, the price, including the mailing, being 35 cents. A solid gold button is furnished for $2.00 prepaid. Address all communications to SHORT WAVE LEAGUE, 99-101 Hudson St., New York.

SHORT WAVE SCOUT NEWS

Andreita O. Cloquell Delighted With "Scout Trophy"

Editor, SHORT WAVE CRAFT:

I wish to acknowledge receipt of the twenty-fifth "Scout Trophy." I was fortunate, indeed, to have won this Trophy and wish to express my thanks to the magazine's staff and compliment them upon the beautiful work of art, which they have incorporated in this Trophy. It certainly is worth all of those long nights I spent doing "DX."

I am proud and happy to be the first woman who has won the Scout Trophy. I shall keep it all my life as my most honored possession.

I wish to advise you and all my friends both in and outside of the United States, that I am no longer living in Arecibo, and ask you to please take note of my new address at the bottom of this letter.

Please find my photo of the Trophy and all-wave radio receiver herewith.

ANDREITA O. CLOQUELL,
Primavera St., No. 22, Stop 20,
Santurce, Puerto Rico.

O.L.P. Report from Freeport, Pa.

● MOST of the short-wave stations are now on their summer wavelengths.

PHI, Huizen, Holland, is back on 17.77 meg.

DJD on 11.77 meg. sending the evening North America program, together with DJC.

England is using GSO 15.18 meg. in the 4th transmission and GSP 15.31 meg. in the 5th transmission.

The 20-meter amateur band is now also very good.

JVN Nazaki, Japan, 10.55 meg. Comes in about on R-7 to 8 on Mondays and Thursdays at 4:00 to 5:00 p.m.

When tuning for Japan, remember that they are a great distance away. Therefore, you must tune very carefully and also Japan does not use the regular bands that the other countries use. You may tune them in very weak, but stick to them—tune carefully and you will be rewarded.

SUV, Cairo, Egypt, has been heard several times the past month phoning England. They always use scrambled speech, called condition A. You have to tune them in before they start to talk to England, if you want to hear them without inverted speech.

IRY, Rome, Italy, phone almost every morning at about 10:00 a.m. They use "Pronto, Pronto" when working some one.

ANGELO CENTANINO,
Box 516, Freeport, Pa.

Report from Listening Post in Trinidad, B.W.I.

● WITH the approach of spring, reception has been somewhat erratic, but on the whole quite good. Morning reception of the 16 and 19 meter bands has fallen off a bit, the Daventry stations not coming in with their usual bang. The other bands have been steady and good.

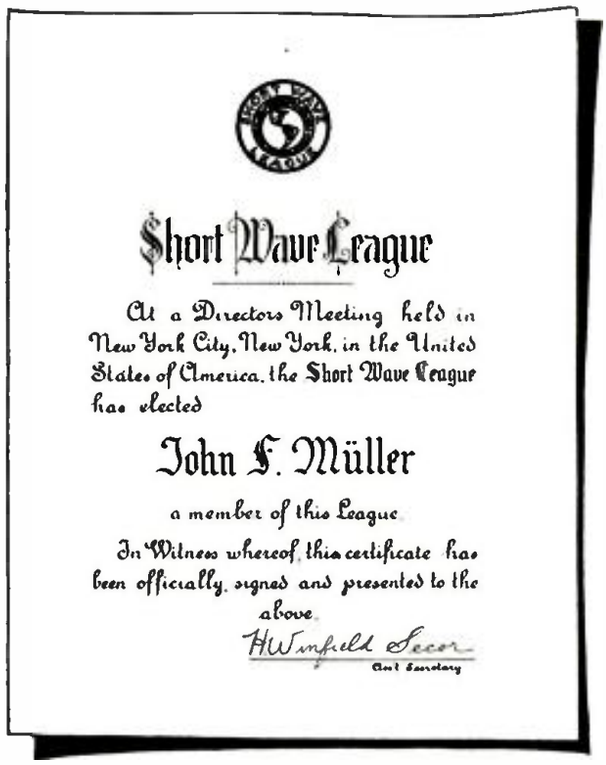
The highlight in this month's report of this Listening Post was the reception of the Ethiopian Station, ETB at Addis Ababa which was heard here on Sunday, April 4, from 4:26 to 4:44 p.m., E.S.T., working on a frequency of 11.95 mc. Announcements were made in English, and were being well received until a CW station came on the same frequency, blotting out all signals. ETB was coming in QSA5, R7.

On March 23, at 8:30 p.m., E.S.T., the new Colombian station in Cartagena, HJ1ABP, "Radio Cartagena," on 9.60 mc., was heard very well. Announcements also made in English.

YV4RC, Caracas, heard on 23rd March with R8 signal, on a frequency of 7.45 mc. and not on its usual wave of 6.37 mc.

On March 24, the Japanese station JVN, 10.66 mc. received, very weak and fading.

(*Continued on page* 191)



This is the handsome certificate that is presented FREE to all members of the SHORT WAVE LEAGUE. The full size is 7¼" x 9½".

See page 190 how to obtain certificate.

CORRECTED AND REVISED Monthly

World S-W Station List

Complete List of Broadcast, and Telephone Stations

All the stations in this list use telephone transmission of some kind. **Note: Stations marked with a star ★ are the most active and easily heard stations and transmit at fairly regular times.**

Please write to us about any new stations or other important data that you learn through announcements over the air or correspondence with the stations.

Stations are classified as follows: C—Commercial phone. B—Broadcast service. X—Experimental transmissions.

Around-the-Clock Listening Guide

It is a good idea to follow a general schedule as far as wavelength in relation to the time of the day is concerned. The observance of these simple rules will save time.

From daybreak till 7 p.m. and particularly during bright daylight, listen between 13 and 19 meters (21540 to 15800 kc.)

To the east of the listener, from about 4 p.m.-5 a.m., the 19-35 meter will be found very productive. To the west of the listener this same band is generally found best from about 12 m. until 7 a.m. (After dark, results above 35 meters are usually much better than during daylight.) These general rules hold for any location in the Northern Hemisphere.

Short-Wave Broadcasting, Experimental and Commercial Radiophone Stations

NOTE: To convert kc. to megacycles (mc.) shift decimal point 3 places to left: Thus, read 21540 kc. as 21.540 mc.

31600 kc. W2XDU
-BX- 9.494 meters
ATLANTIC BROADCASTING CO.,
485 MADISON AVE., N.Y.C.
Relays WABC daily 5-10 p.m., Sat., Sun. 12:30-5, 6-9 p.m.

31600 kc. W8XAI
-BX- 9.494 meters
STROMBERG CARLSON CO.
ROCHESTER, N.Y.
Relays WHAM daily 7:30 a.m.-12.05 a.m.

31600 kc. W8XWJ
-BX- 9.494 meters
DETROIT, MICH.
6:15 a.m.-12:30 p.m., 2-5, 7-10 p.m.

21540 kc. W8XK
-B- 13.93 meters
WESTINGHOUSE ELECTRIC
PITTSBURGH, PA.
6-9 a.m.; relays KDKA

21530 kc. GSJ
-B- 13.93 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
9-10:15 a.m.

21520 kc. W2XE
-B- 13.94 meters
ATLANTIC BROADCASTING CORP.
485 Madison Ave., N.Y.C.
Relays WABC 6:30 a.m.-12 n.

21470 kc. ★GSH
13.97 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
6-8:45 a.m.

21420 kc. WKK
-C- 14.01 meters
AMER. TEL. & TEL. CO.,
LAWRENCEVILLE, N. J.
Calls S. America 8 a.m.-4 p.m.

21080 kc. PSA
-C- 14.23 meters
RIO DE JANEIRO, BRAZIL
Works WKK Daytime

21060 kc. WKA
-C- 14.25 meters
LAWRENCEVILLE, N. J.
Calls England
noon

21020 kc. LSN6
-C- 14.27 meters
HURLINGHAM, ARG.
Calls N. Y. C.
8 a. m.-5 p. m.

20860 kc. EHY-EDM
-C- 14.38 meters
MADRID, SPAIN
Works S. America, mornings.

20700 kc. LSY
-C- 14.49 meters
MONTE GRANDE
ARGENTINA
Tests irregularly

20380 kc. GAA
-C- 14.72 meters
RUGBY, ENGLAND
Calls Argentina, Brazil, mornings

20040 kc. OPL
-C- 14.97 meters
LEOPOLDVILLE, BELGIAN CONGO
Works with ORG in morning

20020 kc. DHO
-C- 14.99 meters
NAUEN, GERMANY
Works S. America, mornings

19900 kc. LSG
-C- 15.08 meters
MONTE GRANDE, ARGENTINA
Tests irregularly, daytime

19820 kc. WKN
-C- 15.14 meters
LAWRENCEVILLE, N. J.
Calls England, daytime

19680 kc. CEC
-C- 15.24 meters
SANTIAGO, CHILE
Works Buenos Aires and Colombia daytime

19650 kc. LSN5
-C- 15.27 meters
HURLINGHAM, ARGENTINA
Calls Europe, daytime

19600 kc. LSF
-C- 15.31 meters
MONTE GRANDE, ARGENTINA
Tests irregularly, daytime

19480 kc. GAD
-C- 15.4 meters
RUGBY, ENGLAND
Works with Kenya, Africa, early morning

19355 kc. FTM
-C- 15.50 meters
ST. ASSISE, FRANCE
Calls Argentine, mornings

19345 kc. PMA
-B,C- 15.51 meters
BANDOENG, JAVA
Calls Holland early a.m.
Broadcasts Tues., Thur., Sat., 10:00-10:30 a.m. irregular

19260 kc. PPU
-C- 15.58 meters
RIO de JANEIRO, BRAZIL
Works with France mornings

19220 kc. WKF
-C- 15.60 meters
LAWRENCEVILLE, N. J.
Calls England, daytime

19200 kc. ORG
-C- 15.62 meters
RUYSSELEDE, BELGIUM
Works with OPL mornings

19160 kc. GAP
-C- 15.66 meters
RUGBY, ENGLAND
Calls Australia, early a.m.

18970 kc. GAQ
-C- 15.81 meters
RUGBY, ENGLAND
Calls S. Africa, mornings

18890 kc. ZSS
-C- 15.88 meters
KLIPHEUVEL, S. AFRICA
Works Rugby 6:30 a.m.-12 n

18830 kc. PLE
-C- 15.93 meters
BANDOENG, JAVA
Calls Holland, early a. m.

18680 kc. OCI
-C- 16.06 meters
LIMA, PERU
Works various S.A. stations daytime

18620 kc. GAU
-C- 16.11 meters
RUGBY, ENGLAND
Calls N. Y., daytime

18345 kc. FZS
-C- 16.35 meters
SAIGON, INDO-CHINA
Phones Paris, early morning

18340 kc. WLA
-C- 16.36 meters
LAWRENCEVILLE, N. J.
Calls England, daytime

18310 kc. GAS
-C- 16.38 meters
RUGBY, ENGLAND
Calls N. Y., daytime

18299 kc. YVR
-C- 16.39 meters
MARACAY, VENEZUELA
Works Germany, mornings

18270 kc. ETA
-C- 16.42 meters
CHIEF ENGINEER
P. O. Box 283, ADDIS ABABA, ETHIOPIA
Irregularly

18250 kc. FTO
-C- 16.43 meters
ST. ASSISE, FRANCE
Calls S. America, daytime

18200 kc. GAW
-C- 16.48 meters
RUGBY, ENGLAND
Calls N. Y., daytime

18135 kc. PMC
-C- 16.54 meters
BANDOENG, JAVA
Phones Holland, early a. m.

18115 kc. LSY3
-C- 16.56 meters
MONTE GRANDE, ARGENTINA
Tests irregularly

18040 kc. GAB
-C- 16.63 meters
RUGBY, ENGLAND
Calls Canada,
morn. and early aftn.

17810 kc. PCV
-C- 16.84 meters
KOOTWIJK, HOLLAND
Calls Java, 6-9 a. m.

17790 kc. ★GSG
-B- 16.86 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
6-8:45 a.m., 9 a.m.-12 n.

17780 kc ★W3XAL
-B- 16.87 meters
NATIONAL BROAD. CO.
BOUND BROOK, N. J.
Relays WJZ, Daily exc. Sun.
8 a.m.-4 p.m.

17775 kc. ★PHI
-B- 16.88 meters
HUIZEN, HOLLAND
7:30-9:30 a.m. daily except Tue. and Wed.
1-2 p.m. Sun.

17760 kc. ★W2XE
-B- 16.89 meters
ATLANTIC BROADCASTING CORP.
485 Madison Ave., N.Y.C.

17760 kc. DJE
-B- 16.89 meters
BROADCASTING HOUSE
BERLIN, GERMANY
8:05-11 a.m.

17760 kc. IAC
-C- 16.89 meters
PISA, ITALY
Calls ships, 6:30-7:30 a. m.

17741 kc. HSP
-C- 16.91 meters
BANGKOK, SIAM
Works Germany 4-7 a.m.

17650 kc. XGM
-C- 17 meters
SHANGHAI, CHINA
Works London 7-9 a.m.

17520 kc. DFB
-C- 17.12 meters
NAUEN, GERMANY
Works S. America near 9:15 a.m.

17510 kc. VWY2
-C- 17.13 meters
KIRKEE, INDIA
Works Rugby 2-7 a.m.

17310 kc. W3XL
-X- 17.33 meters
NATIONAL BROAD. CO.
BOUND BROOK, N. J.
Tests Irregularly

17120 kc. WOO
-C- 17.52 meters
A. T. & T. CO.,
OCEAN GATE, N. J.
Calls ships

17080 kc. GBC
-C- 17.56 meters
RUGBY, ENGLAND
Calls Ships

16270 kc. WLK
-C- 18.44 meters
LAWRENCEVILLE, N. J.
Phones
Arg., Braz., Peru, daytime

16270 kc. WOG
-C- 18.44 meters
OCEAN GATE, N. J.
Calls England,
morning and early afternoon

16240 kc. KTO
-C- 18.47 meters
MANILA, P. I.
Calls Cal., Tokio and ships
8-11:30 a.m.

16233 kc. FZR3
-C- 18.48 meters
SAIGON, INDO-CHINA
Calls Paris and Pacific Isles

15880 kc. FTK
-C- 18.90 meters
ST. ASSISE, FRANCE
Phones Saigon, morning

15865 kc. CEC
-C- 18.91 meters
SANTIAGO, CHILE
Works other S.A. stations afternoons

15810 kc. LSL
-C- 18.98 meters
HURLINGHAM, ARGENTINA
Calls
Brazil and Europe, daytime

15760 kc. JYT
-X- 19.04 meters
KEMIKWA-CHO, CHIBA-KEN, JAPAN
Irregular in late afternoon and early morning

15660 kc. JVE
-C- 19.16 meters
NAZAKI, JAPAN
Phones Java 3-5 a.m.

15620 kc. JVF
-C- 19.2 meters
NAZAKI, JAPAN
Phones U.S., 5 a.m. & 4 p.m.

15460 kc. KKR
-C- 19.4 meters
RCA COMMUNICATIONS,
BOLINAS, CAL.
Tests irregularly

15415 kc. KWO
-C- 19.46 meters
DIXON, CAL.
Phones Hawaii 2-7 p.m.

15370 kc. ★HAS3
-B- 19.52 meters
BUDAPEST, HUNGARY
Broadcasts Sundays, 9-10 a.m.

15360 kc.
-X,C- 19.53 meters
REICHSPOSTZENSTRALAMT,
ZEESEN, GERMANY
Works with Africa and test irregularly

15355 kc. KWU
-C- 19.53 meters
DIXON, CAL.
Phones Pacific Isles and Japan

15340 kc. DJR
-B,X- 19.56 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
1:30-3:30 a.m.

15330kc.★W2XAD
-B- 19.56 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays
WGY 10 a.m.-2 p.m.

15310 kc. ★GSP
-B- 19.6 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE,
LONDON, ENGLAND
6-8, 9-11 p.m.

15290 kc. LRU
-B- 19.62 meters
"EL MUNDO"
BUENOS AIRES, ARGENTINA, S. A.
Testing 7 a.m.-7 p.m.

15280 kc. DJQ
-B- 19.63 meters
BROADCASTING HOUSE
BERLIN, GERMANY
12:30-7 a.m.

15270 kc. ★W2XE
-B- 19.65 meters
ATLANTIC BROADCASTING CORP.
485 Madison Av., N.Y.C.
Relays
WABC daily, 12 n.-4 p.m.

15260 kc. GSI
-B- 19.66 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
12:15-3:30 p.m.

15252 kc. RIM
-C- 19.67 meters
TACHKENT, U.S.S.R.
Phones RKI near 7 a.m.

15250 kc. W1XAL
-B- 19.67 meters
BOSTON, MASS.
Irregular, in morning

(All Schedules Eastern Standard Time)

15245 kc. ★TPA2
-B- 19.68 meters
"RADIO COLONIAL"
PARIS, FRANCE
Service de la Radiodiffusion
98, bis, Blvd. Haussmann
4.55-10 a.m.

15220 kc. ★PCJ
-B- 19.71 meters
N.V. PHILIPS' RADIO
EINDHOVEN, HOLLAND
Tues. 3-6 a.m.
Wed. 7-11 a.m.
Sun. 6:30-7:30 a.m.

15210 kc. ★W8XK
-B- 19.72 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
9 a.m.-7 p.m.
Relays KDKA

15200 kc. DJB
-B- 19.74 meters
BROADCASTING HOUSE
BERLIN, GERMANY
3.50-11 a.m.

15180 kc. ★GSO
-B- 19.76 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE,
LONDON, ENGLAND
3:40-5:45 p.m.

15140 kc. ★GSF
-B- 19.82 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
9 a.m.-12 n.

15120 kc. ★HVJ
-B- 19.83 meters
VATICAN CITY
ROME, ITALY
10:30 to 10:45 a.m., except Sunday
Sat. 10-10:45 a.m.

15110 kc. DJL
-B.X- 19.85 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
5.45-7.30 a.m.

15090 kc. RKI
-C- 19.88 meters
MOSCOW, U.S.S.R.
Phones Tashkent near 7 a.m. and relays RNE on Sundays 10-11 a.m.

15070 kc. PSD
-C- 19.91 meters
RIO DE JANEIRO, BRAZIL
Calls N.Y., Buenos Aires and Europe, daytime

15055 kc. WNC
-C- 19.92 meters
HIALEAH, FLORIDA
Calls Central America, daytime

14980 kc. KAY
-C- 20.03 meters
MANILA, P. I.
Phones Pacific Isles

14970 kc. LZA
-B.C- 20.04 meters
SOFIA, BULGARIA
Tests irregularly till 11:30 a.m. on Sundays

14960 kc. PSF
-C- 20.43 meters
RIO de JANEIRO, BRAZIL
Works with Buenos Aires daytime

14950 kc. HJB
-C- 20.07 meters
BOGOTA, COL.
Calls WNC, daytime

14940 kc. HII
-C- 20.08 meters
CIUDAD TRUJILLO, D.R.
Phones WNC daytime

14940 kc. HJA3
-C- 20.08 meters
BARRANQUILLA, COL.
Works WNC daytime

14845 kc. OCJ2
-C- 20.21 meters
LIMA, PERU
Works other S.A. stations daytime

14653 kc. GBL
-C- 20.47 meters
RUGBY, ENGLAND
Works JVH 1-7 a.m.

14640 kc. TYF
-C- 20.49 meters
PARIS, FRANCE
Works Saigon and Cairo 3-7 a.m., 12 n.-2:30 p.m.

14600 kc. JVH
-B.C- 20.55 meters.
NAZAKI, JAPAN
Phones Europe 4-8 a.m.
Broadcast Daily 12 m-1 a.m.
Mon. and Thurs. 4-5 p.m.

14590 kc. WMN
-C- 20.56 meters
LAWRENCEVILLE, N. J.
Phones England
morning and afternoon

14535 kc. HBJ
-B- 20.64 meters
RADIO NATIONS,
GENEVA, SWITZERLAND
Broadcasts irregularly

14530 kc. LSN
-C- 20.65 meters
HURLINGHAM, ARGENTINA
Calls N.Y.C. afternoons

14500 kc. LSM2
-C- 20.69 meters
HURLINGHAM, ARGENTINA
Calls Rio and Europe daytime

14485 kc. TIR
-C- 20.71 meters
CARTAGO, COSTA RICA
Phones Cen. Amer. & U.S.A.
Daytime

14485 kc. HPF
-C- 20.71 meters
PANAMA CITY, PAN.
Phones WNC daytime

14485 kc. TGF
-C- 20.71 meters
GUATEMALA CITY, GUAT.
Phones WNC daytime

14485 kc. YNA
-C- 20.71 meters
MANAGUA, NICARAGUA
Phones WNC daytime

14485 kc. HRL5
-C- 20.71 meters
NACAOME, HONDURAS
Works WNC daytime

14485 kc. HRF
-C- 20.71 meters
TEGUCIGALPA, HONDURAS
Works WNC daytime

14470 kc. WMF
-C- 20.73 meters
LAWRENCEVILLE, N. J.
Phones England
morning and afternoon

14460 kc. DZH
-C.X- 20.75 meters
REICHSPOSTZENSTRALAMT, ZEESEN, GERMANY
Works on telephony and tests 3:45-5:45 a.m.

14440 kc. GBW
-C- 20.78 meters
RUGBY, ENGLAND
Calls U.S.A., afternoon

13990 kc. GBA
-C- 21.44 meters
RUGBY, ENGLAND
Calls
Buenos Aires, late afternoon

13820 kc. SUZ
-C- 21.71 meters
ABOU ZABAL, EGYPT
Works with Europe 11 a.m.-2 p.m.

13690 kc. KKZ
-C- 21.91 meters
RCA COMMUNICATIONS
BOLINAS, CAL.
Tests irregularly

13635 kc. SPW
-B- 22 meters
WARSAW, POLAND
Mon., Wed., Fri. 11:30 a.m.-12:30 p.m.
Irregular at other times

13610 kc. JYK
-C- 22.04 meters
KEMIKAWA-CHO, CHIBA-KEN, JAPAN
Phones California till 11 p. m.

13585 kc. GBB
-C- 22.08 meters
RUGBY, ENGLAND
Calls
Egypt & Canada, afternoons

13415 kc. GCJ
-C- 22.36 meters
RUGBY, ENGLAND
Calls Japan & China early morning

13390 kc. WMA
-C- 22.40 meters
LAWRENCEVILLE, N. J.
Phones England
morning and afternoon

13380 kc. IDU
-C- 22.42 meters
ASMARA, ERITREA, AFRICA
Works with Rome daytime

13345 kc. YVC
-C- 22.48 meters
MARACAY, VENEZUELA
Calls Hialeah daytime

13285 kc. CGA3
-C- 22.58 meters
DRUMMONDVILLE, QUE., CAN.
Works London and Ships afternoons

13075 kc. VPD
-X- 22.94 meters
SUVA, FIJI ISLANDS
Daily exc. Sun. 12:30-1:30 a.m.

12840 kc. WOO
-C- 23.36 meters
OCEAN GATE, N. J.
Calls ships

12825 kc. CNR
-B.C- 23.39 meters
DIRECTOR GENERAL
Telegraph and Telephone Stations, Rabat, Morocco
Broadcasts, Sunday, 7:30-9 a.m.

12800 kc. IAC
-C- 23.45 meters
PISA, ITALY
Calls Italian ships, mornings

12780 kc. GBC
-C- 23.47 meters
RUGBY, ENGLAND
Calls ships

12396 kc. CT1GO
-B- 24.2 meters
PAREDE, PORTUGAL
Sun. 10-11:30 a.m., Tues., Thur., Fri. 1:00-2:15 p.m.

12325 kc. DAF
-C- 24.34 meters
NORDDEICH, GERMANY
Works German ships daytime

12290 kc. GBU
-C- 24.41 meters
RUGBY, ENGLAND
Calls N.Y.C., afternoon

12250 kc. TYB
-C- 24.49 meters
PARIS, FRANCE
Irregular

12235 kc. TFJ
-B.C- 24.52 meters
REYKJAVIK, ICELAND
Phones England mornings.
Broadcasts Sun. 1:40-2 p.m.

12215 kc. TYA
-C- 24.56 meters
PARIS, FRANCE
Works French Ships in morning and afternoon

12150 kc. GBS
-C- 24.69 meters
RUGBY, ENGLAND
Calls N.Y.C., afternoon

12130 kc. DZE
-C.X- 24.73 meters
REICHSPOSTZENSTRALAMT, ZEESEN, GERMANY
Works phone and tests irregularly

12060 kc. PDV
-C- 24.88 meters
KOOTWIJK, HOLLAND
Tests irregular

12000 kc. RNE
-B- 25 meters
MOSCOW, U. S. S. R.
Sun. 6-9, 10-11 a.m., 12:30-6 p.m., 9-10 p.m.
Wed. 6-7 a.m.
Daily 12:30-6 p.m.

11991 kc. FZS2
-C- 25.02 meters
SAIGON, INDO-CHINA
Phones Paris, morning

11955 kc. ETB
-C- 25.09 meters
ADDIS ABABA, ETHIOPIA
See 18270 kc.

11950 kc. KKQ
-X- 25.10 meters
BOLINAS, CALIF.
Tests, irregularly, evenings

11940 kc. FTA
-C- 25.13 meters
STE. ASSISE, FRANCE
Phones CNR morning.
Hurlingham, Arge., nights

11880 kc. ★TPA3
-B- 25.23 meters
"RADIO COLONIAL"
PARIS, FRANCE
1-4 a.m., 10:15 a.m.-5 p.m.

11870 kc. ★W8XK
-B- 25.26 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
5-10:30 p.m.
Fri. till 12 m
Relays KDKA

11860 kc. YDB
-B- 25.29 meters
N.I.R.O.M.,
SOERABAJA, JAVA
Sat. 7 p.m.-1:30 a.m. (Sun.)
Daily 10:30 p.m.-1:30 a.m.

11860 kc. GSE
-B- 25.29 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND

11855 kc. DJP
-B.X- 25.31 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
12 n.-2 p.m.

11830 kc. W9XAA
-B- 25.36 meters
CHICAGO FEDERATION OF LABOR
CHICAGO, ILL.
Relays WCFL 6:30 a.m.-4 p.m., 9 p.m.-12 m.

11830 kc. W2XE
-B- 25.36 meters
ATLANTIC BROADCASTING CORP.
485 MADISON AVE., N. Y. C.
Relays WABC 4-9 p.m.

11820 kc. GSN
-B- 25.38 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE,
LONDON, ENGLAND
11:30 p.m.-1:30 a.m. irregular

11810 kc. ★HJ4ABA
-B- 25.4 meters
P. O. BOX 50,
MEDELLIN, COLOMBIA
11:30 a.m.-1 p.m., 6:30-10:30 p.m.

11810 kc. ★2RO
-B- 25.4 meters
E.I.A.R.
Via Montello 5
ROME, ITALY
6:15-9 a.m., 9:15-11 a.m., 11:30 a.m.-12:15 p.m., 1:30-5 p.m.

11795 kc. DJO
-B.X- 25.43 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
3.4:55 p.m.

11790 kc. W1XAL
-B- 25.45 meters
BOSTON, MASS.
Daily 5:15-6:15 p.m.
Sun. 5-7 p.m.

11770 kc. ★DJD
-B- 25.49 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
11:35 a.m.-4:20 p.m.; 4:50-10:45 p.m.

11750 kc. ★GSD
-B- 25.53 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
11:30 p.m.-1:30 a.m., 12:15-5:45 p.m., 6-8, 9-11 p.m.

11730 kc. PHI
-B- 25.57 meters
HUIZEN, HOLLAND
Irregular

11720 kc. ★CJRX
-B- 25.6 meters
WINNIPEG, CANADA
Daily, 8 p. m.-12 m.

11715 kc. ★TPA4
-B- 25.61 meters
"RADIO COLONIAL"
PARIS, FRANCE
5:15-9:15 p.m.
9:45 p.m.-12 m.

11680 kc. KIO
-X- 25.68 meters
KAHUKU, HAWAII
Tests in the evening

11595 kc. VRR4
-C- 25.87 meters
STONY HILL, JAMAICA, B.W.I.
Works WNC daytime.

11560 kc. VIZ3
-X- 25.95 meters
AMALGAMATED WIRELESS OF AUSTRALASIA
FISKVILLE, AUSTRALIA
Calls Canada evening and early a.m.

11413 kc. CJA4
-C- 26.28 meters
DRUMMONDVILLE, QUE., CAN.
Tests with Australia irregularly in evening

11200 kc. XBJQ
-X- 26.79 meters
BOX 2825,
MEXICO CITY, MEX.
Irregular

11050 kc. ZLT4
-C- 27.15 meters
WELLINGTON, N. ZEALAND
Phones Australia and England early a.m. Also broadcasts irregularly on Sunday, 9-10 a.m.

11000 kc. PLP
-B-C- 27.27 meters
BANDOENG, JAVA
Broadcasts Sat. 7 p.m.-1:30 a.m., Sun. 5:30-10 a.m.
Also 2-7 a.m. daily

10970 kc. OCI
-C- 27.35 meters
LIMA, PERU
Works with Bogota, Col., evenings

10955 kc. HS8PJ
-3X- 27.38 meters
BANGKOK, SIAM
Broadcasts 6-10:15 a.m.

10840 kc. KWV
-C- 27.68 meters
DIXON, CAL.
Works with Hawaii evenings.

10770 kc. GBP
-C- 27.85 meters
RUGBY, ENGLAND
Calls
Sydney, Austral. early a. m.

10740 kc. ★JVM
-B.C- 27.93 meters
NAZAKI, JAPAN
Tues. and Fri. 2-3 p.m.

10675 kc. WNB
-C- 28.1 meters
LAWRENCEVILLE, N. J.
Calls Bermuda, daytime

10670 kc. ★CEC
-C- 28.12 meters
SANTIAGO, CHILE
Broadcasts Thurs., Sun. 8:30-9 p.m., Daily 7-7:15 p.m.

10660 kc. ★JVN
-B.C- 28.14 meters
NAZAKI, JAPAN
Phones Europe 3-8 a.m.
Broadcasts Mon and Thurs 4-5 p.m.
Daily 12 m-1 a.m., 4-8 a.m.

10550 kc. WOK
-C- 28.44 meters
LAWRENCEVILLE, N. J.
Phones
Arge., Braz., Peru, nights

10520 kc. VLK
-C- 28.51 meters
SYDNEY, AUSTRALIA
Calls Rugby, early a.m.

10430 kc. YBG
-C- 28.76 meters
MEDAN, SUMATRA
5:30-6:30 a. m., 7:30-8:30 p. m.

10420 kc. XGW
-C- 28.79 meters
SHANGHAI, CHINA
Calls Manila and England, 6-9 a. m. and California late evening

10410 kc. PDK
-C- 28.80 meters
KOOTWIJK, HOLLAND
Calls Java 7:30-9:40 a. m.

10410 kc. KES
-X- 28.80 meters
BOLINAS, CALIF.
Tests evenings

10350 kc. LSX
-C- 28.98 meters
MONTE GRANDE, ARGENTINA
Tests irregularly 8 p.m.-12 midnight.

10330 kc. ORK
-B-C- 29.04 meters
RUYSSELEDE, BELGIUM
Broadcasts 1:30-3 p.m.

10300 kc. LSL2
-C- 29.13 meters
HURLINGHAM, ARGENTINA
Calls Europe, evenings

10290 kc. DZC
-X- 29.16 meters
ZEESEN, GERMANY
Broadcasts irregularly

(All Schedules Eastern Standard Time)

10260 kc. PMN
-B-C- 29.74 meters
BANDOENG, JAVA
Calls Australia 5 a.m.
Broadcasts Sat. 7 p.m.-1:30 a.m., Sun. 5:30-10 a.m.

10250 kc. LSK3
-C- 29.27 meters
HURLINGHAM, ARGENTINA
Calls Europe and U. S., afternoon and evening

10220 kc. PSH
-C- 29.35 meters
RIO DE JANEIRO, BRAZIL

10170 kc. RIO
-C- 29.5 meters
BAKOU, U.S.S.R.
Works with Moscow
10 p.m.-5 a.m.

10169 kc. HSJ
-CX- 29.5 meters
BANGKOK, SIAM
Tests 9-10 a.m., Mon., Wed., Thur.

10140 kc. OPM
-C- 29.59 meters
LEOPOLDVILLE, BELGIAN CONGO
Phones around 3 a.m. and 1-4 p.m.

10080 kc. RIR
-C- 29.76 meters
TIFLIS, U.S.S.R.
Works with Moscow early morning.

10070 kc. EDM-EHY
-C- 29.79 meters
MADRID, SPAIN
Works with S. America evenings

10055 kc. ZFB
-C- 29.84 meters
HAMILTON, BERMUDA
Phones N. Y. C. daytime

10055 kc. SUV
-C- 29.84 meters
ABOU ZABAL, EGYPT
Works with Europe 1-6 p.m.

10042 kc. DZB
-X- 29.87 meters
ZEESEN, GERMANY
Works with Central America and tests 7-9 p.m.

9990 kc. KAZ
-C- 30.03 meters
MANILLA, P.I.
Works with Java, Cal. and ships early morning

9950 kc. GCU
-C- 30.15 meters
RUGBY, ENGLAND
Calls N.Y.C. evening

9930 kc. HKB
-C- 30.21 meters
BOGOTA, COL.
Phones Rio de Janeiro evenings

9890 kc. LSN
-C- 30.33 meters
HURLINGHAM, ARGENTINA
Calls New York, evenings

9870 kc. WON
-C- 30.4 meters
LAWRENCEVILLE, N. J.
Phones England, evening

9860 kc. ★EAQ
-B- 30.43 meters
P. O. Box 951
MADRID, SPAIN
Daily 5:15-9:30 p.m.; Saturday also 12 n.-2 p.m.

9840 kc. JYS
-X- 30.49 meters
KEMIKAWA-CHO, CHIBA-KEN, JAPAN
Irregular, 4-7 a. m.

9800 kc. LSI
-C- 30.61 meters
MONTE GRANDE, ARGENTINA
Tests irregularly

9790 kc. GCW
-C- 30.64 meters
RUGBY, ENGLAND
Calls N.Y.C., evening

9760 kc. VLJ-VLZ2
-C- 30.74 meters
AMALGAMATED WIRELESS OF AUSTRALIA
SYDNEY, AUSTRALIA
Phones Java and N. Zealand early a.m.

9750 kc. WOF
-C- 30.77 meters
LAWRENCEVILLE, N. J.
Phones England, evening

9710 kc. GCA
-C- 30.89 meters
RUGBY, ENGLAND
Calls Arge. & Brazil, evenings

9675 kc. DZA
-C- 31.01 meters
ZEESEN, GERMANY
Works with Africa and broadcasts 5-7 p.m.

9650 kc. ★CT1AA
-B- 31.09 meters
LISBON, PORTUGAL
Tues., Thurs., Sat. 3-6 p.m.

9650 kc. DGU
-C- 31.09 meters
NAUEN, GERMANY
Works with Egypt in afternoon

9635 kc. ★2RO
-B- 31.13 meters
E.I.A.R., ROME, ITALY
M., W., F., 6-7:30 p.m.
Tues., Thurs., Sat. 6-7:45 p.m.

9620 kc. YDB
-B- 31.19 meters
N.I.R.O.M.
SOERABAJA, JAVA
4:30-10 a.m.

9600 kc. CB960
-B- 31.25 meters
SANTIAGO, CHILE
9:30 p.m. on

9600 kc. HJ1ABP
-B- 31.25 meters
P.O. BOX 37,
CARTAGENA, COL.
11 a.m.-1 p.m. 5-11 p.m.
Sun. 10 a.m.-1 p.m., 3-6 p.m.

9595 kc. ★HBL
-B- 31.27 meters
LEAGUE OF NATIONS
GENEVA, SWITZERLAND
Saturdays, 5:30-6:15 p. m.
Mon. at 1:45 a.m.

9595 kc. HH3W
-B- 31.27 meters
P.O. BOX 117,
PORT-AU-PRINCE, HAITI
1-2, 7-8 p.m.

9590 kc. HP5J
-B- 31.28 meters
APARTADO 867,
PANAMA CITY, PANAMA
11:45 a.m.-1 p.m., 7:30-10 p.m.

9590 kc. ★PCJ
-B- 31.28 meters
N. V. PHILIPS RADIO
EINDHOVEN, HOLLAND
Sun. 7-8 p.m.
Wed 7-10 p.m.

9590 kc. ★VK2ME
-B- 31.28 meters
AMALGAMATED WIRELESS, LTD., 47 YORK ST.
SYDNEY, AUSTRALIA
Sun. 1-3, 5-9, 11:30 a.m.-1:30 p.m.

9590 kc. ★W3XAU
-B- 31.28 meters
NEWTOWN SQUARE, PA.
Relays WCAU
Daily 11 a.m.-7 p.m.

9580 kc. LRX
-B- 31.32 meters
"EL MUNDO"
BUENOS AIRES, ARGENTINA
Testing

9580 kc. ★ GSC
-B- 31.32 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
6-8, 9-11 p.m.

9580 kc. ★VK3LR
-B- 31.32 meters
Research Section,
Postmaster Gen'ls. Dept.,
61 Little Collins St.,
MELBOURNE, AUSTRALIA
3:15-7:30 a.m., except Sun. also Fr. 10 p.m.-2 a.m.

9570 kc. ★W1XK
-B- 31.35 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
SPRINGFIELD, MASS.
Relays WBZ, 6 a.m.-12 m.
Sun 7 a.m.-12 m.

9565 kc. VUB
-B- 31.36 meters
BOMBAY, INDIA
11 a.m.-12:30 p.m., Wed., Thurs., Sat.

9560 kc. ★DJA
-B- 31.38 meters
BROADCASTING HOUSE, BERLIN
12:30-3, 8:05-11 a.m., 4:50-10:45 p.m.

9550 kc .JH1ABE
-B- 31.41 meters
P.O. BOX 31,
CARTAGENA, COLOMBIA
Daily 7:30-9 p.m.,
Mon. also 10 p.m.-12 m.

9540 kc. ★DJN
-B- 31.45 meters
BROADCASTING HOUSE
BERLIN, GERMANY
12:30-3:50, 8:05-11 a.m., 4:50-10:45 p.m.

9530 kc. ★W2XAF
-B- 31.48 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays WGY 4 p.m.-12 m.
Sat. 12 n.-12 m.

9525 kc. LKJ1
-B- 31.49 meters
JELOY, NORWAY
5-8 a.m., 11 a.m.-6 p.m.

9525 kc. CQN
-B- 31.49 meters
MACAO, PORTUGUESE CHINA
Mon. and Fri. 7-8:30 a.m.

9510 kc. ★VK3ME
-B- 31.55 meters
AMALGAMATED WIRELESS, Ltd.
167 Queen St.,
MELBOURNE, AUSTRALIA
Daily exc. Sun. 4-7 a.m.

9510 kc. ★GSB
-B- 31.55 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
11:30 p.m.-1:30 a.m., 12:15-5:45 p.m.

9510 kc. HJU
-B- 31.55 meters
NATIONAL RAILWAYS
BUENAVENTURA, COLOMBIA
Mon., Wed., Fri. 8-11 p.m.

9500 kc. PRF5
-B- 31.58 meters
RIO DE JANEIRO, BRAZIL
Irregularly 4:45-5:45 p.m.

9490 kc. XGOX
-B- 31.61 meters
NANKING, CHINA
6:30-8:40 a.m., Sun. 7:30-9:30 a.m.

9450 kc. TGWA
-B- 31.75 meters
MINISTRE de FOMENTO
GUATEMALA CITY,
GUATEMALA
Irregular 6-11 p.m.
Sun. 2-5 a.m.

9428 kc. ★COCH
-B- 31.8 meters
2 B ST., VEDADO,
HAVANA, CUBA
Daily 8 a.m.-7 p.m.
Sun. 11 a.m.-12 n., 6:30-9:30 p.m.

9415 kc. PLV
-C- 31.87 meters
BANDOENG, JAVA
Phones Holland around 9:45 a.m.

9330 kc. CGA4
-C- 32.15 meters
DRUMMONDVILLE, CANADA
Phones England irregularly

9280 kc. GCB
-C- 32.33 meters
RUGBY, ENGLAND
Calls Can. & Egypt, evenings

9170 kc. WNA
-C- 32.72 meters
LAWRENCEVILLE, N. J.
Phones England, evening

9150 kc. YVR
-C- 32.79 meters
MARACAY, VENEZUELA
Works with Europe afternoons.

9125 kc. ★HAT4
-B- 32.88 meters
"RADIOLABOR,"
GYALI-UT. 22
BUDAPEST, HUNGARY
Sunday 6-7 p.m.

9060 kc. TFK
-C- 33.11 meters
REYKJAVIK, ICELAND
Phones London afternoons.
Broadcasts irregularly.

9020 kc. GCS
-C- 33.26 meters
RUGBY, ENGLAND
Calls N.Y.C., evenings

9010 kc. KEJ
-C- 33.3 meters
BOLINAS, CAL.
Relays NBC & CBS
Programs in evening irregularly

8975 kc. VWY
-C- 33.43 meters
KIRKEE, INDIA
Works with England in morning

8795 kc. HKV
-B- 34.09 meters
BOGOTA, COLOMBIA
Irregular; 6:30 p.m.-12 m.

8775 kc. PNI
-C- 34.19 meters
MAKASSER, CELEBES, N.I.
Phones Java around 4 a. m.

8765 kc. DAF
-C- 34.23 meters
NORDDEICH, GERMANY
Works German Ships irregularly

8760 kc. GCQ
-C- 34.25 meters
RUGBY, ENGLAND
Calls S. Africa, afternoon

8750 kc. ZCK
-B- 34.29 meters
HONGKONG, CHINA
Relays ZBW
Daily 11:30 p.m.-1:15 a.m.
Mon. and Thurs. 3-7 a.m.
Tues., Wed., Fri. 6-10 a.m.
Sat. 6-11 a.m.

8730 kc. GCI
-C- 34.36 meters
RUGBY, ENGLAND
Calls India, 8 a. m.

8680 kc. GBC
-C- 34.56 meters
RUGBY, ENGLAND
Calls ships

8665 kc. CO9JQ
-X- 34.62 meters
CAMAGUEY, CUBA
5:30-6:30, 8-9 p.m. daily except Sat. and Sun.

8590 kc. YNVA
-B- 34.92 meters
MANAGUA, NICARAGUA
7:30-9:30 p. m.

8560 kc. WOO
-C- 35.05 meters
OCEAN GATE, N. J.
Calls ships irregular

8400 kc. HC2AT
-B- 35.71 meters
CASSILLA 877
GUAYAQUIL, ECUADOR
8-11 p.m.

8380 kc. IAC
-C- 35.8 meters
Pisa, Italy

8214 kc. HCJB
-B- 36.5 meters
QUITO, ECUADOR
7-11 p.m., except Monday
Sun. 11 a.m.-12 n.; 4-10 p.m.

8190 kc. XEME
-B- 36.63 meters
CALLE 59, No. 517
MERIDA, YUCATAN
"LA VOZ de YUCATAN desde MERIDA
10 a.m.-12 n., 6 p.m.-12 m.

8185 kc. PSK
-C- 36.65 meters
RIO DE JANEIRO, BRAZIL
Irregularly

8036 kc. CNR
-B- 37.33 meters
RABAT, MOROCCO
Sunday, 2:30-5 p. m.

7975 kc. HC2TC
-B- 37.62 meters
QUITO, ECUADOR
Thurs., Sun. at 8 p.m.

7901 kc. LSL
-C- 37.97 meters
HURLINGHAM, ARGENTINA
Calls Brazil, night

7880 kc. JYR
-B- 38.07 meters
KEMIKAWA-CHO, CHIBA-KEN, JAPAN
4-7:40 a. m.

7860 kc. SUX
-C- 38.17 meters
ABOU ZABAL, EGYPT
Works with Europe 4-6 p.m.

7854 kc. HC2JSB
-B- 38.2 meters
GUAYAQUIL, ECUADOR
8:15-11:15 p.m.

7830 kc. YV9RC
-B- 38.31 meters
CARACAS, VENEZUELA
7-11 p.m.

7799 kc. ★HBP
-B- 38.47 meters
LEAGUE OF NATIONS,
GENEVA, SWITZERLAND
5:30-6:15 p. m., Saturday

7715 kc. KEE
-C- 38.89 meters
BOLINAS, CAL.
Relays NBC & CBS
Programs in evening irregularly

7630 kc. ZHJ
-B- 39.32 meters
PENANG, MALAYA
Daily 7-9 a.m.
also Sat. 11 p.m.-1 A.M. (Sun.)

7626 kc. RIM
-C- 39.34 meters
TACHKENT, U.S.S.R.
Works with Moscow early morning

7620 kc. ETD
-C- 39.37 meters
ADDIS ABABA, ETHIOPIA
See 18270 kc.

7610 kc. KWX
-C- 39.42 meters
DIXON, CAL.
Works with Hawaii, Philippines, Java and Japan nights.

7550 kc. TI8WS
-B- 39.74 meters
"ECOS DEL PACIFICO"
P. O. BOX 75 PUNTA ARENAS, COSTA RICA
6 p.m.-12 m.

7520 kc. KKH
-C- 39.89 meters
KAHUKU, HAWAII
Works with Dixon and broadcasts irregularly nights

7510 kc. JVP
-B.C- 39.95 meters
NAZAKI, JAPAN

7500 kc. RKI
-C- 40 meters
MOSCOW, U.S.S.R.
Works RIM early a.m.

7390 kc. ZLT2
-C- 40.6 meters
WELLINGTON, N.Z.
Works with Sydney 3-7 a.m.

7380 kc. XECR
-B- 40.65 meters
FOREIGN OFFICE,
MEXICO CITY, MEX.
Sun. 6-7 p.m.

7281 kc. HJ1ABD
-B- 41.04 meters
CARTAGENA, COLO.
Irregularly, evenings

7100 kc. HKE
-B- 42.25 meters
BOGOTA, COL., S. A.
Tue. and Sat. 8-9 p. m.; Mon. & Thurs. 6:30-7 p. m.

7080 kc. VP3MR
-B- 42.68 meters
GEORGETOWN, BRI. GUIANA, S.A.
Sun. 7:45-10:15 a.m.
Mon. 3:45-4:45 p.m.
Tues. 4:45-6:45 p.m.
Wed. 4:45-7:45 p.m.
Thur. 5-6:45 p.m.
Sat. 4:45-7:45 p.m.

7074 kc. HJ1ABK
-B- 42.69 meters
CALLE, BOLIVIA,
PROGROSO-IGUALDAD
BARRANQUILLA, COLOMBIA
Sun. 3-6 p.m.

7030 kc. HRP1
-B- 42.67 meters
SAN PEDRO SULA, HONDURAS
Reported on this and other waves irregularly in evening

6996 kc. PZH
-B- 42.88 meters
P. O. BOX 18,
PARAMIRABO, DUTCH GUIANA
Sun. 9:36-11:36 a.m.
Mon. and Fri. 5:36-9:36 p.m.
Tues. and Thur. 8:36-10:36 a.m., 2:36-4:36 p.m.
Wed. 3:36-4:36, 5:36-9:36 p.m.
Sat. 2:36-4:36 p.m.

6976 kc. HCETC
-B- 43 meters
TEATRO BOLIVAR
QUITO, ECUADOR
Thurs. till 9:30 p.m.

6905 kc. GDS
-C- 43.45 meters
RUGBY, ENGLAND
Calls N.Y.C. evening

6900 kc. HI3C
-B- 43.48 meters
LA RAMONA, DOM. REP.
LA VOZdeRIO DULCE.
11:55 a.m.-1:25 p.m., 6:10-7:40 p.m.

6860 kc. KEL
-X- 43.70 meters
BOLINAS, CALIF.
Tests irregularly
11 a. m.-12 n.; 6-9 p. m.

(All Schedules Eastern Standard Time)

6850 kc. TI6OW
-B- 43.8 meters
DNDA del CARIBE
PUERTO LIMON, COSTA RICA
Irregularly 8-9:30 p.m.

6800 kc. HI7P
-B- 44.12 meters
EMISORIA DIARIA de COMERCIO. CIUDAD TRUJILLO. DOM. REP.
Daily exc. Sat. and Sun. 12:40-1:40, 6:40-8:40 p.m.; Sat. 12:40-1:40 p.m.; Sun. 10:40 a.m.-11:40 a. m.

6780 kc. HIH
-B- 44.25 meters
SAN PEDRO de MACORIS
DOMINICAN REP.
12:10-1:40 p.m., 7:30-9 p.m., Sun. 3-4 a.m. 4:15-6 p.m.

6755 kc. WOA
-C- 44.41 meters
LAWRENCEVILLE, N. J.
Phones England, evening

6750 kc. JVT
-B.C- 44.44 meters
NAZAKI, JAPAN
KOKUSAI-DENWA KAISHA, LTD., TOKIO

6710 kc. ★TIEP
-B- 44.71 meters
LA-VOZ DEL TROPICO
SAN JOSE, COSTA RICA
APARTADO 257. Daily 7-10 p.m.

6672 kc. YVQ
-C- 44.95 meters
MARACAY, VENEZUELA
Broadcasts Sat. 8-9 p.m.

6660 kc. ★HC2RL
-B- 45.05 meters
P. O. BOX 759, GUAYAQUIL, ECUADOR, S. A.
Sunday, 5:45-7:45 p. m.
Tues., 9:15-11:15 p. m.

6650 kc. IAC
-C- 45.11 meters
PISA, ITALY
Calls ships, evenings

6630 kc. HIT
-B- 45.25 meters
"LA VOZ de la RCA VICTOR," APARTADO 1105, CIUDAD TRUJILLO, D.R.
Daily exc. Sun. 12:10-1:40 p.m., 5:40-8:40 p.m., also Sat. 10:40 p.m.-12:40 a.m. (Sun.)

6618 kc. ★PRADO
-B- 45.33 meters
RIOBAMBA, ECUADOR
Thurs. 9-11:45 p.m.

6611 kc. RV72
-B- 45.38 meters
MOSCOW, U. S. S. R.
1-6 p. m.

6600 kc. HI8A
-B- 45.45 meters
CIUDAD TRUJILLO, DOM. REP.
Irregular

6600 kc. HI4D
-B- 45.45 meters
CIUDAD TRUJILLO, DOMINICAN REPUBLIC
Except Sun. 11:55 a.m.-1:40 p.m.; 4:40-7:40 p.m.

6560 kc. HI4V
-B- 45.73 meters
CIUDAD TRUJILLO, D.R.
LA VOZ de LA MARINA
5:10-7:40 p.m.

6550 kc. TIRCC
-B- 45.77 meters
RADIOEMISORA CATOLICA COSTARRICENSE
SAN JOSE, COSTA RICA
Sun. 11 a.m.-2 p.m., 6-7, 8-9 p.m., Daily 12 n.-2 p.m., 6-7 p.m., Thurs. 6-11 p.m.

6520 kc. ★YV6RV
-B- 46.01 meters
VALENCIA, VENEZUELA
11 a.m.-2 p.m., 5-10 p.m.

6500 kc. HIL
-B- 46.15 meters
APARTADO 623
CIUDAD TRUJILLO, D.R.
12:10-1:40 p.m., 5:40-7:40 p.m.

6500 kc. HJ5ABD
-B- 46.15 meters
MANIZALES, COL.
12-1:30 p. m., 7-10 p. m.

6451 kc. YNLF
-B- 46.51 meters
MANAGUA, NICARAGUA
6-9 a.m., 12:30-2:30, 6:30-10 p.m.

6450 kc. HJ4ABC
-B- 46.51 meters
APARTADO 39
IBAQUE, COLOMBIA
11 a.m.-12 n., 8-11 p.m.

6447 kc. HJ1ABB
-B- 46.53 meters
BARRANQUILLA, COL., S. A.
P. O. BOX 715.
11:30 a.m.-1 p.m.; 4:30-10 p.m.

6425 kc. W9XBS
-X- 46.7 meters
NATL. BROAD. CO.
CHICAGO, ILL.
Relays WMAQ. Irregular

6420 kc. HI1S
-B- 46.73 meters
PUERTO PLATA, DOM. REP.
11:40 a.m.-1:40 p.m., 5:40-7:40, 9:40-11:40 p.m.

6410 kc. TIPG
-B- 46.8 meters
APARTADO 225,
SAN JOSE, COSTA RICA
"LA VOZ DE LA VICTOR"
12 n.-2 p.m., 6-11:30 p.m.

6380 kc. HI3U
-B- 47.02 meters
SANTIAGO de los CABALLEROS, DOM. REP.
10:40 a.m.-1:40 p.m., 4:40-9:40 p.m.

6375 kc. YV4RC
-B- 47.06 meters
CARACAS VENEZUELA
5:30-9:30 p.m.

6316 kc. HIZ
-B- 47.5 meters
CIUDAD TRUJILLO
DOMINICAN REPUBLIC
Daily except Sat. and Sun. 5:10-8:40 p.m.; Sat. 5:10-11:10 p.m.; Sun., 11:40 a.m.-1:40 p. m.

6300 kc. YV12RM
-B- 47.62 meters
MARACAY, VENEZUELA
8-10:30 p.m.

6280 kc. CO9WR
-B- 47.77 meters
P.O. BOX 85,
SANCTI SPIRITUS, CUBA
4-6, 9-11 p.m.

6280 kc. HIG
-B- 47.77 meters
CIUDAD TRUJILLO, D.R.
7:10-8:40 a.m., 12:40-2:10, 8:10-9:40 p.m.

6235 kc. HRD
-B- 48.12 meters
LA CEIBE, HONDURAS
8-11 p.m., Sat. 8 p.m.-1 a.m. (Sun.)

6230 kc. OAX4G
-B- 48.15 meters
Apartado 1242
LIMA, PERU
Daily 7-10:30 p.m.
Wed. 6-10:30 p.m.

6185 kc. HI1A
-B- 48.5 meters
P. O. BOX 423, SANTIAGO, DOMINICAN REP.
11:40 a. m.-1:40 p. m.
7:40-9:40 p. m.

6180 kc. XEXA
-B- 48.54 meters
DEPT. OF EDUCATION
MEXICO CITY, MEX.
7-11 p.m.

6175 kc. HJ2ABA
-B- 48.58 meters
TUNJA, COLOMBIA
1-2; 7:30-9:30 p.m.

6170 kc. HJ3ABF
-B- 48.62 meters
BOGOTA, COLOMBIA
7-11:15 p. m.

6160 kc. ★YV3RC
-B- 48.7 meters
CARACAS, VENEZUELA
11 a.m.-2 p.m., 4-10:30 p.m.

6155 kc. COKG
-B- 48.74 meters
BOX 137, SANTIAGO, CUBA
9-10 a.m., 11:30 a.m.-1:30 p.m., 3-4:30 p.m., 10-11 p.m., 12 m.-2 a.m.

6150 kc. CSL
-B- 48.78 meters
LISBON, PORTUGAL
7-8:30 a.m., 2-7 p.m.

6150 kc. ★CJRO
-B- 48.78 meters
WINNIPEG, MAN., CANADA
8 p. m.-12 m.
Sun. 3-10:30 p. m.

6150 kc. HJ5ABC
-B- 48.78 meters
CALI, COLOMBIA
Daily 11 a.m.-12 n., Sun. 12 n.-2 pm., Daily except Sat. and Sun. 7-10 p.m.

6140 kc. ★W8XK
-B- 48.86 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
Relays KDKA
9 p.m.-12 m.

6135 kc. HI5N
-B- 48.9 meters
SANTIAGO, D.R.
6:40-9:10 p.m.

6130 kc. HJ4ABP
-B- 48.94 meters
MEDELLIN, COL.
Relays HJ4ABQ 8-11 p.m.

6130 kc. TGXA
-B- 48.94 meters
DIORNAL LIBERAL PROGRESSISTA, GAUTEMALA CITY, GUAT.
Heard in the evening.

6130 kc. COCD
-B- 48.94 meters
"La Voz del Aire"
CALLE G y 25, VEDADO, HAVANA, CUBA
Relays CMCD 11 a.m.-12 n., 7-10 pm., Sun. 12 n.-4 p.m.

6130 kc. ZGE
-B- 48.94 meters
KUALA LUMPUR,
FED. MALAY STATES
Sun., Tue., and Fri., 6:40-8:40 a. m.

6130 kc. ★CHNX
-B- 48.94 meters
P.O. BOX 998
HALIFAX, N.S., CANADA
Daily 9 a.m.-12:30 p.m., 4-10 p.m.
Relays CHNS

6128 kc. HJ3ABX
-B- 48.95 meters
LA VOZ de COLOMBIA
CALLE 14, No. 738,
BOGOTA, COLOMBIA
5:45-11:30 p.m.

6120 kc. ★W2XE
-B- 49.02 meters
ATLANTIC BROADCASTING CORP.
485 MADISON AVE., N. Y. C.
Relays WABC. 9-10 p.m.

6120 kc. XEFT
-B- 49.02 meters
AV. INDEPDENCIA 28,
VERA CRUZ, MEX.
11 a.m.-4 p.m., 7:30 p.m.-12 m.
Sat. also 6:30-7:30 p.m.
Sun. 11 a.m.-4 p.m., 9 p.m.-12 m.
Relays XETF

6110 kc. VUC
-B- 49.1 meters
CALCUTTA, INDIA
Daily except Sat., 3-5:30 a. m., 9:30 a. m.-noon; Sat., 11:45 a. m.-3 p. m.

6105 kc. HJ4ABB
-B- 49.14 meters
MANIZALES, COL., S. A.
P. O. Box 175
Mon. to Fri. 12:15-1 p. m.; Tues. & Fri. 7:30-10 p. m.; Sun. 2:30-5 p. m.

6100 kc. ★W3XAL
-B- 49.18 meters
NATIONAL BROADCASTING CO.
BOUND BROOK, N. J.
Relays WJZ
Monday, Wednesday, Saturday, 4-5 p.m., Sat. 11 p.m.-12 m.

6100 kc. ★W9XF
-B- 49.18 meters
NATL. BROAD. CO.
Relays WENR, Chicago
Sun., Tues., Thur., Fri. 9 p.m.-2 a.m.; M., W., Sat., 1-2 a.m.

6097 kc. ZTJ
-B- 49.2 meters
AFRICAN BROADCASTING CO.
JOHANNESBURG, SOUTH AFRICA.
Sun.-Fri. 11:45 p.m. 12:30 a.m. (next day)
Mon.-Sat. 3:30-7 a.m.
9 a.m.-4 p.m.
Sun. 8-10:15 a.m.; 12:30-3 p.m.

6090 kc. ★CRCX
-B- 49.26 meters
TORONTO, CANADA
Daily 5:30-11:30 p.m.
Sun. 11:45 a.m.-11:45 p.m.

6090 kc. VE9BJ
-B- 49.26 meters
SAINT JOHN, N. B., CAN.
7-8:30 p. m.

6085 kc. 2RO
-B- 49.3 meters
E.I.A.R.
RDME, ITALY

6083 kc. VQ7LO
-B- 49.31 meters
NAIROBI, KENYA, AFRICA
Mon.-Fri. 5:45-6:15 a.m., 11:30 a.m.-2:30 p.m. Also 8:30-9:30 a.m. on Tues. and Thurs.; Sat. 11:30 a.m.-3:30 p.m.; Sun. 11 a.m.-2 p.m.

6080 kc. CP5
-B- 49.34 meters
LAPAZ, BOLIVIA
7-10:30 p. m.

6080 kc. HP5F
-B- 49.34 meters
Carlton Hotel
COLON, PANAMA
11:45 a.m.-1:15 pm., 7:45-10 p.m.

6080 kc. W9XAA
-B- 49.34 meters
CHICAGO FEDERATION OF LABOR
CHICAGO, ILL.
Relays WCFL
Sunday 11:30 a. m.-9 p. m. and Tues., Thurs., Sat., 4 p. m.-12 m.

6079 kc. DJM
-B.X- 49.34 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
7:30-9:30 p.m.

6072 kc. OER2
-B- 49.41 meters
VIENNA, AUSTRIA
9 a. m.-5 p.m., Sat. to 6 p.m.

6070 kc. HJ4ABC
-B- 49.42 meters
PERIERA, COL.
9-11 a.m., 7-8 or 9 p. m.

6070 kc. VE9CS
-B- 49.42 meters
VANCOUVER, B. C., CANADA
Sun. 1:45-9 p. m., 10:30 p. m.-1 a. m.; Tues. 6-7:30 p. m., 11:30 p. m.-1:30 a. m. Daily 6-7:30 p. m.

6065 kc. HJ4ABL
-B- 49.46 meters
MANIZALES, COL.
Daily 11 a.m.-12 n., 5:30-7:30 p.m. Sat. 5:30-10:30 p.m.

6060 kc. ★W8XAL
-B- 49.50 meters
CROSLEY RADIO CORP.
CINCINNATI, OHIO
5:30 a.m.-7 p.m.; 10 p.m.-1 a.m.
Relays WLW

6060 kc. W3XAU
-B- 49.50 meters
NEWTOWN SQUARE, PA.
Relays WCAU, Philadelphia
7 p.m.-10 p.m.

6060 kc. OXY
-B- 49.50 meters
SKAMLEBOAEK, DENMARK
1-6:30 p.m.

6050 kc. HJ3ABD
-B- 49.59 meters
COLOMBIA BROADCASTING, BOX 509, BOGOTA, COL.
12 n.-2 p.m., 7-11 p.m., Sun. 5-9 p.m.

6050 kc. HI9B
-B- 49.59 meters
SANTIAGO
DOM. REP.
Irregular 6 p.m.-11 p.m.

6042 kc. HJ1ABG
-B- 49.65 meters
EMISORA ATLANTICO
BARRANQUILLA, COLO.
11 a.m.- 11 p.m.
Sun. 11 a.m.- 8 p.m.

6040 kc. W4XB
-B- 49.67 meters
MIAMI BEACH, FLA.
Relays WIOD 12 n.-2 p.m., 5:30 p.m.-12 m.

6040 kc. PRA8
-B- 49.67 meters
RADIO CLUB OF PERNAMBUCO
PERNAMBUCO, BRAZIL
1-3 p.m., 4-7:30 p.m. daily

6040 kc. ★W1XAL
-B- 49.67 meters
BOSTON, MASS.
Tues., Thurs. 7:15-9:15 p.m.
Sun 5-7 p.m.

6040 kc. YDA
-B- 49.67 meters
N.I.R.O.M.
TANDJONGPRIOK, JAVA
5:45-6:45 p.m., 10:30 p.m.-1:30 a.m.

6030 kc. ★HP5B
-B- 49.75 meters
P. O. BOX 910
PANAMA CITY, PAN.
12 n.- 1p.m., 7-10:30 p.m.

6030 kc. VE9CA
-B- 49.75 meters
CALGARY, ALBERTA, CAN.
Thurs. 9 a.m.-2 a.m. (Fri.); Sun. 12 n.-12 m.
Irregularly on other days from 9 a.m.-12 m.

6020 kc. DJC
-B- 49.83 meters
BROADCASTING HOUSE,
BERLIN
11:35 a.m.-4:20 p.m.

6020 kc. XEUW
-B- 49.82 meters
AV. INDEPENDENCIA, 98,
VERA CRUZ, MEX.
8 p.m.-12:30 a.m.

6018 kc. ZHI
-B- 49.8 meters
RADIO SERVICE CO.,
20 ORCHARD RD.,
SINGAPORE, MALAYA
Mon., Wed. and Thurs 5:40-8:10 a.m. Sat. 10:40 p.m.-1:10 a.m. (Sun.) Every other Sunday 5:10-6:40 a.m.

6012 kc. HJ3ABH
-B- 49.91 meters
BOGOTA, COLO.
APARTADD 565
6-11 p.m.
Sun. 12 n.-2 p.m., 4-11 p.m.

6010 kc. ★COCO
-B- 49.92 meters
P.O. BOX 98
HAVANA, CUBA
Daily 9:30 a.m.-1 p.m., 4-7 p.m., 8-10 p.m.
Sat. also 11:30 p.m.-2 a.m.

6005 kc. HJ1ABJ
-B- 49.96 meters
SANTA MARTA, COLO.
6-11 p.m. except Wed.

6005 kc. HP5K
-B- 49.96 meters
Box 33,
COLON, PANAMA
7:30-9 a.m., 12 n.-1 p.m., 6-9 p.m.

6005 kc. ★VE9DR
-B- 49.96 meters
CANADIAN MARCONI CO., DRUMMONDVILLE, QUE., CAN.
Relays CFCF 6 a.m.-11 p.m., Sun. 7 a.m.-9:15 p.m.

6000 kc. HJ1ABC
-B- 50 meters
QUIBDO, COLOMBIA
5-6 p.m., Sun. 9-11 p.m.

5990 kc. ★XEBT
-B- 50.08 meters
MEXICO CITY, MEX.
P. O. Box 79-44
8 a.m.-1 a.m.

5988 kc. HJ2ABD
-B- 50.10 meters
BUCARAMANGA, COL.
11:30 a.m.-12:30 p.m., 5:30-6:30, 7:30-10:30 p.m.

5980 kc. XEWI
-B- 50.17 meters
MEXICO CITY, MEX.
Mon., Wed., Fri., 3-4 p.m. Tues., Fri. 7:30-8:45, 10 p.m.-12 m.; Sat. 9-10 p.m.; Sun. 1-2:15 p. m.

5980 kc. HIX
-B- 50.17 meters
CIUDAD TRUJILLO, DOMINICAN REP.
Sun 7:40-10:10; Daily 12:10-1:10 p.m., 4:40-5:40 p.m.; Tues. and Fri. 8:10-10:10 p.m.

5976 kc. HJ2ABC
-B- 50.2 meters
CUCUTA, COLOMBIA
6-9:30 p.m.

5970 kc. HJN
-B- 50.26 meters
BOGOTA, COL.
6-11 p.m.

5968 kc. HVJ
-B- 50.27 meters
VATICAN CITY (ROME)
2-2:15 p. m., daily. Sun., 5-5:30 a. m.

5940 kc. TG2X
-B- 50.5 meters
GUATEMALA CITY, GUAT.
4-6, 9-11 p.m., Sun. 2-5 a.m.

5930 kc. HJ4ABE
-B- 50.59 meters
MEDELLIN, COLO.
Daily 11 a.m.-12 n., 6-10:30 p.m.

(All Schedules Eastern Standard Time)

5900 kc. HH2S
-B- 50.85 meters
PORT-au-PRINCE, HAITI
7:30-10:30 p.m.

5885 kc. HCK
-B- 50.98 meters
QUITO, ECUADOR, S. A.
8-11 p.m.

5880 kc. YV8RB
-B- 51.02 meters
"LA VOZ de LARA"
BARQUISIMETO,
VENEZUELA
12 n.- 1p.m., 6-10 p.m.

5875 kc. HRN
-B- 51.06 meters
TEGUCIGALPA, HONDURAS
1:15-2:15, 8:30-10 p.m., Sun.
3:30-5:30, 8:30-9:30 p.m.

5865 kc. HI1J
-B- 51.15 meters
SAN PEDRO de MACORIS,
DOM. REP.
12 n.-2, 6:30-9 p.m.

5853 kc. WOB
-C- 51.26 meters
LAWRENCEVILLE, N. J.
Calls Bermuda, nights

5850 kc. ★YV5RMO
-B- 51.28 meters
CALLE REGISTRO, LAS DELICIAS APARTADO de CORRES 214
MARACAIBO, VENEZUELA
11 a.m.-12:30 p.m., 5-9:30 p.m.

5830 kc. ★TIGPH
-B- 51.5 meters
ALMA TICA,
APARTADO 800,
SAN JOSE, COSTA RICA
11 a.m.-1 p.m., 6-10 p.m.,
Relays TIX 9-10 p.m.

5800 kc. ★YV2RC
-B- 51.72 meters
RADIO CARACAS
CARACAS, VENEZUELA
Sun. 8:30 a.m.-10:30 p.m.
Daily 11 a.m.-1:30 p.m., 4-9:30 p.m.

5790 kc. JVU
-C- 51.81 meters
NAZAKI, JAPAN

5780 kc. OAX4D
-B- 51.9 meters
P.O. Box 853
LIMA, PERU
Mon., Wed. & Sat. 9-11:30 p.m.

5770 kc. HJ4ABD
-B- 51.99 meters
LA VOZ CATIA,
MEDELLIN, COLOMBIA
8-11:30 p.m.

5720 kc. YV10RSC
-B- 52.45 meters
"LA VOZ de TACHIRA,"
SAN CRISTOBAL,
VENEZUELA
6-11:30 p.m.

5713 kc. TGS
-B- 52.51 meters
GUATEMALA CITY, GUAT.
Wed., Thurs. and Sun. 6-9 p.m.

5500 kc. TI5HH
-B- 54.55 meters
SAN RAMON, COSTA RICA
Irregularly 3:30-4, 8-11:30 p.m.

5145 kc. PMY
-B- 58.31 meters
BANDOENG, JAVA
5:30-11 a.m.

5077 kc. WCN
-C- 59.08 meters
LAWRENCEVILLE, N. J.
Phones England irregularly

5025 kc. ZFA
-C- 59.7 meters
HAMILTON, BERMUDA
Calls U.S.A., nights

5000 kc. TFL
-C- 60 meters
REYKJAVIK, ICELAND
Calls London at night
Also broadcasts irregularly

4975 kc. GBC
-C- 60.30 meters
RUGBY, ENGLAND
Calls Ships, late at night

4820 kc. GDW
-C- 62.24 meters
RUGBY, ENGLAND
Calls N.Y.C., late at night

4790 kc. VE9BK
-BX- 62.63 meters
RADIO SALES SERVICE,
LTD., 780 BEATTY ST., VANCOUVER, B.C., CAN.
Daily exc. Sun. 11:30-11:45 a.m., 3-3:15, 8-8:15 p.m.

4752 kc. WOO
-C- 63.1 meters
OCEAN GATE, N. J.
Calls ships irregularly

4600 kc. HC2ET
-B- 65.22 meters
Apartado 249
GUAYAQUIL, ECUADOR
Wed., Sat., 9:15-11 p.m.

4320 kc. GDB
-C- 69.44 meters
RUGBY, ENGLAND
Tests, 8-11 p. m.

4273 kc. RV15
-B- 70.20 meters
KHABAROVSK, SIBERIA,
U. S. S. R.
Daily, 3-9 a.m.

4272 kc. WOO
-C- 70.22 meters
OCEAN GATE, N. J.
Calls ships irregularly

4098 kc. WND
-C- 73.21 meters
HIALEAH, FLORIDA
Calls Bahama Isles

4002 kc. CT2AJ
-B- 74.95 meters
PONTA DELGADA,
SAO MIGUEL, AZORES
Wed. and Sat. 5-7 p. m.

3040 kc. YDA
-B- 98.68 meters
N.I.R.O.M.
TANDJONGPRIOK, JAVA
5:30-11 a.m.

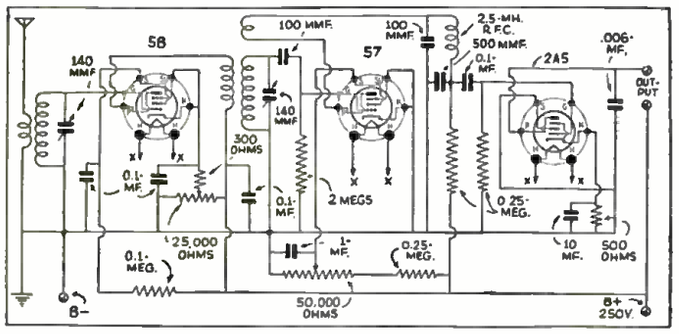
Alphabetical List of S-W Stations

By Call-Letter and Frequency

(Frequency in Megacycles)

CALL	FREQ.	CALL	FREQ.	CALL	FREQ.	CALL	FREQ.	CALL	FREQ.	CALL	FREQ.	CALL	FREQ.
CB960	9.06 mc.	FZS	18.35mc.	HIH	6.78 mc.	HSP	17.74 mc.	OER2	6.07 mc.	TPA3	11.88 mc.	W2XE	11.83 mc.
CEC	19.68	FZS2	11.99	HII	14.94	HVJ	15.12	OPL	20.04	TPA4	11.72	W2XE	6.12
CEC	15.87	GAA	20.38	HIL	6.50	HVJ	6.97	OPM	10.14	TYA	12.22	W3XAL	17.78
CEC	10.67	GAB	18.04	HIT	6.63	IAC	17.76	ORG	19.20	TYB	12.25	W3XAL	6.10
CGA3	13.29	GAD	19.48	HIX	5.98	IAC	12.80	ORK	10.33	TYF	14.64	W3XAU	9.59
CGA4	9.33	GAP	19.16	HIZ	6.32	IAC	8.38	OXY	6.06	VE9BJ	6.09	W3XAU	6.06
CHNX	6.11	GAQ	18.97	HI1A	6.19	IAC	6.65	PCJ	15.22	VE9BK	4.79	W3XL	17.31
CJA3	11.41	GAS	18.31	HI1J	5.86	IDU	13.39	PCJ	9.59	VE9CA	6.03	W4XB	6.04
CJRO	6.15	GAU	18.62	HI1S	6.42	(I)2RO	11.81	PCV	17.81	VE9CS	6.07	W8XAL	6.06
CJRX	11.72	GAW	18.20	HI3C	6.90	2RO	9.64	PDK	10.41	VE9DR	6.01	W8XK	21.54
CNR	12.83	GBA	13.99	HI3U	6.38	JVE	15.66	PDV	12.06	VIZ3	11.56	W8XK	15.21
CNR	8.04	GBB	13.59	HI4D	6.60	JVF	15.62	PHI	17.78	VK2ME	9.59	W8XK	11.87
COCD	6.13	GBC	17.08	HI4V	6.56	JVH	14.60	PHI	11.73	VK3LR	9.58	W8XK	6.14
COCH	9.43	GBC	12.78	HI5N	6.14	JVM	10.74	PLE	18.83	VK3ME	9.51	W8XWJ	31.60
COCO	6.01	GBC	8.68	HI7P	6.80	JVN	10.66	PLP	9.42	VLJ	9.76	W9XAA	11.83
COKG	6.16	GBC	4.98	HI8A	6.60	JVP	7.51	PLV	11.00	VLK	10.52	W9XAA	6.08
CO9JQ	8.67	GBL	14.65	HI9B	6.05	JVT	6.75	PMA	19.35	VLZ2	9.76	W9XBS	6.43
CO9WR	6.28	GBP	10.77	HJA3	14.94	JVU	5.79	PMC	18.14	VPD	13.08	W9XF	6.10
CP5	6.08	GBS	12.15	HJB	14.95	JYK	13.61	PMN	10.26	VP3MR	7.08	XBJQ	11.20
CQN	9.53	GBU	12.29	HJN	5.97	JYR	7.88	PMY	5.15	VQ7LO	6.08	XEBT	5.99
CRCX	6.09	GBW	14.44	HJU	9.70	JYS	9.84	PNI	8.78	VRR4	11.60	XECR	7.38
CSL	6.15	GCA	9.71	HJ1ABB	6.45	JYT	15.76	PPU	19.25	VUB	9.57	XEFT	6.12
CT1AA	9.65	GCB	9.28	HJ1ABC	6.0	KAY	14.98	PRADO	6.62	VUC	6.11	XEME	8.19
CT1GO	12.40	GCI	8.73	HJ1ABD	7.28	KAZ	9.99	PRA8	6.04	VWY	8.98	XEUW	6.02
CT2AJ	4.00	GCJ	13.42	HJ1ABE	9.55	KEE	7.72	PRF5	9.50	VWY2	17.51	XEVI	5.98
DAF	12.33	GCQ	8.76	HJ1ABG	6.04	KEJ	9.01	PSA	21.08	WCN	5.08	XEXA	6.18
DAF	8.77	GCS	9.02	HJ1ABJ	6.01	KEL	6.86	PSD	15.07	WKA	21.06	XGM	17.65
DFB	17.52	GCU	9.95	HJ1ABK	7.07	KES	10.41	PSF	14.96	WKF	19.22	XGOX	9.49
DGU	9.650	GCW	9.79	HJ2ABA	6.18	KIO	11.68	PSH	10.22	WKK	21.42	XGW	10.42
DJA	9.560	GDB	4.32	HJ2ABC	5.98	KKH	7.52	PSK	8.19	WKN	19.82	YBG	10.43
DJB	15.20	GDS	6.91	HJ2ABD	5.98	KKR	15.46	RIM	15.25	WLA	18.34	YDA	6.04
DJC	6.02	GDW	4.82	HJ3ABD	6.05	KKZ	13.69	RIM	7.63	WLK	16.27	YDA	3.04
DJD	11.77	GSB	9.51	HJ3ABF	6.17	KTO	16.24	RIO	10.17	WMA	13.39	YDB	9.62
DJE	17.76	GSC	9.58	HJ3ABH	6.01	KWO	15.42	RIR	10.08	WMF	14.47	YDB	11.86
DJL	15.11	GSD	11.75	HJ3ABX	6.13	KWU	15.36	RKI	15.09	WMN	14.59	YNA	14.49
DJM	6.08	GSE	11.86	HJ4ABA	11.81	KWV	10.84	RKI	7.50	WNA	9.17	YNLF	6.45
DJN	9.54	GSF	15.14	HJ4ABB	6.11	KWX	7.61	RNE	12.0	WNB	10.68	YVC	13.35
DJO	11.8	GSG	17.79	HJ4ABC	6.45	LKJ1	9.53	RV15	4.27	WNC	15.06	YVQ	6.67
DJP	11.86	GSH	21.47	HJ4ABC	6.07	LRU	15.29	SPW	13.64	WND	4.10	YVR	18.30
DJQ	15.28	GSI	15.26	HJ4ABD	5.77	LRX	9.58	SUV	10.06	WOA	6.76	YVR	9.15
DJR	15.34	GSJ	21.53	HJ4ABE	5.93	LSF	19.60	SUX	7.86	WOB	5.85	YV2RC	5.80
DJT	15.36	GSN	11.82	HJ4ABL	6.06	LSG	19.90	SUZ	13.82	WOF	14.47	YV3RC	6.16
DZA	9.68	GSO	15.18	HJ4ABP	9.60	LSI	9.80	TFJ	12.24	WOG	16.27	YV4RC	6.38
DZB	10.04	GSP	15.31	HJ5ABC	6.15	LSK3	10.25	TFK	9.06	WOK	10.55	YV5RMO	5.85
DZC	10.29	HAS3	15.37	HJ5ABD	6.50	LSL	15.81	TFL	6.0	WON	9.87	YV6RV	6.52
DZE	12.13	HAT4	9.13	HKB	9.93	LSL2	10.30	TGF	14.49	WOO	17.62	YV8RB	5.88
DZH	14.46	HBJ	14.54	HKE	7.10	LSM2	14.50	TGS	5.71	WOO	12.84	YV9RC	7.83
EAQ	9.86	HBL	9.60	HKV	8.80	LSN	9.89	TGWA	9.45	WOO	8.56	YV10RSC	5.72
EDM	20.86	HBP	7.80	HPF	14.49	LSN	11.53	TGXA	6.13	WOO	4.75	YV12RM	6.30
EDM	10.07	HCETC	6.98	HP5B	6.03	LSN5	19.65	TG2X	5.94	WOO	4.27	ZBW	8.75
EHY	20.86	HCJB	8.21	HP5F	6.08	LSN6	21.02	TIEP	6.71	W1XAL	15.25	ZFA	5.03
EHY	10.07	HCK	5.89	HP5J	9.59	LSX	10.35	TIGPH	5.83	W1XAL	11.79	ZFB	10.06
ETA	18.27	HC2AT	8.40	HP5K	6.01	LSY	20.70	TIPG	6.41	W1XAL	6.04	ZGE	6.13
ETB	11.96	HC2ET	4.60	HRD	6.24	LSY3	18.12	TIR	14.49	W1XK	9.57	ZHI	6.02
ETD	7.62	HC2JSB	7.85	HRF	14.49	LZA	14.97	TIRCC	6.55	W2XAD	15.33	ZHJ	7.63
FTA	11.94	HC2RL	6.66	HRL5	14.49	OAX4D	5.78	TI5HH	5.50	W2XAF	9.53	ZLT2	7.39
FTK	15.88	HC2TC	7.98	HRN	5.88	OAX4G	6.23	TI6OW	6.85	W2XE	21.52	ZLT4	11.05
FTM	19.36	HH2S	5.91	HRP1	7.03	OCI	18.68	TI8WS	7.55	W2XE	17.76	ZSS	18.89
FTO	18.25	HH3W	9.60	HS8PJ	10.96	OCI	10.97	TPA2	15.25	W2XE	15.27	ZTJ	6.10
FZR3	16.23	HIG	6.28	HSJ	10.17	OCJ2	14.85						

• • • Short Wave



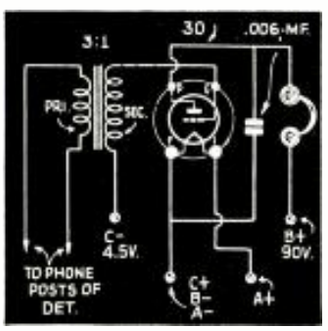
3-Tube receiver using 58, 57, and 2A5.

3-TUBE RECEIVER

Seymour Levine, B'klyn, N. Y.

(Q) I intend building a receiver using a 58 as a radio frequency amplifier, a 57 as regenerative detector, and with a 2A5 audio amplifier. I would appreciate it very much if you would print the diagram showing the proper connections and the values of all parts required.

(A) The diagram using 57, 58, and 2A5 is shown. This set will operate a speaker on some of the stronger stations, but for full speaker volume a 56 should be connected between the 2A5 and the 57 detector.



Type 30 audio amplifier.

AMPLIFIER FOR 1-TUBE RECEIVER

Will Rogers, Minneapolis, Minn.

(Q) If possible, I would like to add another tube, an audio amplifier, to the 1-tube receiver which I already have. This receiver uses a type 30 as a detector. Would you be kind enough to print the necessary wiring diagram?

(A) We are showing a diagram of a type 30 which may be transformer-coupled to your present receiver. The primary terminals of the 3 to 1 audio transformer connect to the terminals of the 1-tube set, which were formerly used as the earphone connections. This should give a considerable increase in volume.

VOLUME CONTROL

Hans Martin, B'klyn, N. Y.

(Q) I would like to know where I could connect a volume control to a 1-tube receiver.

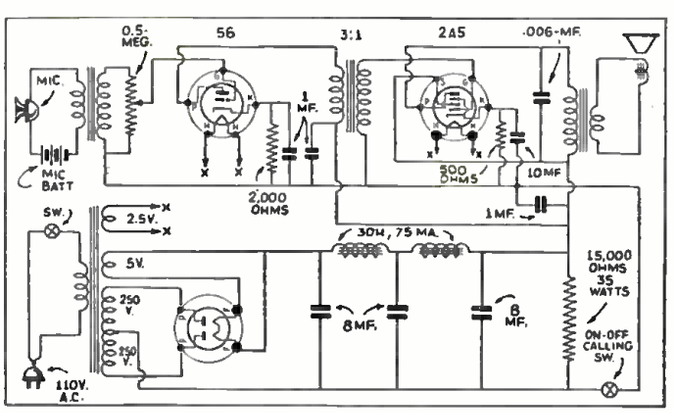
(A) We do not believe a volume control is necessary on a 1-tube set, for remember *a volume control only cuts volume down from the maximum obtainable amount*, and does not increase volume. In other words, a volume control is merely an *attenuator*.

P. A. CALLING SYSTEM

Richard Sweeney, San Leando, Calif.

(Q) I would like to construct an amplifier system which can be used in an office for calling various members of the staff to the telephone. I would like to use two tubes and a rectifier, if necessary. I intend operating this from 110 volts A.C. and want to use a single-button microphone.

(A) The diagram published uses a 56 and a 2A5 with an 80 in the power supply. Sufficient volume should be obtained to operate a dynamic speaker. A volume control is also incorporated in the first stage of amplification in order that the amplifier may be adjusted to the desired *level*. In the B negative circuit we have incorporated an *on-and-off* switch which is independent of the primary switch. This B negative switch is used for putting the amplifier into operation.



Inter-office calling system.

CONVERTING TERMS

Homer Hartley, Morgantown, W. Va.

(Q) Would you please explain how ohms may be converted to megohms and mf. to mmf.

(A) One megohm is a million ohms; .5 megohm will naturally be ½ million. The number being too large to write, it is designated as a decimal or part of a megohm. 1/10th megohm is 100,000 ohms, etc. If we had a condenser value indicated as 100 mmf. we merely place a decimal six places to the left of this number. We would then have a .000100 or .0001 mf. Zeros to the right of the number are, of course, of no consequence. The reverse procedure is followed in converting the decimal back into a whole number. Moving the decimal six places to the right we again have 100 mmf.

IMPROVING THE "DOERLE"

Robert Marshall, New Bedford, Mass.

(Q) I have constructed the "Doerle" receiver using a 57 and a 2A5. However, I would like to obtain more volume, and would appreciate it very much if you would print a diagram of the same receiver using a 57, 56, and 2A5. I would also like to know if this receiver would be satisfactory for 10-meter operation.

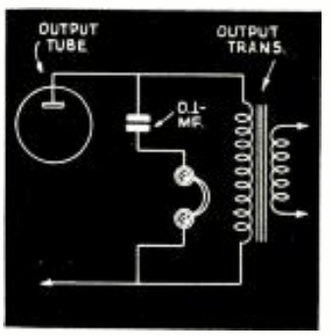
(A) We have shown the Doerle circuit with the addition of a "56" first stage of audio amplification, but we do not think that you will obtain very good results on 10 meters. Past experiences have shown that a good super-heterodyne is necessary on the 10-meter band, unless you are only interested in local police calls, etc.

CONNECTING EARPHONES TO COMMERCIAL ALL-WAVE RECEIVERS

Gerald Grandmaison, Salem, Mass.

(Q) I have a commercial all-wave receiver and would like to know if there is any simple method by which I may connect earphones to it. If so, will you be kind enough to print the diagram in the *"Question Box?"*

(A) We are showing a diagram of one method of connecting earphones to the output amplifier of any receiver. Merely connect a .1 mf. condenser in series with a pair of earphones. Then one side of the condenser is connected to the plate of the output tube and the other connection of the earphone to the B plus or B negative. It is advisable to use a high voltage condenser, something having a working voltage of from 600 to 1,000 volts, in order that no damage will be done to the earphones due to break down of the condenser.



Connecting earphones to output tube.

WHICH ANTENNA IS BEST?

William Owens, Bangor, Pa.

(Q) I would like to know the diameter of the coil form used in the article, *"Which Short-Wave Aerial is Best?"* Also, can the Marconi type antenna be longer than 75 feet?

(A) The coil form has a diameter of approximately 2½". The 75 foot length for the Marconi antenna will give best results; we do not recommend that you change the size.

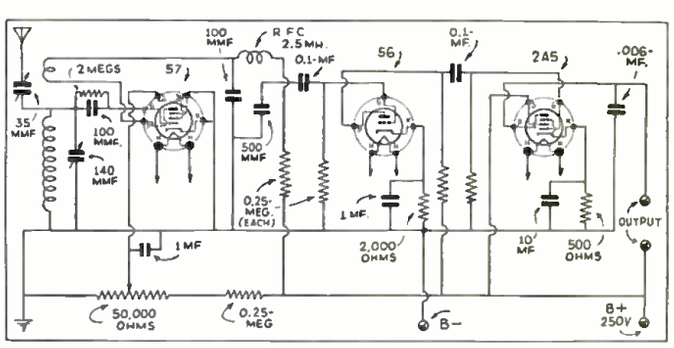
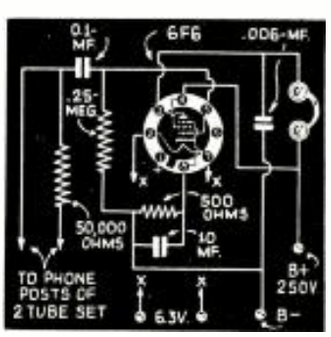


Diagram of 3-tube set using 57, 56, and 2A5.

METAL TUBE AMPLIFIER

John Rose, W. Toledo, Ohio

(Q) I built the 2-tube metal receiver described by Harry D. Hooton on Page 718 of the April, 1936 issue, and would now like to add a pentode amplifier using a metal tube. Please publish the diagram in the *"Question Box."*



Pentode amplifier using metal tube.

QUESTION BOX

EDITED BY GEORGE W. SHUART, W2AMN

● Because the amount of work involved in the drawing of diagrams and the compilation of data, we are forced to charge 25c each for letters that are answered directly through the mail. This fee includes only hand-drawn schematic drawings. We cannot furnish "picture-layouts" or "full-sized" working drawings. Letters not accompanied by 25c will be answered in turn on this page. The 25c remittance may be made in the form of stamps, coin or money order.

Special problems involving considerable research will be quoted upon request. We cannot offer opinions as to the relative merits of commercial instruments.

Correspondents are requested to write or print their names and addresses clearly. Hundreds of letters remain unanswered because of incomplete or illegible addresses.

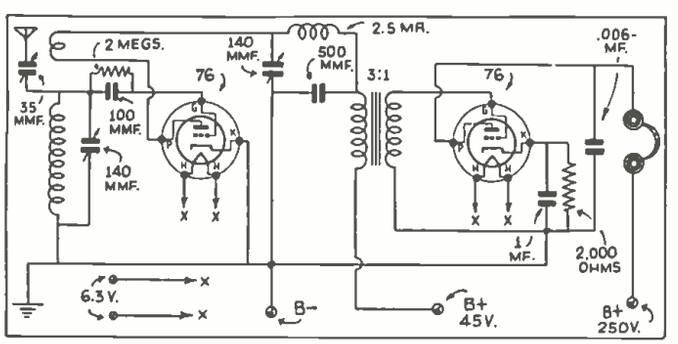
(A) The addition of a 6F6 pentode amplifier to the 2-tube receiver should be a profitable undertaking in so far as results are concerned. The diagram is clearly shown. The two input terminals of the amplifier connect to the earphone posts of the 2-tuber.

2-TUBE SET USING 76's

J. Bailey, Pittsburgh, Pa.

(Q) Would you be kind enough to print a diagram of a short-wave receiver using one 76 as a detector, regenerative, of course, and another 76 as a transformer coupled audio amplifier. This should use regular two-winding plug-in coils which were illustrated in the January, 1936 *"Question Box."*

(A) The diagram you requested is given and it should make an excellent short-wave receiver. It is advisable to try different voltages on the plate of the detector in order to determine what voltage would give maximum sensitivity and smooth regeneration with the particular coils used.



2-tuber using type 76's.

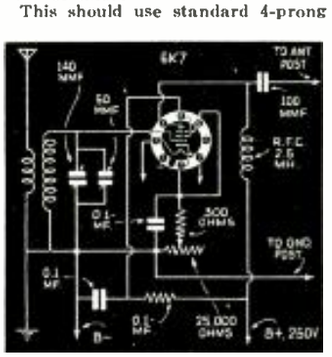
AMPLIFIER FOR METAL TUBE 2

Rudie Bartel, Comfort, Texas.

(Q) I would greatly appreciate it if you would print a diagram of a 6K7 T.R.F. amplifier which can be added to the "Metal Tube 2" receiver, described in the September issue of *Short Wave Craft*.

This should use standard 4-prong plug-in coils and a 140 mmf. condenser, which I want to gang with the detector condenser.

(A) The addition of an R.F. stage should greatly improve the performance of the receiver mentioned above. If the two condensers are ganged a trimmer having a capacity of approximately 50 mmf. or larger, should be connected across the R.F. tuning condenser, in order to compensate for discrepancies in the circuit.



Rf. amplifier using a metal tube.

"2 EQUALS 3" DIAGRAM

Carl Smetka, Owosso, Mich.

(Q) Will you publish in one of the coming issues of the *"Question Box"* a diagram of a 2-tube receiver employing 6.3 volt tubes and 4-prong, two-winding plug-in coils? The tubes which I prefer are a 6F7 used as a regenerative detector, and one stage of audio amplification and a 37 as an audio amplifier forming the second stage. The regeneration control should be in the screen-grid circuit.

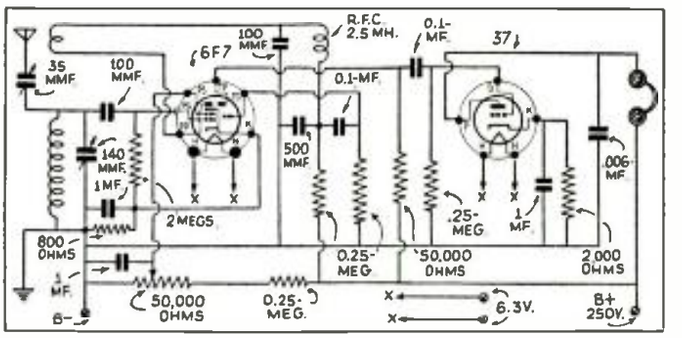
(A) The combination of a 6F7 and 76 makes a very excellent receiver. In it we really have a regenerative pentode detector, with two stages of resistance-coupled audio amplification, all with two tubes. Regeneration, as requested, is controlled by varying the screen-grid voltage.

HOW TO GET VERIS

Ray Ward, Chicago, Ill.

(Q) Would you please tell me how I may obtain verification cards from short-wave stations that I receive on my radio? Also, kindly point out the correct procedure in the coming issue of the *"Question Box."*

(A) Many of our readers have expressed the desire to obtain information regarding requests for veris. It is a very simple procedure. Merely make note of the time, date, and character of the program received, together with any other information which you feel may be of interest to the operators of the station, and send this to them accompanied by an *International Postal Reply Coupon.* Of course, there are a few stations which do not issue verification cards.



6F7 and 37 used as detector and two A.F.

METAL TUBE 1-TUBER

George McEvenue, Ontario, Canada

(Q) I contemplate building a receiver using one metal tube. I do not know just which type tube will give best performance, and I trust that you will publish the necessary information in the coming issue of the *"Question Box."*

(A) There are two tubes which will serve very nicely as a regenerative detector when working into a pair of earphones. They are the 6F5 and the 6C5. The 6F5 is the high-mu tube, and the 6C5 is the low-mu tube. Regeneration is controlled by a 140 mmf. throttle condenser.

A.C.-D.C. PRE-SELECTOR

W. E. Skutt, B'klyn. N. Y.

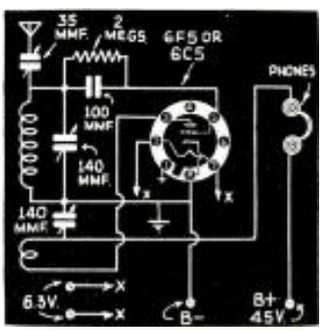
(Q) Kindly print a diagram of a 3-tube pre-selector using two 6D's and a 2A5 as a rectifier. This should be a self-powered amplifier which may be connected to the input antenna and ground posts of any short-wave receiver.

(A) A 2-stage pre-selector of this type will present a tremendous increase in sensitivity. As shown, the two tuning condensers are operated separately. If they are ganged, then a trimming condenser having a capacity of around 50 mmf. should be connected across the 140 mmf. tuning condenser in the first stage. That is the stage immediately following the antenna.

REDUCING VOLTAGE

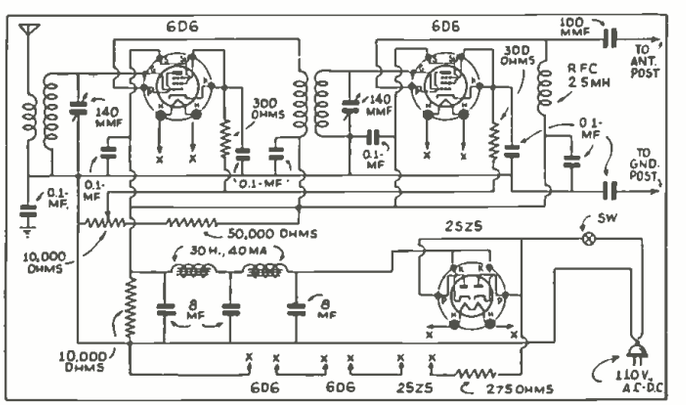
W. M. Warren, Wichita, Kansas.

(Q) I have a 600 volt power supply and would like to reduce it to 400 volts in order to operate 53's in class B. I am informed that a resistor will not work properly. What must I do to reduce the plate voltage when the filaments are to be taken from the same transformers.



1-tube receiver using a 6C5 or 6F7 metal tube.

(A) If you wish to sacrifice the filament windings on this transformer you may use a small step-down transformer ahead of a 600 volt transformer. However, it would be more economical to obtain another 250 volt transformer. Any resistance unit used to reduce the voltage will give very poor regulation.



2-stage pre-selector operates from either A.C. or D.C.

Amateur Radio Station, W8FRC

Gerald D. Coleman, Johnstown, Pa., owner and operator was awarded our "Silver Trophy" for his work in Johnstown Flood.

Gerald D. Coleman, taken while on U.S.N.R. training duty, at Philadelphia Navy Yard.

● THE "Ham" shack is a room 9 by 12 ft. in size and located on the second floor. The radio room is more like a studio and a transmitting room combined—in fact the folks in the neighborhood think it is too nice to be called a "SHACK."

The walls, newly papered, are free of QSL cards and, except for a U.S. and World map and several pictures, are without adornment. The woodwork is painted Ivory. One side of the room is taken up by a large studio couch to take care of visitors or the operator, in case he tires during the operation of the station.

The operating position consists of a large flat-top office desk on which is a Scott 12 tube Allwave receiver—key and microphone. The switches and controls on the *transmitter* are accessible from the operating position, without resorting to remote control equipment.

The transmitter frame is made of hardwood, now six years old, and the panel is made of prestwood. (Lack of funds has kept W8FRC from being rebuilt on metal.) The rig is six feet high and twenty-one inches wide. The entire rig is built so that it uses the six shelves without crowding.

The bottom shelf or number six contains four large "B" batteries used to bias the tubes. Shelf five holds a 500 volt supply for the buffer stage and power supply for speech and modulators. Number four contains two power supplies—one 750 volt supply for final class "C" amplifier—the other 300 volt supply for the crystal oscillator stage. On shelf three we have the speech amplifier and class "B" modulation equipment. On this same shelf we have a "beat-oscillator" and its power-supply, used in conjunction with the Scott receiver, in order that cw may be copied. Shelf two holds the crystal oscillator and the intermediate amplifier, while shelf one contains the final R.F. amplifier.

The crystal oscillator uses a type 59 in a tri-tet circuit—the buffer is a 46 and the first class "C" amplifier uses two type 10's, with an input of 70 watts on phone and 100 watts on cw. The antenna system is a Zepp type, with 132 foot flat-top and 45 foot feeders.

W8FRC, since its inception, has operated almost entirely on 80 meters, using cw telegraphy. The frequency used has been 3610 kcs—this frequency is used by members of the U. S. Naval Communication Reserve in the Fourth Naval District. During the Johnstown Flood of 1936, W8FRC operated phone on 3908 kcs. in order to give "news" and expedite the transmission of messages to the outside world. It might be well to mention that the naval reserve frequency was guarded by W8DYY, who lives but two blocks from W8FRC.

The Transmitter at W8FRC. Larger Triplett meters have been added since this photo was taken

New Electronic Eye Tester and Tuning Indicator

By K. Phelan

● SHORT WAVE fans and experimenters will welcome this new *Test-All* Device. This new unit employs the latest 6E5 electron ray tuning indicator combined in a novel circuit with a 6H6 double diode and a 6C5 super triode.

The new Cisin device has a self-contained power supply and operates equally well on a.c. or d.c. When powered from an a.c. source, rectification is accomplished by means of the 6C5 tube. The 6H6 tube also functions as a rectifier, but in this circuit serves to convert incoming (input) a.c. to direct current, so that a d.c. voltage will be applied to the grid of the 6E5 indicator tube.

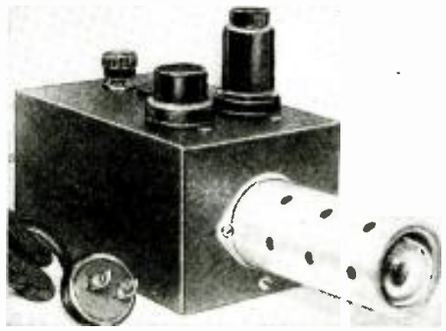
While primarily designed to help the short wave listener to tune in more distant stations with his present equipment, the new device is undoubtedly one of the most versatile devices ever devised for general radio test work.

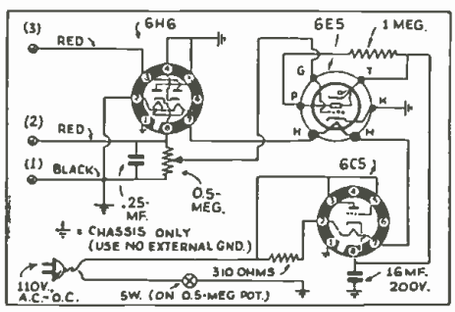
The "Test-All" can be used to supply a quick and effective test of the antenna system, indicating leakage or the presence of grounds.

It is very easy to assemble and wire the new tester. The entire device is mounted in a small metal cabinet as shown in the illustration, with the 6C5 and the 6H6 tubes on top, and the 6E5 tube at the front. An aluminum shield is placed over the 6E5 to protect the color screen from light penetration. The sensitivity control potentiometer and the three pin jacks are also mounted on the front of the cabinet. The "on-off" switch is combined with the potentiometer. The filaments of all three tubes are connected in series—also being in series with a 310 ohm resistor contained in the line cord. The new testing instrument operates on A.C. or D.C. and the negative leg of the tip-jack (black) is always "hot" with respect to incoming voltages. When the "eye" glows green, the negative (black) pin jack is on the grounded side of the device. To use the instrument as a tuning indicator, attach the leads from terminals (1) and (3) to the voice coil of the speaker and also connect the (1) terminal to chassis ground at the same time. The 6H6 tube changes the fluctuating voice coil current to d.c. so that the 6E5 tube will then show an increase or decrease of speaker volume by the expansion or contraction of the moving shadow portion of the "eye."

This device may be used as an output meter to measure a.c. and d.c. peak voltages, also to make tests of audio circuits, filter circuits, power packs and a.v.c. circuits. It is invaluable for lining up individual r.f. and i.f. stages; also for calibrating signal generators and measuring signal generator output.

This article has been prepared from data supplied by courtesy of Allied Engineering Institute.





Appearance and hook-up of Tester

Book Review

PRACTICAL RADIO COMMUNICATION, by Arthur R. Nilson and J. L. Hornung. Size 6¼" by 9", 754 pages, over 400 illustrations, durably bound in flexible blue cloth with blue edges on pages. Published by McGraw-Hill Book Co., New York; price $5.00.

It almost seems like a platitude to say that this fine new book on radio communication, which includes short-wave and ultra-short wave sections, should be on every radio student's bookshelf—but the reviewer, who has been constantly on the lookout for a really good, complete book on radio, feels that no real student of the subject can afford to be without this work.

The authors, both of whom have had a broad radio experience professionally, have covered the subject in a most excellent manner. The opening chapter deals with direct current electricity and magnetism. The treatment is surprisingly complete and new angles such as magnetostriction, etc., are discussed. The second chapter deals with alternating currents in a refreshing manner and everything is so well explained that the student can understand the text very easily with the help of the excellent diagrams.

The section dealing with the vacuum tube is exceptionally well handled and just what happens in the various forms of oscillatory circuits, including transmitting circuits, are discussed and illustrated thoroughly. Later chapters deal with antennas and wave propagation and cover all of the well-known as well as the latest types of antennas.

Other subjects covered are: Broadcast studio acoustics, transcription apparatus, control-room equipment and operation, broadcast transmitters—with diagrams, communication transmitters, commercial receivers, radio aids to navigation, rectifier units, dynamo-electric machinery and meters—including motor-generators and control apparatus. The final chapter is a very complete one on storage batteries.

A very useful appendix is found at the end of the volume.

Eilen

RX-14

6-tube Band-spread Receiver

8½ to 600 meters

OUR LARGEST, FINEST, AND MOST SENSITIVE SHORT WAVE RECEIVER which WILL satisfy even the most discriminating SW fan. Uses two 6D6, two 76, one 42, and one 5Y3 hi-gain tubes as TUNED RF amplifier, TUNED electron coupled screen grid regenerative detector, POWERFUL 3 stage audio amplifier, HUM-FREE full wave rectifier and built-in power supply. Operates from your AC house current.

POWERFUL hi-quality audio system delivering 3 watts of power to the built-in hi-fidelity dynamic loudspeaker—automatic headphone jack—smooth regeneration and volume controls—connections for doublet or single wire antenna—black shrivel finished metal chassis and cabinet of extreme beauty—selectivity, sensitivity, and volume that will amaze you. PRICE, complete with 6 tubes, 8 coils, cabinet, speaker, wired, less B.C. coils, ready to use..... **$21.95**

(2 Broadcast band coils, extra $1.45)

RX-14 KIT of necessary parts, including 8 low-loss coils for 8½ to 200 meters, and simple instructions, (less cabinet, tubes, and BC coils, unwired) $14.95

Beautiful, heavy steel cabinet, extra $2.50

6 MATCHED ARCTURUS tubes $2.95

SPECIAL

Complete kit, cabinet, tubes, speaker, and detailed instructions, less B.C. coils, unwired..... **$19.95**

Labor for wiring and testing, extra 2.00

Broadcast band coils (2), extra 1.45

If METAL TUBES are preferred over the glass type, add $1 to price.

RX-14B: Battery model of RX-14. Subtract $1 from above price (less batteries).

AMATEURS:

Model RX-14-AB COMMUNICATIONS RECEIVER has same specifications as RX-14 except that it is equipped with special coils for the 20-40-80-160 M bands which spread these bands over a generous portion of the tuning dial. Also equipped with plate voltage cut-off switch for use during transmitting periods. An ideal receiver for amateur communications work. Add $1 to price of RX-14.

Eilen

BS-5

5-Tube Band switch Receiver

9½ to 600 meters

A powerful, sensitive, and selective SW receiver covering the entire wavelength span of 9½ to 600 meters in 5 steps. NO PLUG-IN COILS are used. Simply turn the waveband selector switch and enjoy reception on any wavelength within this range.

Uses two 6D6, one 76, one 43, and one 25Z5 tubes as RF amplifier, electron coupled screen grid regenerative detector, powerful 2 stage audio amplifier with pentode output stage, rectifier, and complete built-in power supply.

HUM-FREE—Hi-fidelity dynamic loudspeaker—illuminated, airplane type vernier dial—band spread tuning control—automatic headphone jack—extremely smooth acting controls—operates from your AC or DC house current—beautiful, heavy, black shrivel finish chassis and cabinet.

DELIVERS GREAT LOUDSPEAKER VOLUME ON THE GREAT MAJORITY OF SHORT WAVE FOREIGN STATIONS UNDER FAIR CONDITIONS.

PRICE, complete with 5 tubes, cabinet, speaker, wired, ready to use..... **$16.95**

BS-5 KIT, of necessary parts, including speaker and detailed instructions, less tubes, cabinet, unwired..... **$10.95**

Beautiful, black shrivel finish metal cabinet, extra $2.00

Set of 5 MATCHED Arcturus tubes, extra.. 2.50

SPECIAL: Complete kit, cabinet, tubes and instructions, unwired..... **$14.95**

Labor for wiring and testing, extra $2.00

(If metal tubes are preferred to glass type, add $1)

AMATEURS:

Model BS-5-AB has same specifications as BS-5 except that it has special bandspread circuit for 20-40-80-160 M bands and is equipped with plate voltage cut-off switch. Add $1.00 to above price.

Eilen

3A 3-Tube SW Receiver

9½ to 600 meters

A simple and efficient short wave model, inexpensive in price but a wizard in performance. Uses three tubes in a special ultra-sensitive regenerative circuit with one stage of audio amplification and complete built-in power supply.

- Vernier dial for easy tuning.
- Good volume on all stations.
- Small, compact, and light in weight.
- Operates from your AC or DC house current.
- Black, crackle finish metal chassis, panel, & cabinet.

Eilen 3A KIT, of necessary parts, including coils for 9½ to 200 meters, and simple instructions, less cabinet, tubes, B.C. coils, unwired..... **$4.95**

Beautiful, crackle finish cabinet, extra..... $1.25

Set of MATCHED tubes, extra..... 1.14

SPECIAL: Complete kit, cabinet, tubes, and instructions, less B.C. coils, unwired.. **$7.25**

Labor for wiring and testing, extra..... $1.50

2 Broadcast band coils, extra..... 1.25

MODEL 3B 3-TUBE BATTERY OPERATED RECEIVER
9½ to 600 meters
AN IDEAL SUMMER PORTABLE

Same specifications as model 3A except that it uses 3 of the 2 volt battery operated tubes in a highly efficient circuit as regenerative detector and 2 stage audio amplifier. The cabinet of this model is equipped with a special leather carrying strap enabling the unit to be used as a portable. Same price as 3A.

Eilen

HF-4 4-Tube 2½ to 15 Meter

combination Receiver-Transmitter

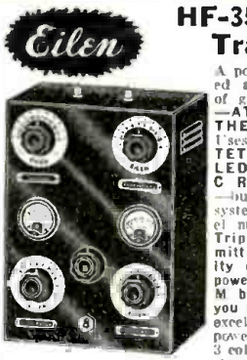
An ultra-high frequency receiver designed to give full loudspeaker volume on stations operating on wavelengths between 2½ & 15 meters. Uses two 76, one 38, and one 80 tubes as ultra sensitive super regenerative detector, powerful 2 stage audio amplifier, rectifier, and built in power supply. Great volume on amateurs, police stations, hi-frequency broadcast, television and experimental stations.

Illuminated, aeroplane dial—low loss silver plated inductances—headphone jack—chromium plated chassis and black shrivel finish metal cabinet. Extremely small and light in weight. Only 10"x7"x6½". Operates from AC house current.

Send—Receive switch, enabling the unit to be used as a low powered transmitter, having a range to 10 or 15 miles.

HF-4, complete with 4 tubes, cabinet, speaker, wired ready to use..... **$14.45**

KIT, of all parts including speaker, cabinet, 4 tubes and instructions, unwired $12.95.



Eilen

HF-35 3-Tube SW Transmitter

A powerful and well engineered amateur band transmitter of great beauty and efficiency—AT A PRICE WITHIN THE AMATEUR'S REACH. Uses 59-46-46 tubes as TRITET CRYSTAL CONTROLLED OSCILLATOR—CLASS C RF POWER AMPLIFIER—built-in antenna tuning system—beautiful, black shrivel metal case and shelling—Triplett meters—Eilen transmitting dials—highest quality construction—35 watts of power output on 20-40-80-160 M bands. A transmitter that you can be proud to own. An excellent exciter unit for high power stages to be added later. 3 coils for any 1 band and instructions included.

HF-35, assembled, and ready to wire (less tubes, power supply, crystal, holder and additional coils)..... **$21.95**

Matched Arcturus Tubes (3)..... $2.15

Eilen quartz crystal (80 or 160)..... $1.95

Eilen crystal holder..... 1.00

Coils for additional bands, per set..... 1.45

HV-475 1-Tube power supply for use with HF-35, less tube (ready to wire).. **$12.95**

Labor for wiring extra $1.00

83 tube for HV-475, extra 65 cents

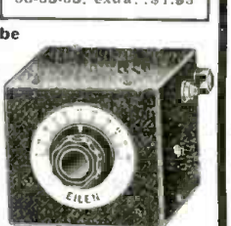
M-1S 3-Tube Modulator for use with HF-35 and capable of modulating its entire output at 100%, priced at (less tubes)..... **$14.95**

Three Arcturus tubes, 56-53-53, extra..$1.95

Eilen

HF-19 One-Tube Transceiver 5 to 10 meters

A masterpiece in simplicity! An unequalled value for the experimenter who is interested in an inexpensive transceiver which will enable him to maintain reliable 2 way communication with a friend over distances up to 5 or 10 miles. So simple that even a beginner may readily obtain remarkable results with it. Uses one type 19 (twin 2 in 1 tube) in special circuit providing great volume and signal strength. Operates from 2 dry cells and 90 to 135 volts of B battery.



HF-19 TRANSCEIVER KIT, of necessary parts, and simple instructions, less cabinet, tube, microphone, unwired..... **$3.95**

Beautiful crackle finish cabinet, extra..$1.25

Type 19 tube, extra..... .85

Wired and tested, extra..... 1.50

Microphone for above, extra..... 1.95

FREE

Large, illustrated 20 page catalogue of short wave receiver kits, transmitters, and accessories. Send stamp to cover postage and handling charges.

24 hour service. 20% deposit on C.O.D. orders

Eilen

6C SHORT WAVE 4-TUBE Receiver

A Giant In Performance

FULL 6 TUBE PERFORMANCE—POWERFUL 3 STAGE AUDIO AMPLIFIER which takes the guesswork out of so-called "loudspeaker reception."

Uses 6D6—6F7 (twin 2 in 1)—76—12A7 (twin 2 in 1) high-gain tubes as RF amplifier, screen grid regenerative detector, POWERFUL 3 stage audio amplifier with pentode output stage, rectifier and built-in hum-free power supply. Completely self-contained. Nothing else required. Operates entirely from 105 to 130 volt AC or DC light socket.

BAND SPREAD TUNING—smooth regeneration control—built-in high quality loud-speaker—automatic headphone jack—large, illuminated airplane type vernier dial—large 3 winding low-loss inductances—selectivity, sensitivity, and volume that will amaze you. Heavy black shrivel finish metal chassis and cabinet. Must be seen to be appreciated. Satisfied owners report dozens of foreign stations on loudspeaker—You may do the same under the proper conditions. ORDER YOURS TODAY! YOU'LL NEVER REGRET IT!

AMATEURS:

Model 6C-AB has same specifications as 6C except that it has special tuning circuit and coils for spreading out the 20-40-80-160 M bands over 80% of dial scale—plate voltage cutoff switch.

Add $1 to price of 6C.

6C KIT (unwired), of all necessary parts, 4 coils for 9½ to 200 meters and instructions (Less cabinet, tubes, speaker, and B.C. coils)..... **$7.45**

Beautiful cabinet..... $1.25

4 matched Arcturus tubes 3.15

Special loudspeaker..... 1.45

Broadcast band coils (2).. 1.25

SPECIAL: Complete kit, cabinet, 4 tubes loudspeaker, and one B.C. coil, (unwired).. **$12.45**

Labor for wiring and testing, extra..... $1.50

EILEN 6B or 6B-AB battery model of 6A using 34-19-30-33 tubes. Subtract $1 from price of 6C or 6C-AB.

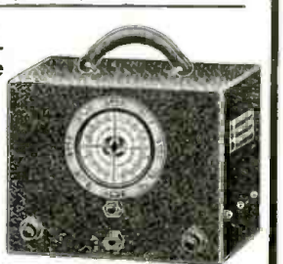
Eilen

HF-3 Three-Tube Portable Transceiver

5 and 10 meters

The ideal battery operated transceiver for the experimenter who is satisfied only WITH THE FINEST of apparatus.

Lack of space does not permit us to describe this transceiver fully. Please send for descriptive literature.



10¼"x8¼"x7¾"

EILEN RADIO LABORATORIES, Dept. SC 7, 136 LIBERTY STREET, NEW YORK, N. Y.

What's New in Short-Wave Apparatus

(*Continued from page* 150)

"B" modulator delivers ample audio power to sufficiently modulate a 10 watt carrier, with a high percentage of modulation. The modulation system is designed to work from a 200 ohm single button carbon microphone. A plug-in arrangement is provided for a power supply cable, facilitating changing from *mobile* to *fixed* station operation. All parts are of high quality and insure a long period of use and maximum efficiency and performance.

The oscillator unity-coupled tank coil is wired directly on the isolantite 6E6 tube socket plate prongs, for shortest leads possible. A bakelite extension shaft runs out to the front panel on which a nickeled Bud dial is mounted, minimizing hand-capacity effects when tuning. All wiring is done on the bottom of the chassis and R.F. leads kept as short as possible.

Two feed-through insulators are mounted on the cabinet to bring the antenna feeders or transmission to the plate tank through two mica condensers. An aluminum shield between the transmitter and receiver effectively eliminates any interaction between the units. Tuning the transmitter is simplicity itself. With the milliammeter plug in the oscillator jack, tune the transmitter dial for minimum plate current indication on the milliammeter. The oscillator current should be between 40 and 50 ma. With the milliammeter plug in the modulator jack and no speech applied to the microphone, a reading of 35 to 40 ma. should be indicated. With speech the milliammeter should kick up to about 60 to 70 milliamperes, never more, or distortion will result.

For mobile work a quarter-wave rod will suffice for an antenna. Attach the feeder to one feed-through insulator and ground the other to the cabinet. For *fixed* station in the shack, a matched impedance, two-wire feed antenna is recommended. This Duplex Transmitter and Receiver is very well adapted to mobile police work, with the proper unity coupled oscillator tank coil. The receiver operates very efficiently on the ultra high frequency police bands. There is no end to the possibilities of the portable station. It can be used on racing yachts to report the progress of the races, may be installed in motor-boats for relay work, or may be used in an airplane or at the airport to cover glider meets. This "Eagle Minuteman Duplex Transmitter and Receiver" would also make an excellent emergency station.

The unit was tried out in the author's home "shack" in the Bronx and exceptionally good results were obtained. Of course, local reports were all QSA5 R-9 plus, with good modulation and frequency stability. One particular QSO was held with W2AMJ at Bergenfield, N. J., *working duplex* and a report of QSA5 R-8 through some very heavy QRM was given to our signals. This "rig" sure goes places and in fine style. Data on various antennas may be found in back issues of *Short Wave Craft*.

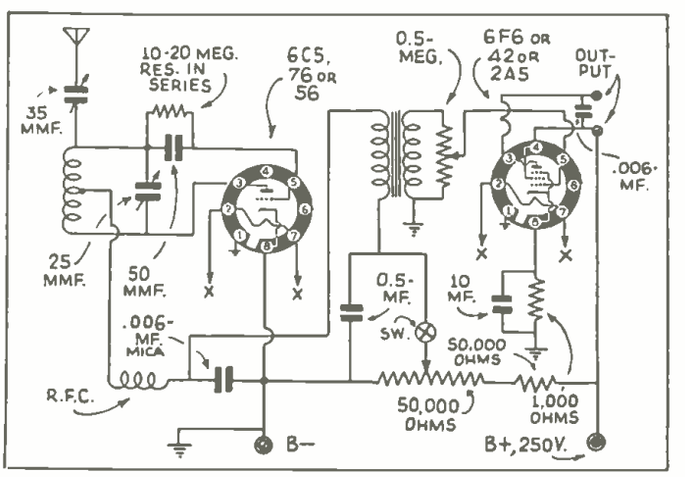
This article has been prepared from data supplied by courtesy of Eagle Radio Co.

Parts List for Transmitter

1—Unity coupled oscillator tank coil (Eagle)
1—15 mmf. variable midget condenser (Hammarlund)
2—.002 mf. mica cond.
1—5mf. 25 volt electrolytic cond.
1—500,000 ohm potentiometer with switch
1—5000 ohm 10 watt
1—500 ohm 10 watt
1—1000 ohm 1 watt
3—single-circuit closed jacks
1—Thordarson 6A6 class "B" driver audio transformer No. 6747
1—Thordarson 6A6 class "B" R.F. load output No. 6759
2—7 prong isolantite sockets
1—7 prong wafer socket
1—S. P. S. T. toggle sw.
1—Tank condenser panel
1—Bakelite shaft
1—Shaft coupling
2—Bud 2½ inch silvered dials
3—Silvered indicator plates
1—Triplett 0-150 D.C. milliammeter
1—Meter plug
1—Meter cable
4—Bar knobs
2—Feed-through insulators
2—Peewee battery clips
1—Mike battery connector
1—Power cable
1—Eagle Black crackled cabinet 17x9x8
2—Eagle Duplex transmitter chassis.

(For "Receiver" parts list, refer to page 751, April issue.)

5 Meter Super-Regenerative Receiver

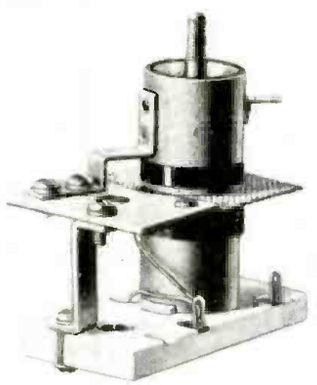


The New Hammarlund "Super Pro"

(*Continued from page* 153)

unit. For instance, in the "Super Pro" this intermediate amplifier consists of 10 tuned circuits in cascade, certainly an impractical number to control with variable tuning. The mechanical or structural separation of these two parts has, therefore, been carried out almost as completely as their electrical or functional separation.

The "Super Pro" tuning unit consists

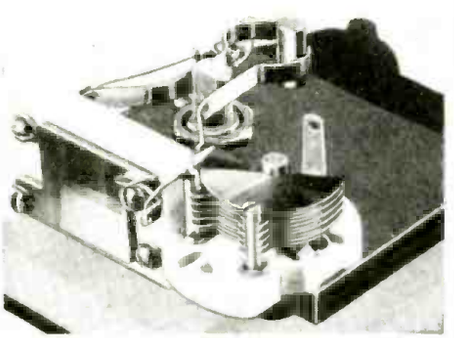


Input unit with Faraday shield.

of the band-changing switch, main tuning condensers, band-spread condensers, tuning coils, tuning dials, dial masks, and dial lamps. It is a completely enclosed rigid unit, and fits into a large rectangular cut-out in the center of the receiver chassis. Only eight leads project through rubber grommets in the sides of this unit and connect to the receiver proper.

The "Band-Change" Switch

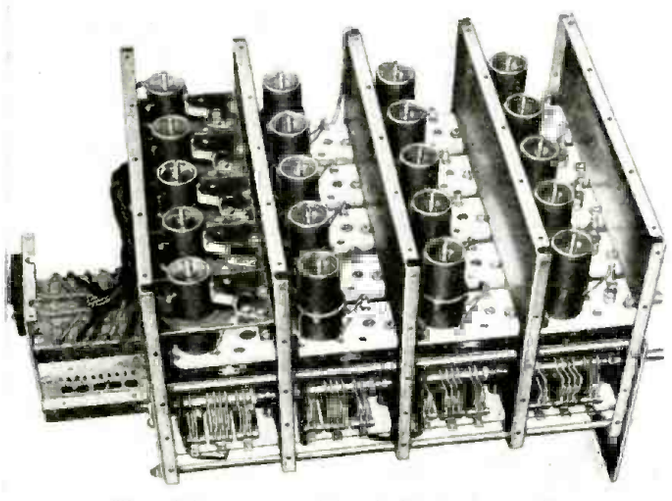
And now, for the description of the unusual band changing switch. This switch has five sections completely shielded from each other. Each section consists of a two-pole, five-position switch. The basic principle is that of the standard knife-switch which has proven so dependable. Silver-plated knives, mounted on bakelite panels, sliding in guides are raised and lowered by cams on the switch shaft. In the lower position, the knives engage pairs of contacts on the switch base, thereby closing the circuit. The base contacts are of spring bronze, silver-plated. Each has six separate contact fingers to further insure dependable low-resistance connection. This design eliminates the necessity for pigtails, wiping rotary contacts and even the pivot of the knife blade, which is probably the chief source of trouble in the standard knife-switch. Since the switch knives merely enter and leave the spring base contact, as the circuits are opened and closed, there is absolutely no "passing through" action—with its attendant wear. Consequently there is no chance to build up a conducting path of metallic particles



Close-up of crystal unit.

between contacts. Nor is it possible to drag dirt or other foreign matter into the contact. No moving part carries current to cause noise or to provide stray coupling, and the circuit isolation and shielding by the sections is remarkably perfect. Silver-plated short-circuiting springs automatically short the four spring contacts at all times. All five positions are passed through by one revolution of the switch shaft. The five contact points which are 72° apart are very definitely located by an accurate and positive detent mechanism. No stop is used, so that the switch can be continuously rotated in either direction. The timing of the cams and arrangements of contacts is such that the circuit through one set of knives is not broken until contact is made with another set. This avoids sparking in the sections which handle plate current and also prevents open grid circuits when the switch is turned.

There are 16 tubes in the receiver. There are two 6D6's in two stages of tune R.F.; a 6C6 as a high frequency oscillator, electron-coupled to the first detector; a 6A7 first detector; three 6D6's in three 465 kc. I.F. stages; a 6B7 as a combination fourth I.F. and diode second-detector; a 6C6 as a low-frequency beat-oscillator; a 6B7 for AVC; a 76 as a resistance coupled A.F.; a 42 as a Class "A" driver; two 42's as Class "AB" or "A Prime" push-pull audio output; a 5Z3 as a plate voltage rectifier; and a 1-V as a grid voltage rectifier.



The elaborate, precision-built tuning unit.

The tuning coils are mounted on individual isolantite bases, which are in turn secured to the shielded partitions of the lower half of the tuning unit. There are 25 coils in all; 5 for each of the 5 bands. In each band the input circuit consists of two coils — antenna or primary coil, and a grid or secondary coil. These two coils are effectively shielded from each other electrostatically by a Faraday screen placed between them. The transfer of energy from the antenna to the grid is thus limited to pure electro - magnetic coupling. The third and fourth coils in each band are special radio frequency transformers and the fifth is the high frequency or heterodyne oscillator coil. Each coil has a trimming capacitor mounted on its Isolantite base for circuit alignment to the high-frequency end of its range. At the low-frequency end alignment is accomplished by adjusting the inductance by means of a copper disc on an adjusting screw mounted in a friction bushing, which in turn is mounted in the top of each coil form.

This article has been prepared from data supplied by courtesy of Hammarlund Mfg. Co.

A second discussion of this interesting receiver will appear next month.

New Apparatus for the "HAM"

(*Continued from page* 152)

have illustrated the 2½ mh., 125 ma., 23 ohm, D.C. resistance receiving choke; and also the 1 mh., 500 ma., transmitting choke which has a D.C. resistance of 2.38 ohms.

Other chokes of similar construction having the following specifications are also announced. 5 mh., 125 ma., 34 ohms, D.C. resistance. 1.5 mh., 500 ma., 3.13 ohms, D.C. resistance. 4 mh., 500 ma., 5.52 ohms, D.C. resistance.

Two new rf. chokes designed for diathermy apparatus, presumably for the ultra high frequencies are also introduced. One of these has an inductance of .15 mh., 500 ma. carrying capacity, and 1.24 ohms, D.C. resistance. Another has .54 mh. inductance, 500 ma. carrying capacity, and 1.84 ohms, D.C. resistance.

Here is a complete line of chokes which cover everything for the transmitter and receiver.

POLICE CALLS, corrected to date, will appear in the next issue!

Also the "Commercial S-W Receiver" Hook-Ups department.

Details of HAM Sets That Will Flash Yacht Race News

(*Continued from page* 134)

to shore or from one boat to another.

The power supply is entirely batteries. Filaments may be lighted either from a 6-volt "Hot-Shot" or a storage battery, though the latter is preferable. Power for the plates of the oscillator and the class B modulator comes from a bank of five 45-volt heavy-duty Eveready B batteries. All connections are made through the medium of a four-wire cable permanently fastened into the chassis and emerging through a rubber grommeted hole at the back.

Only three tubes are necessary. A single 6A6 functions as a pushpull oscillator; another 6A6 operates as a class A driver for a third 6A6 which functions as a class B modulator. Due to the use of a single-button high-output mike, no speech amplification is necessary.

Extreme care has been used in insulating the RF portion of the circuits. To this end, all RF wiring is mounted on a small Victron panel set into the metal subbase. This panel measures 3x5x¼ inches thick. A hole smaller than these dimensions by ¼ inch all around was cut through the subbase and the Victron fastened over the hole. The oscillator tube socket is mounted beneath a hole drilled in the Victron, both to get the wiring below deck and to bring the top of the tube low enough to permit the lid of the box to be closed. The unity-coupled inductance, wound of 3-16 inch copper tubing, also is mounted on the Victron.

The grid coil of especially well-insulated flexible wire is threaded through the inside of the copper tubing plate coil and comes out through a drilled hole at the electrical center.

The mike transformer and the Class B input and output transformers are symmetrically arranged at the back of the subbase. The mike transformer is No. CS5, the input is No. CS29 and the output No. CS33.

Aside from the necessity of keeping all wiring leads as short as possible, there is no particular trick to wiring the rig. Use the very best grade of well-insulated flexible wire except for the R.F. where No. 14 heavily tinned is better, and see that all joints are properly soldered with an iron that is really hot. It is best practice to wire the filaments first, then the grids and lastly the plates.

Reference to the wiring diagram will reveal a little unorthodox practice in that a double-button mike transformer is used. One side of the winding is used for the single-button mike and the other side for the high-frequency buzzer. This simplifies construction.

The resistors, all of which are 10-watt noninductively wire wound Aerovox, are larger in wattage capacity than really necessary. The sockets are National Isolantite, subpanel mounted. The R.F. choke is a National type 100.

In order to put the rig in operation it is only necessary to attach the four-wire cable to the A and B supply, plug in the mike, flip a switch and talk. The high-frequency buzzer for ICW may be left "jacked" in all the time.

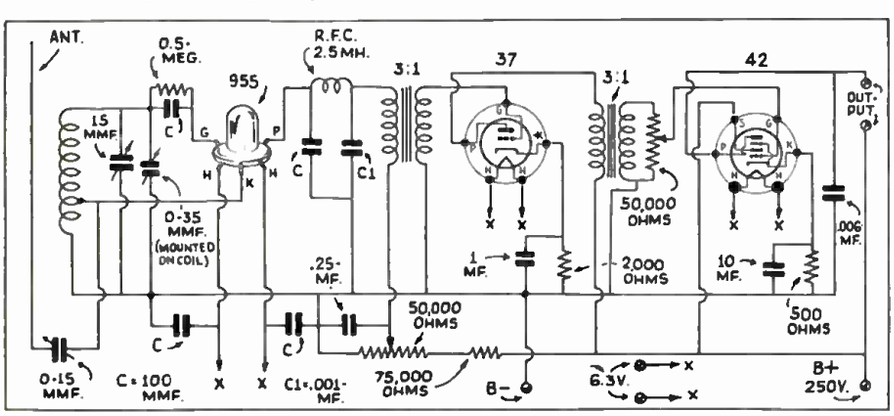
Under normal operation the rig will be run with about 20 watts input.

The antenna system was laid out with the particular object in view of giving good radiation and at the same time providing an arrangement that should not interfere in any way with the sailing equipment of the yacht. Hence, the antenna has been made a half-wave di-pole with a quarter wave matching stub, commonly known as a "J" antenna. The base of the matching stub is fed through Lynch Giant Killer cable, which may be any necessary length without introducing appreciable losses. With this arrangement the whole radiating system together with the stub and feeders may be in a perfectly straight vertical line occupying the minimum of space and out of the way of everything.

All of the engineering work on the transmitter, as well as the complete job of wiring was done by Edwin Ruth (W2GYL) head of the Technical Committee of the Garden City Radio Club. Working with him, Harry Lawson (W2IER) helped in planning the layout and did all of the mechanical work.

Parts List

2—.001 mf. fixed Mica Condensers (Aerovox).
1—UMA 15 mmf. variable condenser (National).



Hook-up of 5-Meter Super-Regenerative Receiver. Full Details Will Appear in Next Issue

(*Continued from page* 169)

3—6-prong National Isolantite Sockets.
1—0-150 Milliampere meter.
1—High frequency Buzzer.
1—National type "B" Dial.
2—Open Circuit Jacks.
1—Type R-100 National Choke.
1—1 mf. 600-volt by-pass condenser (Aerovox).
1—2 mf. 600-volt by-pass condenser (Aerovox).
2—S. P. S. T. Toggle Switches.
1—National type SW-3 Metal Cabinet with supporting shelf.
2—Chromium-plated handles.
1—5,000-ohm five-watt resistor (Electrad).
1—1,000-ohm two-watt resistor (Electrad).
1—.5 mfd. by-pass condenser.
1—.25 meghom one-watt grid-leak resistor (I. R. C.).
Six feet of four-wire shielded cable.
1—Microphone transformer. CS5.
1—Class B. input transformer. CS29.
1—Class B output transformer. CS33.
(Name of manufacturer of above transformers furnished upon receipt of stamped envelope.)

"What Interests Me Most in Short Waves"

(*Continued from page* 131)

tion of our modern system of "air-travel." Especially "blind-flying," which makes air travel possible even in adverse weather.

8. *Police Radio*—This interests me because it has become a necessary part of police systems in cities of any size, and it shows again what an important part short waves play in our everyday life.

9. *"DX" Reception*—"DX" listening had become practically a "lost art" as far as I was concerned, but short waves have revived my interest and keep it alive.

10. *"Uncertain Reception"*—This interests me very much. The fact that on certain days stations will roll in like "locals," and on other days can scarcely be heard, will always make short waves particularly interesting to me.

* * *

Second Prize Winning Letter, by Alan E. Vosburg, Jr.

● MY interest in short waves is centered about the following subjects:

1. *The construction of modern superheterodynes*—using 10 to 12 tubes of a modern type and incorporating latest circuit features, because these sets can not be beaten for sensitivity and selectivity and general dependability.

2. *Building and operating low and medium-powered transmitters.* I am going to become a licensed amateur soon and wish to have a small transmitter which will deliver the goods.

3. *Learning the code.* I wish to bring up my code speed because the majority of stations use code and it affords an element of secrecy (from the layman). Press reports can be copied hours before the broadcast stations give out the news, and while this information can not be used for your own benefit it is interesting to be "in the know" first. The R.F. spectrum also will hold about five CW stations in the same space required by one phone station.

4. *Tubes.* The developments that are made each year in tubes are amazing. New circuits which follow may greatly improve reception. Such tube circuit developments have included a.v.c., q.a.v.c., a.t.c., noise suppression, bass boosters and voltage-doublers.

5. *Antennas.* Directional and noise reducing antennas for receiving make all the difference between hearing and not hearing those elusive foreigners. Directional arrays for the higher frequency amateur bands make your signal much more effective.

6. *Portable ultra-short wave transmitters and receivers*—which have such useful applications as remote pickups, communication between parties on the move, exploring parties, and are plenty of fun for the "ham," especially if installed in his car or boat.

7. *Efficient battery-powered "strictly portable" receivers*—using two tubes. These little sets enable the ham or fan to listen in when out of town on business or other reasons. He is able to get code practice or pure enjoyment when he could not possibly have taken his big receiver with him.

8. *Portable transmitters and receivers with self-contained power-supplies*—for use by the ham in times of local emergencies such as floods, storms, fires, destruction of land-lines, etc.

9. *Construction of receivers*—using 5 to 6 up-to-date tubes, a.c. operated, t.r.f. or small superhets, equipped with band-spread, to be used for general ham communication and for the fans.

10. *Television:* In the future the ham and the experimenter are going to be responsible for some big improvements in television methods and apparatus, and because seeing the far-off fellow you are talking with will be a new thrill.

* * *

Third Prize Winning Letter, by Carl E. Swanson

● THE following ten subjects are of most interest to me:

1. *Short-Wave Future:* The very mystery of short waves themselves keeps me constantly interested and alert to progress being made in a great scientific field.

2. *Television:* The possibilities of this field in short waves rank it next to that of communication because its perfection will affect us all in our daily life.

3. *Therapeutics:* Because none of us are immune to physical suffering, the use of short waves to relieve pain and distress should command the attention of every one.

4. *Set Building:* I still enjoy building the 1, 2, and 3 tube sets and sincerely believe that from these simple circuits will come the sets we may be carrying about in the future.

5. *Short Wave Antennas:* This relatively simple device we use to intercept and release radio energy is most interesting to me as I believe we have not attained all the efficiency that further study and experimentation will bring about.

6. *Airplane Navigation:* On dark, stormy nights I thrill to the unseen hand that guides the many pilots to their ports. Short waves are a vital part to successful transportation.

7. *Amateur Radio:* As I listen to amateur bands I can't help but realize the possibilities for young men and boys to engage in a fine scientific hobby, and I, too, feel the urge to become a "ham."

8. *Foreign Radio:* The short wave programs from other countries are most interesting as we learn about our neighbors. And who knows but that these "unseen links" may bring about international peace?

9. *Weather Forecasting:* This new use of short waves may take some of the guesswork out of weather predictions and as such be a daily service to everyone.

10. *Mineral Explorations:* Using short waves to liberate nature's hidden treasures is a most fascinating subject and its practical use will be a servant of the mining industry.

The RX-14 S-W Receiver For "Fan" or "Ham"

(*Continued from page* 151)

ment of parts, combined with the use of electron-coupling, results in selectivity and sensitivity that is undreamed of by the average fan. The use of plug-in coils, well known for their high order of efficiency, low losses and convenience, is to a large extent responsible for the excellent results obtainable. A thorough test of this model has demonstrated its capabilities for consistent foreign station reception with remarkable regularity.

For the transmitting amateur who is interested primarily in the 10-20-40-80-160 meter bands, there is model RX-14-AB which is equipped with a plate voltage cut-off switch for use during the transmitting periods and special *bandspread* coils, enabling these bands to be spread over a generous portion of the tuning dial. Incidentally, these special coils are interchangeable with the regular coils furnished (9 to 600 meters) with the RX-14 and no changes whatsoever.

This article has been prepared from data supplied by courtesy of Eilen Radio Laboratories.

The "Transceptor"—A New 5-Meter Portable

(*Continued from page* 151)

trols when the unit is not actually in use. This cover, opening outward on a pair of sturdy hinges, makes a very convenient little writing compartment, in which a log-book, pencils, watch, and even the necessary antenna wire may be carried. A special compartment on the right side of the case houses a "hand-set." When this "Transceptor" is closed up for carrying, it really is closed, and no additional hand-bag for a half-dozen accessories is required!

The case is made of black crackle finished steel, and will withstand all sorts of mechanical abuse. The outfit may be handled as an ordinary piece of baggage, and can be stowed away in any part of a car without suffering damage to exposed knobs, dials, binding posts, etc. It can be sat on and stood on!

Electrically, the set comprises 4 tubes in a tested and thoroughly reliable circuit combination. In the accompanying circuit diagram, tube V-1, a type 30 functions as a self-quenching super-regenerating detector, operated with a separate receiving antenna. When the 3-position switch SW is thrown to the position marked "R" (receiving), transformer T-1 operates as a straight audio amplifying transformer, working into tube V-2, also a type 30. This tube works into a class B push-pull audio, which comprises transformers T-2 and T-3 and a type 19 tube. The receiver portion of the hand-set connects directly to the secondary of output transformer T-3.

When the change-over switch on the front panel is thrown to the "S" or transmitting position, the type 19 tube V-4 operates as a unity-coupled push-pull R.F. oscillator. The microphone part of the hand-set is connected in series with a special primary on transformer T-1, which thus acts as a microphone-coupling transformer. Tubes V-2 and V-3 then function as voice amplifiers, with tube V-3 further operating as a modulator tube. The secondary of the transformer T-3 is thrown in series with the B+ lead to the oscillator tube V-4, and thus modulates the R.F. output of the latter, accomplishing the phenomenon of radio telephony.

When the change-over switch is thrown to the transmitting position, it opens the filament to the receiving tube V-1, thus preventing additional modulation of the transmitter by incoming signals. Resistors are provided in the filament circuit to compensate for the slight voltage differences that occur between the receiving and transmitting circuit combinations.

A 500,000-ohm potentiometer connected across the secondary to transformer T-1 operates as a volume control in the receive position, and as a microphone gain control in the transmit position. A separate 100,000-ohm variable resistor in the plate circuit to tube V-1 functions as a regeneration control.

As the front view of the "Transceptor" indicates, separate tuning controls are provided for transmitter and receiver tuning. It is therefore possible to adjust the transmitter for maximum efficiency on any particular frequency and then to cover the entire band with the separate receiver control. That this is a huge improvement over ordinary transceiver operation will be readily evident to any person who has had experience with instruments of the latter type.

The inside view of the set shows the neat and simple distribution of the various parts. The hand-set is in its own special compartment at the left, with tip jacks provided for quick connection. There are no loose cords of any kind hanging from the front panel to interfere with the tuning manipulations. The left section of the chassis contains the receiver tube V-1 and its own tuning system comprising a space-wound coil, and a tiny 10 mmf. variable capacitor; beyond the partition, to the right, are tubes V-2, V-3 and V-4, and the heavy copper tubing, comprising the tank coil of the push-pull oscillator. In the schematic diagram the dotted lines indicate insulated wire pulled through the tubing. This insulated coil represents the grid inductor, while the copper tubing is the plate inductor. Snap clips attached to the tank coil are run through fixed condensers to a pair of binding posts on the front panel for eventual connection to any of the usual types of 5-meter antenna. The audio units and assorted fixed resistors and capacitors are on the under-side of the chassis. The various dry cells required for filament, grid-plate and microphone current supply fit snugly inside the bottom of the case.

The particular "Transceptor" illustrated is the 2-volt battery model. Another model, which is undergoing completion, will use the identical mechanical layout with the 2-volt tubes replaced by tubes of the 6.3 volt series. This model will be available for operation on a 6-volt storage battery, as in an automobile, with either batteries or a dynamotor for plate supply; or for 110-volt a.c. service with a specially designed power pack that will fit in the space now occupied by the dry batteries. This will make a marvelous little compact 5-meter station for fixed use in the home or for semi-portable use outside.

This outfit has undergone thorough field

tests and has proved to be exceptionally successful in all respects. Its improved mechanical construction and electrical design will appeal instantly both to the experienced 5-meter operator who has wrestled with ordinary transceivers, and to the beginner who wants to get started on 5-meters with a versatile instrument of low cost.

This article has been prepared from data supplied by courtesy of Wholesale Radio Service Co.

New Ultra S-W Tuner

(*Continued from page* 139)

this particular receiver, the detector circuit is designed for modulation frequencies in the broadcast band. In other words the entire instrument as shown is not really a receiver, but a S-W converter. Tests have shown that the receiver will respond to a band width of approximately 4,000 kilocycles and therefore it should be excellent as a television receiver when television becomes a reality in this country.

New Television and Sound Antenna

(*Continued from page* 139)

the tower structure. The wave lengths to be used in the new B.B.C. television system are in the vicinity of 6 to 7 meters. The receiving apparatus to be used in picking up the television images, employs a cathode ray tube. A great many "field tests" have been conducted successfully already, tending to prove that the television system, as worked out by the engineers, will operate in a very satisfactory manner. With these short wavelengths or ultra-high frequencies, there is bound to be a considerable amount of absorption by steel-frame buildings, and also distortions of the wave as it passes over sections containing a great many steel frame structures. Just what the reception results will be under these conditions remains to be seen.

Cathode-Ray Tube Tester

(*Continued from page* 139)

for sales or technical reference purposes are the brilliancy of the fluorescent screen, in candle-power or other similar units, and also the sharpness and intensity of the light spot produced on the screen. Note the light sensitive cell contained in the round metal case circuit, supported by the laboratory stand at the right of the photo. The illumination projected through the glass and the fluorescent screen at the end of the cathode tube, falls on this cell. In this manner, it is easy to measure the specific luminosity produced on the fluorescent screen of the tube. Other cathode ray tube factors which can be measured with this newest measuring apparatus, are the degree of vacuum inside the tube and the magnitude of the cathode ray beam.

All HAMS will be interested in W2AMN's article in the August number, describing a new transmitter using the 6L6 (Beam) Tubes. All bands with 1 crystal. The simplest yet!

Girl Operators, Attention!

Listen "YL's" and "XYL's"!! Why not send the Editor a good photo of your "Rig"—and don't forget yourself. A separate photo of yourself will do, with a "clear" photo of that station! $5.00 for best "YL" photo.—Editor. See page 649 March issue for details.

New Television Experiments by RCA

(*Continued from page* 133)

image appears pointing upward, so that one would have to look down on the top of the cabinet to see the image directly. However, the television image, which has a size of 5x7 inches, is reflected on a metal mirror, which is so arranged that persons sitting in front of the set can clearly see the images.

33 Tubes Used In Receiver

The receivers employ a total of 33 tubes, all of which are of the standard receiving type, with the exception of the cathode-ray tube and its associated high-voltage rectifier. There are 3 metal tubes in the set; all the rest are glass.

A total of 14 controls is to be found on the set, 7 on the front panel and 7 under the movable top of the cabinet. This top is raised and lowered exactly as is the top of a radio-phonograph cabinet. Instead of a phonograph turn-table within, however there is the cathode-ray tube and the 7 controls mentioned above. The reflecting mirror is mounted on the inside of this movable top which is left in the raised position when "viewing" a broadcast.

The 7 front panel controls are for tuning, sound volume, high-frequency and low-frequency tone control; picture contrast, detail, and brightness. The 7 upper-deck controls are for adjusting the synchronism of the picture, the focus, the horizontal and vertical size and the horizontal and vertical "framing."

Receiver Circuit

The input from the aerial and the first detector-oscillator stage is *common* for both the *sight* and *sound* channels. In other words, both sight and sound are tuned in by the *same control*. Since there is only one signal-frequency oscillator, and as this can be oscillating at only one frequency (disregarding harmonics) at a time, the 46 mc. *sight* carrier and the 48 mc. *sound* carrier must produce two entirely different beat frequencies when they are mixed with this oscillator frequency. This is just what happens and the result is that there are 2 different beat frequencies or "I.F.'s" in the output of the first detector. These are fed to entirely separate I.F. amplifiers and thence through separate second-detectors and audio systems, with the picture ending up at the cathode-ray tube and the sound at the loud speaker. The block diagram illustrates this arrangement clearly. The I.F. employed in the picture channel is from 10-11.5 mc. while that for the sound channel is around 8.75-9 mc.

A surprising thing about the demonstration was the negligible effect automobile ignition interference had on the pictures. Frequently the interference became strong enough to render the sound channel momentarily unintelligible, but instead of blotting out the image the interference caused only slight blurring of the images for a fraction of a second. This was not serious enough to be distracting to the eye.

Future Developments

This demonstration was given as preliminary to the first experimental field tests of the system to be conducted in New York City beginning about June 29th. Transmission will be from the new 10 kw. ultra-short wave television transmitter now being completed on the 85th floor of the Empire State Building. The studios will be in Radio City.

About 50 of these experimental receivers will be placed in the homes of RCA engineers in and around New York for the purpose of discovering whether the system is practical outside the laboratory. If the field tests turn out successfully it is hoped to eventually inaugurate a regular television system for the public as an adjunct to sound broadcasting. This will not occur for 18 months at the *very least*, however, according to statements made by RCA officials at the demonstration.

2-Volt Short-Wave Superheterodyne

(*Continued from page* 143)

transformers are pretuned or "peaked" at the factory which makes the final adjustment of the set comparatively simple. The 19 is used as a *square-law detector* because the author has been unable to obtain good results with this tube operating as a bias detector. The 3:1 ratio audio transformer and the output section of the 19 provide plenty of volume for comfortable loudspeaker operation on most stations.

"Control" Line-up

As shown in the photographs, the set is built up on a 7x9x2 inch chassis, no front panel being used. The various controls along the front of the chassis, reading left to right, are as follows: (1) volume control; (2) off-on switch; (3) "high frequency" padding condenser; (4) "low frequency" padding condenser; (5) filament rheostat. The mixer coil is at the left of the dial; the oscillator coil is at the right. The method of mounting the sockets is novel and contributes much to the clean-cut appearance of the set. A drilling layout is shown in Fig. 2.

Chassis Layout

The photographs and drawings should be studied carefully before any of the parts are mounted on the chassis. All of the parts have been placed in the position that gives the shortest and most direct leads between them. The large or filament prongs of the four tubes are placed toward the rear of the chassis and the coil sockets are mounted so that the grid and plate leads are short and direct. It is extremely important that the leads from the tubes to the I.F. transformers be kept very short and well separated, not to reduce losses, but to prevent the I.F. amplifier from oscillating. The by-pass condensers of both the 1C6 and the 34 *screen* circuits should be connected to the screen-grid terminals of the sockets themselves, and *grounded directly to the chassis*. The end of the by-pass condenser having the band or marked "outside foil" goes to the chassis. If these precautions are not observed the 34 may oscillate or have a high noise-level. The shields used on the 1C6, 34 and 19 tubes are of the close fitting "jacket" type. In order to obtain a "sure-fire" ground connection for these shields, the author soldered a short flexible "pigtail" lead to each shield and to the chassis. This method proved to make the set much more quiet than when the shields were grounded by means of the usual spring clip.

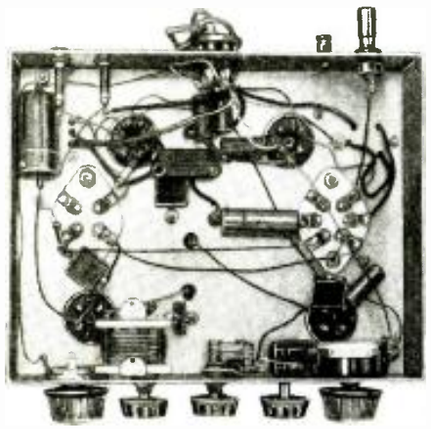
Mounting of By-pass and Fixed Condenser

The various by-pass and fixed condensers and resistors are merely mounted in the position that gives the shortest leads and are supported by the wiring. An examination of the photo showing the bottom view of the chassis will show that apparently all of the negative leads are merely grounded to the chassis, no "bonding" wire being use in this case. This is true of only the battery and audio frequency leads. All R.F. and I.F. leads are soldered to machine screws through the chassis and these machine screws are connected together by a single length of bus wire. This arrangement gives a better electrical as well as mechanical return for these leads. Needless to say all of the connections are soldered by means of a *hot clean* iron and *rosin core* solder.

Three Dry Cells Will Operate Set

This receiver has been designed for operation on *three ordinary dry cells* as the source of "A" supply. The filaments of the 30, the 1C6, the 34 and the 100 ohm resistor are wired in parallel and the output of this combination is then connected to the negative filament terminal of the 19 socket. The positive filament terminal of the 19 goes to the "A" positive and "B" negative as shown in Fig. 1. By using this *parallel-series* arrangement, the total drain

on the "A" battery is only 0.26 ampere at 4 volts. The 500,000 ohm grid leak of the second detector should be returned to the negative filament terminal of the 19 tube rather than to the chassis. If the leak is connected to the chassis an undesirable bias of 2 volts negative would be placed on the grid of this section of the 19. *Do not re-*



Bottom View

move either the 7C6, the 30 or the 34 tubes from their sockets while the "A" current is turned on! If one or more of these tubes are taken out during operation, the current drawn by that tube is forced to find its way through the filaments of the remaining tubes in the parallel combination. This additional load may *shorten their useful life.*

Checking the Wiring

After the set has been wired, the wiring should be checked by referring to Fig. 1 before the batteries are connected to their leads. It is a good idea to close both the filament and the "B" negative switches and test from each "B" positive lead to the chassis in order to determine whether any short-circuits are in existence. A pair of headphones and a 4½ volt "C" battery are satisfactory for this purpose. If everything has been wired properly, a loud click will be heard the *first time* the connection is made and no clicks or very weak ones should be heard on successive contacts. If a loud click is heard every time the contact is made and broken a "short-circuit" exists or the plate or screen grid by-pass condensers are *leaky.*

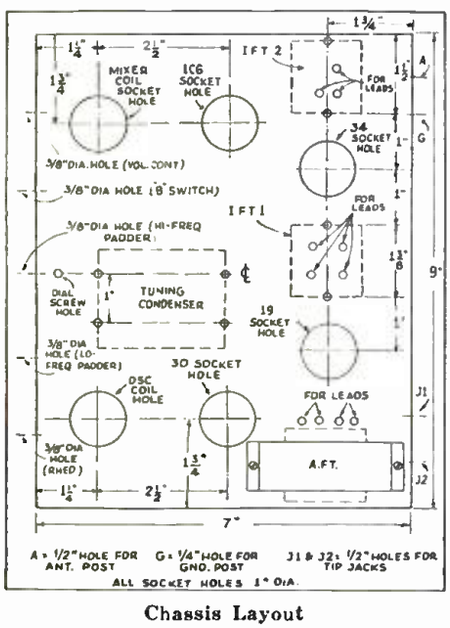
Aligning the Various Stages Easy

This short-wave superhet is extremely easy to align and adjust for maximum performance. The procedure of bringing the oscillator and the signal-circuit into correct alignment is as follows: Place the 31-50 meter coils in their sockets and connect the antenna and ground wires to their respective binding posts. The proper voltages are applied to the grids, filaments and plates of the tubes as shown in Fig. 1 and the volume control (R2) is turned full on. Set condenser CP3 with its plates nearly all out and adjust CP2 for about 50% maximum capacity. Now rotate the tuning condenser to the lower end of this band (about 15 or 20 on the dial) and try to pick up some kind of a signal. The 35 mmf. condenser, CP3, is adjusted for maximum signal strength.

It will be noticed that two points of maximum signal strength can be found—one with the plates nearly all out and another with the plates nearly all in. Regardless of the band in use, the unmeshed position is the correct one. The tuning condenser is now turned to about 75 or 80 and CP2 is adjusted for maximum signal volume in exactly the same manner as was done on the lower end of the tuning scale. Once the two padding condensers are adjusted, CP3 should not be bothered; any necessary readjustment can be made with CP2 which is much less critical.

The oscillator coil values have been worked out so that little or no "re-tracking" of the oscillator is necessary when changing coils! In fact, this super is just as easy to operate as an ordinary straight regenerative receiver, using only one tuned circuit.

Ordinarily very little realignment of the I.F. transformers is necessary as these are "peaked" to 456 kc. at the factory. However, a slight lining up of this circuit will increase the overall sensitivity of the set if the original settings have been disturbed. The procedure for I.F. alignment is as follows: Tune in a weak station (the weakest that can be heard in the phones) and, with an insulated screw-driver, adjust the trimmer of the grid section of the output transformer for maximum volume. Now adjust each trimmer in turn, working back toward the mixer tube, until all four condensers have been "peaked" for maximum sensitivity. If the signal becomes very loud during this alignment process, *tune to a weaker station! Do not reduce the volume by turning down the volume control! It must be remembered that in all cases signals must be received before any attempt is made to adjust the I.F. circuits and under no circumstances should the padding condensers be disturbed while this process is being carried out!* It is usually necessary to go over the I.F. trimmers two or three times in order to adjust this circuit for maximum performance if any realignment is required.



Chassis Layout

Hints on Tuning for DX Stations

A few suggestions on tuning this little set may be pertinent. This receiver is extremely sensitive and may be operated satisfactorily on a short antenna, except when tuning for extreme DX reception. The 50,000 ohm potentiometer in the *screen circuit* of the 1C6 serves as a combination volume and sensitivity control and gives a better signal-to-noise ratio when retarded slightly. The operation of this control has a slight effect on the tuning of the oscillator (about the same effect as the regeneration control in the average regenerative circuit) and the circuits can be re-tracked by a slight adjustment of CP2. The adjustment of this particular condenser is so "broad" that it may be turned through its full 180 degrees without throwing the R.F. circuits out of alignment.

Tune S-L-O-W-L-Y !

The time worn admonition to "*tune slowly*" also holds good in this case. The dial shown in the photographs is 10:1 ratio and is fairly satisfactory. A good high-ratio airplane type dial would be more desirable. Most short-wave fans will be surprised and pleased at the way this "2-volt superhet" brings in the "foreigners" on the 25, 31 and 49 meter bands, even when the powerful American stations are operating on adjacent channels.

The author has operated this receiver over a period of about ten days before writing this article. No exceptional DX reception has been received, simply because we have never tried for long distant stations. However, all of the usual American and "foreign" broadcasters, such as W2XAF, W1XAL, EAQ, GSC, DJA, HBL, etc. have been received with *ear-splitting volume* on phones, and fairly good volume on the loud speaker. On the 20 meter amateur phone band, stations have been heard from all parts of the U.S.A. and Canada as well as several Cuban, Costa Rican and South American "hams". On every occasion that the author has operated this receiver, day or night, the bands have been "simply alive" with stations.

(For "Ham" use, the set can be fitted with one of the new Crowe double needle "band-spread" dials, which feature could also be used to advantage by the "Fan" for tuning in the closely-packed S-W broadcast stations in the 6 m.c. (49 meter) band, etc.—Editor.)

List of Parts

C1—2-gang tuning condenser, 140 mmf. each section, Hammarlund.
C2—Mica fixed condenser, .00025 mf., Cornell Dubilier.
C3—Tubular paper condenser, 0.5 mf., 400 volts, Cornell Dubilier.
C4—Tubular paper condenser, .05 mf. 200 volts, Cornell Dubilier.
C5—Mica fixed condenser, .0005 mf., Cornell Dubilier.
C6—Tubular paper condenser, 0.1, mf., 400 volts, Cornell Dubilier.
C7—Tubular paper condenser 0.2 mf., 400 volts, Cornell Dubilier.
C8—Mica fixed condenser, .00025 mf., Cornell Dubilier.
C9—Mica fixed condenser, .001 mf., Cornell Dubilier.
CP1—Mica fixed condenser, .001 mf., Cornell Dubilier.
CP2—Midget tuning condenser, .0001 mf., (100 mmf.) Hammarlund.
CP3—Midget tuning condenser, .000035 mf. (35 mmf.) Hammarlund.
L1, L2, L3—See coil table.
R1—Resistor ½ watt, 25,000 ohms, I.R.C.
R2—Potentiometer with switch, 50,000 ohms, Electrad.
R3—Wire-wound fixed resistor, 100 ohms, Electrad.
R4—Resistor ¼ watt, 500,000 ohms. I.R.C.
R5—Rheostat 15 ohms, Electrad.
IFT 1 iron-core I.F. input transformer, 456 kc., Miller.
IFT 2 iron-core I.F. output transformer, 456 kc., Miller.
AFT 3:1 ratio audio frequency transformer, strap mounting type, Thordarson.
1—7x9 inch chassis, electralloy (I.C.A.).
4—Four-prong sockets (see text).
2—Six-prong sockets (see text).
1—Seven-prong socket (for battery plug).
1—Seven-prong plug (for battery cable), Eby.
1—"off-on" switch.
1—Shield for 1C6 tube "jacket" type.
1—Shield for '34 tube "jacket" type.
1—Shield for '19 tube "jacket" type.
1—Dial (see text).
Knobs, tip jacks, binding posts, etc., Eby.
Set of tubes (1C6, 30, 34, 19). R.C.A.—Radiotrons.

Coil Table

Mixer Coils (L1)

Turns	Range	Spacing	Size Wire
5	15-31 M.	1 diameter	No. 24 D.S.C.
11	30-50 M.	Close Wound	No. 24 D.S.C.
23	50-100 M.	Close Wound	No. 28 D.S.C.
52	100-200 M.	Close Wound	No. 28 D.S.C.

Oscillator Coils (L2)

Turns	Range	Tickler (L3)
4½	15-31	6 turns
9	30-50	7 turns
18	50-100	11 turns
40	100-200	19 turns

The oscillator coils are wound with the same size wire and spacing as corresponding mixer coils. All forms are 1½" diameter.

WAKE UP! FELLOWS!

$20.00 Prize Monthly for Best Set

● THE editors are looking for "new" receiving circuits—from 1 to 5 tubes preferably. A $20.00 monthly prize will be awarded to the best short-wave receiver submitted. The closing date for each contest is 75 days preceding date of issue (June 15 for the Sept. issue, etc.). In the event of a tie, an equal prize will be given to each contestant so tieing. Address all entries to: Editor, SHORT WAVE CRAFT, 99 Hudson St., New York City.

1-Tube—1-Crystal—4-Bands!

(*Continued from page* 142)

where grid current flows during a portion of the input cycle, two of these tubes will deliver *60 watts of audio* and the peak grid input power required is only 350 milliwatts.

The foregoing, together with the illustrations of the tube, showing different stages of manufacture, together with the drawing indicating the *electron beaming*, will give the reader a fair idea as to just what this tube is all about.

Immediately, of course, the question arises as to what a tube of this type would do for the amateur (Ham) besides providing audio frequency power. Tests run on a single tube as a *crystal oscillator* showed undoubtedly that this tube is destined to become more popular than the 47, or 59 ever hoped to be. The data compiled and shown in the table is for a *single tube*, either in the tritet or straight pentode connection, with 500 volts on the plate and 280 volts on the screen, with a grid leak of 150,000 ohms. In the table, plate current is given in two values, "R" indicating at resonance and "OR"—off resonance.

With an 80-meter crystal we find that in the straight tetrode connection, the plate current dips down to 10 ma. and goes up to 85, *off resonance*. The screen voltage was 280 and the screen current 9 ma. with the plate circuit unmounted. The measured output was 20 watts. Imagine an oscillator providing 20 watts output with only 30 watts plate input! In each case, when the plate circuit was loaded to maximum output, the screen current drops to 5 ma. So here we have approximately 1.4 watts screen dissipation, 30 watts plate input and 20 watts output! In the well-known tritet circuit, doubling in the plate circuit provided a tremendously strong *second harmonic;* referring to the chart we see that the plate current dips to 15 and goes up to 85, and the power output is 20 watts. There appeared absolutely *no decrease in power output* when using the 6L6 as an *oscillator-doubler!*

This great amount of power obtained when doubling, lead us to believe that the *fourth harmonic* might be worthwhile cultivating. Examination quickly proved this a good hunch and we find that the plate current took a dip from 85 ma. to 42 ma., and indications show that there was greater than 5 watts output on even the 4th harmonic!

So at last we have a tube in which we can *quadruple the frequency directly from an 80-meter crystal* and have *sufficient power output to excite a fairly medium powered amplifier tube!* Operation with a 40-meter crystal gave practically the same results, as will be seen in the table.

No attempt was made to bring out the 10-meter harmonic with a 40-meter crystal. But the test oscillator worked the Pacific Coast on 20 meters using a 40-meter crystal! Undoubtedly there will be a number of other uses for this tube and many combinations using it will be suggested. We hope to present a more elaborate transmitter using these tubes in the next issue of *Short Wave Craft*. Unquestionably, it is the most valuable oscillator tube which has been offered the amateur thus far.

6L6 Crystal Oscillator Plate Voltage 500—Grid Leak—150,000 Ohms With 80 Meter Crystal

Connection	Plate	Current	SG	SG	Watts Input	Watts Output
Tetrode	R	OR	Volts	current*		
	10 ma	85 ma	280	9 ma	30	20
Tritet (2nd Har.)	15 ma	85 ma	280	10 ma	30	20
Tritet (4th Har.)	42 ma	85 ma with 40-meter crystal	280	9 ma	30	5
Tetrode Second Harmonic	10 ma	85 ma	280	9 ma	30	20
Tritet	18 ma	85 ma	280	9 ma	30	18

Note:—Screen current 5 ma. when plate circuit is fully loaded. Screen input 1.4 watts
* With no plate load.

Short Waves and Long Raves

(*Continued from page* 146)

GOOD NEWS FROM RHODESIA, SOUTH AFRICA

crystals whose frequencies are at the one end of the band. The result is that there is a big slice of the band left to listen for DX in. If a man has signals with keyclicks he is boiled in battery acid. The Rhodesian stations are 100% crystal-controlled, so if anyone hears a non-crystal note, using the ZE call, don't work him as nothing under T8 is radiated from this country.

The receiver is a battery-operated TRF-Det-2 LF contraption, which "works." As one can buy a good second-hand motor-car for the price of a HRO National receiver, such receivers are scarce and we have to make the best of what we can get. Still it's great fun—the kick the W's have behind their signals makes up for the lack of "Single-Signal Supers."

I get your magazine every month from the Salisbury Herald Bookstore and I wish *Short Wave Craft* the best of luck, 73.

Yours sincerely,

R. JUBB, ZE1JN,
The Observatory, 16 Lawley Road,
Bulawayo, Southern Rhodesia, S.A.

(Greetings! R. J., and from the photo it appears that you have a very efficient short-wave transmitting and receiving station. You might like to write an article or so for Short Wave Craft, *and we imagine a description of the antennas you may use when making your long-distance contacts would prove worthwhile to the readers of this magazine, giving all the dimensions and elevations of the antenna wires, type of coupling used, and the direction in which the antenna points.—Editor)*

STEPHEN CASEY, W2IIR, PERTH AMBOY, N.J., HAS A-1 STATION

former, for economy or other reasons, and when they try to modulate the carrier the plate voltage and current varies on the final.

If they try this system, it will work very nice as long as they are not over-drawing the transformer rating.

If my fellow amateurs wish to exchange photographs of the "rig" or "shacks," I will be very glad to do so.

Regarding your magazine, *Short Wave Craft*, I hope that you will continue the fine work you started a long time ago for the *radio loving public* and *radio amateurs.*

Very 73.

STEPHEN CASEY, W2IIR,
901 State Street,
Perth Amboy, N.J.

(We are very glad to publish the photo of your excellent transmitter and shall be pleased to have you write some other articles, describing in detail the makeup of your transmitter and also some of your experiences, and the types of receivers you have found best. Do not forget also that we pay for all constructional articles published in Short Wave Craft, *and that we always are on the lookout for good articles of this type, giving full circuit and other details and photos of the set. Other topics, such as tuning up the antenna to the transmitter, etc., form "live" subjects also.—Editor.)*

Don't Miss the August Issue! Lots of Features for S-W FANS!

See Pages 180 and 192 for Remarkable Subscription Offers

RADIO INSTRUCTION

Radio Amateur Course

(*Continued from page* 155)

tioned in this discussion into a 3-tube receiver, consisting of a pentode, R.F. amplifier, pentode detector, and triode audio amplifier. In tuned R.F. circuits of this type, shielding is necessary as indicated in the diagram. This should separate the two stages completely.

The input to the R.F. stage is also inductive and when a doublet is used the dotted connection between the antenna coupling coil and the ground or "B" negative is not made. This connection is only made when an antenna and ground combination such as the Marconi antenna is used.

400 Megacycles Used by French "Hams"

(*Continued from page* 140)

(HB9RDL) several novel aerials were evolved for both mobile and stationary units. The antenna shown in Fig. 6 is a reflector system resonating at 3 meters with the oscillator located at the optical focal point. This unit consists of a group of rods connected together and each resonating at ½ the transmission wavelength. The entire group of rods is arranged in a parabolic curve with the aerial at the focal point or slightly beyond it. The use of the lower frequency (3 meters) for the reflector allows more flexibility in the transmission frequency than when it is tuned to the quarter-wave or half-wave point.

Figure 7 shows an interesting type of antenna used in the experiments which is credited to Marconi by M. Luthi. This directional aerial consists of a series of half-wave rods arranged in such a manner that the entire resonant frequency is equal to twice the resonant frequency of any one rod. The use of this series connection increases the radiation of the system over a single half-wave resonator.

Another interesting radiator is shown in Fig. 8. In this case, each of the open cubes formed by the crossed wires, forms a resonant circuit which is tuned to one-fourth of the transmission frequency. In the case of this antenna, the outer cubes act as *reflectors*, so that a strongly polarized wave is emitted. Some of the most distant transmissions with the 400 mc. rig of HB9AO were accomplished with this radiating system.

Perhaps the most astounding fact in these interesting experiments of two French amateurs is—not that communication was actually established beyond optical range distances (line-of-sight) on this unusually high frequency—but rather that the equipment and tubes were parts which were readily obtainable on the market. And remember—the signals—both voice and buzzer-modulated C.W. were picked up with R9 strength—no "imagined whispers" for these hams!

"HAMS" TALK TO ENGLAND ON 5 METERS!

● A 3450 mile two way short-wave phone conversation was carried on between four amateurs in Troy, N.Y., and a short-wave station in England, according to press reports dated April 15.

R. W. Schermerhorn, Malcolm Hormaats and Frank Granger, of Troy, and Joseph Wright of Watervliet, are the young men concerned in this record-breaking 5-meter contact established across the broad Atlantic.

This reported 3450-mile jump on the 5-meter waves was attributed to freak atmospheric conditions.

"Ham" Antennas for the Low Frequency Bands

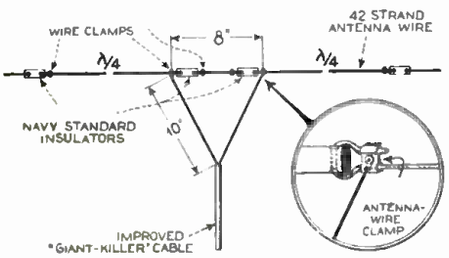
By ARTHUR H. LYNCH

Data for Making Half Wave Doublets Suitable for Receivers As Well As Transmission Up to 250 Watts.

● THE business of providing amateurs with doublet antennas for transmitters has, up to now, required more than ordinary mechanical ability and the proposition has resulted in a considerable expense.

The arrangement shown eliminates a lot of the difficulties which have existed in the past and provides the "Ham" with a shipshape antenna, which is both rugged and inexpensive.

The first, and possibly the most important, recent contribution to low frequency "ham" radio, has been the introduction of a new Cable. By the elimination of all fabric, the "wick effect" which has been bothering amateurs who have been using other types of twisted-pair lines, has been thoroughly eliminated. The use of stranded wire in each conductor makes the entire assembly quite flexible. Pure Laytex is used for insulation for two reasons.



Detail of Antenna Here Described

First the outside covering on each conductor may be made extremely thin, and for that reason the *surge impedance* of the line is kept quite low—approximately 82 ohms. Secondly, in spite of the very thin wall, the voltage breakdown between conductors is very high, being well above 25,000 volts.

Another and entirely new type of antenna wire is being placed on the market and it is made up of 42 strands. It is extremely flexible and very easy to work. The new antenna wire clamps, shown in the insert, make it possible for the "ham" to provide himself with an antenna which is perfectly free from loose contacts, although it is not necessary to use solder. The manner in which the clamps are attached to the antenna wire, as well as to the lead-in wire, are shown in the insert.

The impedance of the transmission line is matched to any half-wave doublet, no matter whether it is for use on 20, 40, 80 or 160 meters, by maintaining the dimensions, which are shown in the triangle in the center of the figure.

The two quarter-wave portions of the antenna proper are made slightly longer than a quarter wavelength each and they are gradually reduced by manipulating the new antenna wire clamps at the two outside ends of the antenna, until the total over-all length brings the antenna into resonance with the crystal frequency of the transmitter.

This procedure eliminates the necessity for cutting and a lot of extra soldering.

In a few instances it has been found that obtaining the correct impedance match between the transmission line and the tank circuit of the transmitter, has required a delicate adjustment of the coupling.

In many cases this adjustment has been greatly simplified by placing a .0001 mmf. variable condenser across the lower end of the transmission line.

This article has been prepared from data supplied by courtesy of Arthur H. Lynch, Inc.

What Does It Cost to Become an Amateur?

(*Continued from page* 137)

transmitter, for *radiophone* work you must have a good quality microphone, speech amplifying equipment, and a modulator unit, all of which involve a rather substantial financial outlay, even for a very low-powered radio telephone. If cost is no object, well and good—you may expect to spend for a low-powered phone, suitable for consistent communication over a couple of hundred miles on the so-called "160 meter band," where your first operation will commence, approximately one-hundred dollars—divided as follows; a radio frequency unit, which must be a stable, modern CW transmitter preferably crystal-controlled, with at least three stages, $50 for parts. The modulator unit for such a phone will take another $20, the speech amplifier about $7.50 and the balance of your hundred dollars will go for the microphone and accessories such as the crystal and holder and also the transmitting antenna equipment.

Look Out for "Bargains"

Remember, in this discussion we are considering only GOOD apparatus, of reliable manufacture—it is true that much equipment may be had at "so-called" bargain prices, but unless the purchaser is familiar with various items or apparatus and their customary prices or is dealing with a reputable supply house, he can go far astray. Accordingly we are recommending that the entrant in this field purchase his first equipment only from houses of established reputation—he will find a large choice and varying price range at most radio supply stores. A transformer for example, may be *uncased* at a low figure, or supplied in various styles of enclosing housings at an increased price. It is still the same transformer and the purchaser should govern his selection by his pocket-book, confident in the knowledge that for performance purposes he will find either type identical.

Be guided, if possible, by other amateurs who are more experienced in their hobby than you. When this cannot conveniently be done, put your trust in a reliable well-established radio supply house that sponsors no outrageous guarantees or "discounts."

To enter the amateur radio telephone field in a small way with equipment that will be acceptable both to the Federal Communications Commission and to the amateur fraternity at large, you should be prepared to spend at least one hundred dollars. Your ability to pick up good used equipment from other amateurs together with your constructional genius will enable you to reduce this figure quite substantially.

A CW Transmitter Cheapest to Start With

If you are short of funds do not be dismayed by the above figures. It is not necessary that you enter upon your amateur activity as a "phone man." You must learn the code regardless of whether you plan to use phone exclusively or not and with limited funds, it is entirely possible to build a simple, though efficient radio-telegraph transmitter; adding to your equipment as you can afford to and eventually acquiring the outfit which you desire. This can be done in such a way that the simple equipment with which you start, need not be discarded as your outfit advances, but becomes incorporated therein.

(*Continued on page* 181)

When to Listen In

By M. Harvey Gernsback

(All Schedules Eastern Standard Time)

HOLLAND

● THE Dutch stations made another change in their schedule on May 25th. PHI on 17775 kc. is on daily except Tues. and Wed. from 7:30-9:30 a.m., with its regular programs for the Dutch East and West Indies. On Sun. it is also on from 1-2 p.m. with a program for Africa. PCJ on 15220 kc. broadcasts a program for East Asia on Sun. from 6:30-7:30 a.m. and broadcasts experimental programs on Tues. from 4-6 a.m. and on Wed. from 7-11 a.m. PCJ on 9590 kc. broadcasts each Sun. for South America from 7-8 p.m. The most important news is that PCJ on 9590 kc. is now broadcasting experimental programs each Wednesday from 7-10 p.m. This marks the return of these famous programs to the air after an absence of about 5 years as PCJ has not been operating on 9590 kc. since 1931.

FRANCE

● RADIO Colonial is now operating on "summer time." The schedule is 1-4 a.m. on 11880 kc., (TPA3) 4:55-10 a.m. on 15245 kc. (TPA2), 10:15 a.m.-5 p.m. on 11880 kc., 5:15-9:15 p.m. and 9:45 p.m.-12 M. on 11715 kc. (TPA4).

HICKSVILLE

● A NEW experimental station, W2XBG at Hicksville, L.I., N.Y., has been reported broadcasting news reports around 7:30 p.m. on 6010 and 6425 kc. This station is operated by Press Wireless, Inc., who operates a large number of telegraph transmitters at Hicksville.

AUSTRALIA

● **A new station will shortly take the air in Western Australia. It is VK6ME, operated by the Amalgamated Wireless of Australia, Ltd. The new station will be located near Perth, W. Australia. It is expected to operate on the same frequency as VK2ME at Sydney, 9590 kc. It will broadcast the same type of programs as 2ME. This station will be in operation by July 1st if all goes well.**

ENGLAND

● THE Daventry schedule for June is as follows: Trans. 1, 11:30 p.m.-1:30 a.m. on GSB and either GSD or GSN. Trans. 2, 6-8:45 a.m. on GSG and GSH or GSJ. Trans. 3, 9-10:30 a.m. on GSG and either GSF or GSJ; 10:30 a.m.-12 n. on GSG and GSF. Trans. 4, 12:15-3:40 p.m. on GSB, GSD and GSI; 3:40-5:45 p.m. on GSB, GSD and either GSO or GSG. Trans. 5, 6-8 p.m. on GSC, GSD and GSP. Trans. 6, 9-11 p.m. on GSC, GSD and possibly GSP or GSI.

GERMANY

● The latest schedule of the German stations is: For E. Asia, 12:30-3:50 a.m. on DJN and DJQ, 3:50-7 a.m. on DJQ, 8:05-11 a.m. on DJN and DJE.

For S. Asia, 12:30-3 a.m. on DJA, 3:50-8:05 a.m. on DJB, 8:05-11 a.m. on DJA and DJB. From 1:30-3:30 a.m. DJR and from 5:45-7:30 a.m. DJL. Both of these last two are experimental.

For Africa, 11:35 a.m.-4:20 p.m. on DJD and DJC. 12 n-2 p.m. on DJP and 3-4:20 p.m. on DJO. The last two are experimental.

From 4:50-10:45 p.m. DJD is on for N. America, DJN for S. America and DJA for Central America. In addition DJM is on experimentally for N. America from 7:30-9:30 p.m.

TIGPH

● A LETTER from the Director of TIGPH, "Alma Tica," Apartado 800, San Jose, Costa Rica, gives the following schedule. Daily, 11 a.m.-1 p.m., 6-10 p.m. This station relays long wave station TIX each evening from 9-10 p.m.

PANAMA

● A NEW station is reported at Colon. The call is HP50, address is Box 33. The station operates daily from 7:30-9 a.m., 12 n.-1 p.m. and 6-9 p.m. on 6005 kc.

CANADA

● **VE9DR, sister station of VE9DN, at Drummondville, Que., has returned to the air. It is on daily, relaying CFCF in Montreal, from 6 a.m.-11 p.m. and on Sun., from 7 a.m.-9:15 p.m. VE9DR is on 6005 kc. also. Address the station in care of the Canadian Marconi Co.**

What Does It Cost to Become An Amateur?

(*Continued from page* 179)

A CW telegraph transmitter is ridiculously simple as compared to the simplest phone. It is merely necessary to purchase or construct some form of radio frequency oscillator capable of generating a signal at some lawful frequency, arranged with a method of breaking up the output into dots and dashes by *keying*, and you're "on the air"!

There are many forms of such radio frequency oscillators. These may be of the type in which the control of the frequency rests entirely with the operator, or the more advanced type in which the frequency is controlled and fixed by means of a piezo-electric crystal—a quartz plate—and commonly referred to by amateurs as *crystal control*. This latter type is by far the more desirable and the "new-comer" is warned against the self-controlled type of oscillator. While a self-controlled oscillator is capable of very good results in the hands of an experienced and capable operator, they are dangerous for a beginner; we refer to the legal phase in calling them dangerous. It is so easy to allow them to oscillate at frequencies outside of an amateur band and also radiate illegal notes, broad waves and similar undesirable characteristics, that they are dangerous for the new-comer. Therefore we suggest that you "forget the self-controlled oscillator."

The range of a low-power CW transmitter is considerably greater than a similar power in a phone transmitter. Also certain frequency bands are open to the new-comer in amateur telegraphy, that permit greater distance being covered, than is the case in the phone bands. Thus we may expect to better the estimated 200 mile range of a simple low-powered phone considerably with a simple crystal oscillator of low power.

We can then use the oscillator itself, with gratifying results. Unlike phone, additional stages beyond the oscillator are not essential for good operation. Doublers, buffers and amplifiers may be added to our oscillator later, as we can afford it. These are an absolute necessity though, when placing a phone on the air.

"Good" Crystal Best Purchase

We need only pick a suitable circuit from among the hundreds appearing in radio publications and build a simple crystal oscillator with its associated power supply. Most important of all is the purchase of a GOOD crystal and holder. It is possible to buy crystals for as little as a dollar, and holders for half that, though it is questionable whether either represent the best economy. The crystal is something that will always be a part of your transmitter and it is better to purchase a good one, even though the cost is a bit higher. Select a crystal which resonates in the lowest frequency band that you expect to use, in order that you may operate in a higher frequency band after you have added a *doubler stage* to your outfit. Select a crystal so that the even harmonics of its natural frequency fall in the higher frequency band. For the benefit of all concerned it is urged that your initial operating be confined to the band between 1715 and 1800 kilocycles. By so doing you will avoid a great deal of interference which would otherwise make your early efforts in radio telegraphy difficult, until you pick up the knack of reading code signals through heavy interference.

"On the Air" for $25.00!

You will find that including an excellent crystal and holder, the parts for your crystal oscillator will be in the neighborhood of ten dollars; a similar figure will also be needed for the *power-supply*. Allow another $5 for the key and transmitting antenna equipment and what few miscellaneous switches and insulators you will need and you have a complete, low-powered, *legal* and efficiently operating radio-telegraph transmitter for some twenty-five dollars! To this may be added equipment as desired until the station eventually becomes complete.

While the above figures represent actual equipment necessary to get "on the air," the really GOOD amateur station is faced with some slight additional expense in connection with the operation and maintenance of it. No GOOD amateur would be without one or two of the popular "Handbooks" which contain ready references and constructional data on all types of equipment. He should also be a subscriber to one or more of the leading radio magazines. He will be required—by law—to have a suitable "log" book for recording his operations. These may be made by ruling pages in a blank book, or "log" books already ruled and printed for the purpose, are available from several sources for a nominal sum. Once you are in operation the many amateurs with whom you converse will send you acknowledgements of your communication in post-card form; these are popularly known as "QSL" cards. You must also be prepared with a supply of such cards with which to return their courtesy. These may be made by hand on Government postcards or purchased from any number of printing establishments at a small cost.

If you are going in for "message handling," suitable message blanks may be purchased also. The above, together with the apparatus itself, comprise the "complete" amateur station. We can safely say that $10 will purchase all the required books, magazine subscriptions, QSL cards and stationery required. So we can then arrive at the grand total of about $35 to put a complete "CW" radio telegraph station on the air. If necessary to build a receiver, or revamp a non-oscillating type, our total station cost will rise to about $42.50.

The equivalent radio telephone station we have already seen, will cost at least $100. Count the pennies in the "teapot" and go forth on a shopping expedition that will result in giving you entry into that wonderful fraternity of world-wide friendships, *the amateur radio game!*

He Talks Through His Hat and Gets Paid for It

(*Continued from page* 135)

would suspect any trickery from an ordinary-looking car parked somewhere in the neighborhood?

What the invisible "Power-plant" used by Mr. Hicks looks like is shown in the accompanying illustration. The "B" battery unit installed in the small box at the left side consisted of 30 dry-cells each of 3 volts, which resembled somewhat in its appearance an elongated 14 gauge shotgun shell. The right-hand box contained the 6 volt "A" battery for the filament circuits of the acorn tubes. In the same box there was also space provided for a standard small-size flash-light battery of 1½ volts, to energize the pocket-size microphone. A modulator unit installed in the box between the "A" and "B" batteries and two switches to control the battery current, completed the equipment of the "power-plant."

The transmitter and modulator construction is shown in the accompanying circuit diagram. The lower box marked by dashes envelopes the modulator unit, which was installed in the center of the leather belt. Experienced amateurs will recognize that the modulator operates according to the methods of the well-known Heising system.

This modulator unit was connected with the "silk-hat" transmitter by means of two wires leading to the coils both marked with "4". These coils are used as R.F. chokes to avoid trouble by unwanted radiation. The tubes used were of the triode type 955. The various parts of the transmitter are, as the diagram and the dimensions indicate, of quite tiny dimensions.

Short Wave Scouts

(*Continued from page* 149)

Call	Freq.	Sched.	Location
W2XE	6120 kc.	Relays WABC.	Atlantic B-cast. Corp. N.Y.C.
W2XE	11830 kc.	Relays WABC.	Atlantic B-cast. Corp. N.Y.C.
W2XE	15270 kc.	Relays WABC.	Atlantic B-cast. Corp. N.Y.C.
W8XAL	6060 kc.	Relays WLW.	Crosley Radio Corp., Cincinnati, Ohio.
W3XAU	6060 kc.	Relays WCAU.	Newtown Square, Pa.
W3XAU	9590 kc.	Relays WCAU.	Newtown Square, Pa.
W3XAL	6100 kc.	Relays WJZ.	Nat. Broadcasting Co., Bound Brook, N.J.
W3XAL	17780 kc.	Relays WJZ.	Nat. Broadcasting Co., Bound Brook, N.J.
W9XF	6100 kc.	Relays WENR.	Nat. Broadcasting Co., Chicago, Ill.
W9XAA	6080 kc.	Relays WCFL.	Chicago Fed. Labor, Chicago, Ill.
W4XB	6040 kc.	Relays WIOD.	Miami Beach, Fla.
W1XAL	6040 kc.	World Wide Broadcasting Corp., Univ. Club.	Boston, Mass.
W1XAL	11790 kc.	World Wide Broadcasting Corp., Univ. Club.	Boston. Mass.
W8XK	6140 kc.	Relays KDKA.	West. Electric & Mfg. Co., Pittsburgh, Pa.
W8XK	11870 kc.	Relays KDKA.	West. Electric & Mfg. Co., Pittsburgh, Pa.
W8XK	15210 kc.	Relays KDKA.	West. Electric & Mfg. Co., Pittsburgh, Pa.
W8XK	21540 kc.	Relays KDKA.	West. Electric & Mfg. Co., Pittsburgh, Pa.

CANADA

CJRO	6150 kc.	6-12 p.m.	Jas. Richardson & Sons, Winnipeg, Manitoba, Can.
CJRX	11720 kc.	6-12 p.m.	Jas. Richardson & Sons, Winnipeg. Manitoba. Can.
VE9DN	6005 kc.	11:30 p.m. Saturdays.	Canadian Marconi Co.. Montreal, Quebec, Can.

MEXICO

XEBT	6000 kc.	8 a.m.-1 a.m.	El Buen Tono, Mexico. D.F. (3 blasts on horn)

PANAMA

HP5B	6030 kc.	12 n.-1 p.m. and 8-10:30 p.m.	"Estacion Miramar," P.O. Box 910, Panama.
HP5J	9590 kc.	11:30 a.m.-1 p.m. and 7-10 p.m.	"La Voz de Panama," Panama. Rep. of Panama.

CUBA

COCH	9428 kc.	8 a.m.-12 p.m.	General Broadcasting Co., Havana. Cuba.
COCD	6130 kc.	11 a.m.-12 n. and 7-10 p.m.	"La Voz del Aire," Havana. Cuba.
COCO	6010 kc.	9:30 a.m.-1 p.m. and 7-10 p.m.	P.O. Box 98, Havana, Cuba.

CENTRAL AMERICA

Ti-RCC	6550 kc.	6-7 p.m.	Radioemisora Catolica Costarricense. San Jose. Costa Rica.
TG2X	5940 kc.	9-11 p.m.	"La Voz de la Policia Nacional," Guatemala City, Guatemala.

SOUTH AMERICA

YV1ORSC	5720 kc.	6-11:30 p.m.	"La Voz de Tachira." San Cristobal. Venez.
YV12RM	6300 kc.	8-11 p.m.	"Emisora 24 de Julio." Maracay. Venez.
YV6RV	6520 kc.	11 a.m. till 2 p.m. and 5-10 p.m.	"La Voz de Carobobo." Valencia. Venez.
YV3RC	6150 kc.	11 a.m. till 2 p.m. and 4-10:30 p.m.	"Radiodifusora Venezuela," Caracas. Venez.
HJ3ABH	6010 kc.	11:30 a.m. till 2 p.m. and 6-11 p.m.	"La Voz de la Victor," Bogota. Colombia.
HJ4ABC	6451 kc.	7-10 p.m.	"Ecos del Combeima," Ibague. Colombia.
HJ1ABE	6115 kc.	7:30-9 p.m.	"La Voz de la Laboratorios Fuentes." Cartagena, Colombia.
HJ1ABG	6042 kc.	12-1 p.m. and 6-10:30 p.m.	"Emisora Atlantico." Barranquilla, Col.
HC2RL	6660 kc.	5:45-7:45 p.m. Sundays and 9:15-11:15 p.m. Tuesdays.	Quinta Piedad, Guayaquil, Ecuador.
CEC	10670 kc.	7-8 p.m.	Comp. Internacional de Radio, S.A. Santiago Chile.
OAX4D	5780 kc.	Mon.-Wed.-Sat. 9-11:30 p.m.	All America Cables, Lima, Peru.
OAX4G	6230 kc.	7-10 p.m.	Roberto Grellaud & Cia, Lima, Peru.

DOMINICAN REPUBLIC

HIH	6814 kc.	12:15-2 p.m. and 5:30-9 p.m.	"La Voz de Higuamo," San Pedro de Macoris, Dom. Rp.
HIX	5980 kc.	4:40-5:40 p.m.	Estacion Radiodifusora, HIX. Ciudad Trujillo, Dom. Rep.
HIZ	6316 kc.	5:30-9 p.m.	Estacion Radiodifusora, HIZ, Ciudad Trujillo, Dom. Rep.

EUROPE

EAQ	9860 kc.	5:15-9:30 p.m.	Transradio Espanola, Madrid, Spain.
HAS-3	15370 kc.	Sun. 9-10 a.m.	Radiolabor, Budapest, Hungary.

HAT-4—9125 kc.—Sun. 6-7 p.m. Radiolabor, Budapest, Hungary.
PHI—11730 kc.—8:30-11 a.m. except Tuesday and Wed. Philip's Radio-Huizen, Holland.
PCJ—15220 kc.—(See card.) Philip's Radio, Eindhoven, Holland.
15245 kc.—7-11 a.m. Station Radio Colonial, Paris, France
11880 kc.—4-5 a.m. and 11 a.m. till 6 p.m. Station Radio Colonial, Paris, France.
11715 kc.—6:15-9 p.m. and 11 p.m. till 1 a.m. Station Radio Colonial, Paris, France.
ORK—10330 kc.—2:30-4 p.m Radio Ruysselede, Brussels, Belgium.
2RO-3—9635 kc.—(See card.) E.I.A.R., Rome, Italy.
2RO-4—11810 kc.—10:15 a.m. till 12:30 p.m. and 1:30-2:30 p.m. E.I.A.R., Rome, Italy.
DJC—6020 kc.—11:35 a.m. till 4:35 p.m. and 4:55-10:45 p.m. Deutscher Kurzwellensender, Berlin, Germany.
DJN—9540 kc.—12:30-3 and 3:50-11 a.m. and 4:55-10:45 p.m. Deutscher Kurzwellensender, Berlin, Germany.
DJI—9675 kc.—5-7 p.m. (now DZA). Deutscher Kurzwellensender, Berlin, Germany.
DIQ—10290 kc.—Irregular (now DZC). Deutscher Kurzwellensender, Berlin, Germany.
DJD—11770 kc.—11:35 a.m. till 4:35 p.m. and 4:55-10:45 p.m. Deutscher Kurzwellensender, Berlin, Germany.
DJB—15200 kc.—3:50-11 a.m. Deutscher Kurzwellensender, Berlin, Germany.
DJE—17760 kc.—8:05-11 a.m. Deutscher Kurzwellensender, Berlin, Germany.
HVJ—15120 kc.—10:30-10:45 a.m. Radio Vaticano, Vatican City, Rome, Italy.

AUSTRALIA

VK2ME—9590 kc.—1-3, 5-9, 9:30-11:30 a.m. Sun. "Voice of Australia," Sydney, N.S.W., Australia.
VK3ME—9510 kc.—4-7 a.m., except Sunday, Melbourne, Victoria, Australia.
3LR—9580 kc.—3:15-7:30 a.m. except Sunday. Nat. Broadcasting Service, Lyndhurst, Victoria, Australia.

Harold E. Bissell, Jr., of Toms Road, Stamford, Conn., this month's "Trophy Winner" and the receiver that clinched the Trophy for Mr. Bissell—a 16-tube MIDWEST all-wave set.

Read This Before You Submit "Veri" Cards!

Many listeners submit cards for the "Trophy Contest" which do NOT specifically verify reception. The general form of these cards is: "We acknowledge receipt of your reception report of.....date. Thank you very much." This is NOT a verification!

Unless the card specifically says: "We VERIFY your reception of..... date," or, "Your report of..... date is correct," the card is NOT considered as a "verification" for this contest.

So, be sure that all cards submitted really are "verifications."—Editor

The August issue will contain articles which you can't afford to miss, on such subjects as—Antennas, 5-meter Sets and S-W Broadcast Receivers.

5 and 10 Meter Crystal Transmitter

(*Continued from page* 145)

measuring the plate current of all three stages and the grid current of the last stage. These jacks are located along the lower edge of the panel and a plug is used to switch the two meters from one jack to another.

Capacity Across Cathode Coil Kept High!

With a tritet oscillator it is necessary to keep the capacity across the cathode coil relatively high, in order that low crystal current will be maintained. The capacity here should be at least 140 mmf. The coil is designed so that the condenser plates are nearly all the way in. The other circuits, i.e., the plate circuits of the amplifier stages and oscillator plate circuits, are designed for very low C. Of course, on 10 meters there is more than sufficient excitation for the last 802, but when the final amplifier is operated on 5 meters and the first 802 is a frequency doubler, there is just sufficient excitation to provide a good plate efficiency. When we say *plate efficiency*, we really mean it—because measurements have shown an efficiency of nearly *50 per cent* in the plate circuit of the final amplifier.

The layout of the transmitter is identical to the drawing; the stages follow each other according to their functions. The rear view of the transmitter clearly shows how the parts are placed, and the tube on the extreme right is the amplifier tube, while the small tube, of course, is the 6C6 oscillator. The switching arrangement is progressive; with all three switches in the *off* position we can turn on the oscillator by SW1. This applies voltage to one side of SW2, which is the buffer or doubler plate switch. After the oscillator is properly tuned, SW2 is turned on, this applies voltage to the first 802 and to one side of the amplifier switch. The last operation is to turn SW3 on and adjust the final stage. Then, for turning the transmitter *on* and *off*, during communication, it is only necessary to operate switch SW1, and all three stages may be turned *on* and *off* simultaneously.

Power Supply

The power supply consists of a heavy-duty transformer with a rating of 465 volts each side of center. With the condenser input arrangement and the use of the 83V rectifier tube, the output voltage under full load of the transmitter during operation is 500 volts. The power supply should be capable of delivering at least 150 ma. Two 8 mf. electrolytic condensers are connected in series to form 4 mf. on each side of the filter choke. The voltage is slightly too high to permit the use of a single condenser, because when the transmitter plate circuits are open, the voltage rises to a point where the condensers will break down.

In the *final amplifier* we modulate both the plate and screen on the power supply side of the screen voltage-dropping resistor. A modulator capable of supplying 20 watts of audio should be entirely satisfactory. The transmitter is straight forward in so far as adjustment is concerned, and no "tricks" are necessary in order to maintain efficient and stable operation. The excitation or grid tap for the final 802 is not connected directly to the plate side of the coil. Two or three turns *in* from the plate will give satisfactory results. Some experimentation will be necessary here, because the position which gives optimum efficiency will depend a lot upon the particular tubes in use and also the arrange-

ment of the circuit. When operated on 10 meters, the final amplifier plate current (*off resonance condition*) is approximately 80 ma., and at resonance will drop down to about 10 ma. For 5-meter operation, the *off resonance* plate current of the amplifier with the particular set described, was 75, while the plate current at resonance was slightly over 20 ma.

The antenna coupling arrangement will depend entirely upon the antenna system used with this transmitter. Any of the *matched impedance* type antenna or tuned feeder type may be coupled through a small coil. Direct coupling is not recommended, unless the antenna is a single-wire feed affair.

Complete data on the coils will be found in the coil table. As for results, this transmitter gave excellent performance on both 5 and 10 meters and proved, especially on 5 meters, that a crystal-controlled carrier or any really stable carrier, produces a better all-around signal for any given amount of input. With a transmitter of this type, the power is concentrated in one narrow band of frequencies where on a transmitter having a considerable degree of frequency modulation we are spreading our carrier over a wide band and results, of course, are poor reception. On 10 meters it is absolutely necessary that a transmitter be crystal-controlled. While this transmitter does not have the power output which can be compared with larger types, it is entirely possible to "work" the entire world with it, under favorable conditions.

Parts List For 5-10 Transmitter

1—140 mmf. variable condenser, National.
1—50 mmf. variable condenser, National.
2—split stator condensers, 50 mmf. per section, National.
11—.001 mf. mica condensers, 1,000 volt, Cornell-Dubilier.
3—100 mmf. mica condensers, 1,000 volt, Cornell-Dubilier.
4—8 mf. 500-volt electrolytic condensers, Cornell-Dubilier.
1—50,000 ohm resistor, 20 watts, Electrad.
3—50,000 ohm resistors, 50 watt, Electrad.
1—3,000 ohm resistor, 50 watts, Electrad.
1—25,000 ohm 50 watt resistor, Electrad.
4—2.5 mh. R.F. chokes, National.
1—5 prong isolantite socket, National.
2—7 prong (large) isolantite socket, National.
4—closed circuit jacks, I.C.A.
4—toggle switches, I.C.A.
1—power transformer, Thordarson.
1—150 ma., 20 henry (approx.) filter choke, Thordarson.
1—20-meter crystal, Bliley.
1—6C6, R.C.A. Radiotron.
2—802's, R.C.A. Radiotron.
1—83V, R.C.A. Radiotron.
1—0-50 ma. meter (small), Triplett.
1—0-100 ma. meter (small), Triplett.
3—4" dials, Crowe.
1—10x17x3" electralloy chassis, I.C.A.
1—10½x19x⅛" crackel-finished electralloy panel, I.C.A.
2—phone plugs, I.C.A.
1—crystal microphone, Astatic.

Coil Data For 5-10 Transmitter

L1—6 turns, 1¼" diameter.
L2—5 turns, 1⅜" diameter.
L3—10 meters, 7 turns 1⅓" diameter. 5 meters, 4 turns ¾" diameter.
L4—10 meters, 8 turns 1⅓" diameter. 5 meters, 4 turns 1" diameter.

Note:—All coils are wound with 12 tinned copper wire. L2, 3, and 4 are spaced to a length of 1¾". L1 is spaced the diameter of the wire. L5 will depend entirely upon the type of antenna used.

The 804 Power Oscillator

(*Continued from page* 137)

and plate circuits or arrangements should be made to facilitate the measurement of the screen and plate currents at any particular moment. It is always advisable, of course, to incorporate the meters directly in the circuit, especially in an oscillator of this type, in order that the current may be checked constantly. This oscillator, as was the 830-B amplifier, is mounted on a 7¾" x 17" x 1" board which has been given a coating of black paint in order to improve its appearance. Of course, a metal base or chassis may be used should the builder desire to go to the extra expense.

How to Mount Power Tube

The two condensers and the coil form are mounted on stand-off insulators in order to prevent any leakage through the board, remembering that occasionally wood may prove to be a very poor R.F. insulator. The tube is mounted horizontally, as can be seen in the photograph. The base support consists of an aluminum angle-bracket which holds the socket and to which are connected the screen and suppressor by-pass condensers. This metal plate is connected to the ground support or B negative. In order to support the other end of the tube, we have constructed a small block of wood, which has been slightly rounded out at the top. The tube merely lies on this wooden support. Do not attempt to support the tube by the plate cap, and also do not make a rigid mechanical connection to this cap; the connection should be flexible in order to allow for expansion of the glass. If the tube were mounted solid in some form of receptacle, considerable strain may be present in the glass after the tube has heated.

Coupling to Antenna

No antenna coupling arrangement has been specified, other than a single-turn link, which is coupled to the input of the 830-B amplifier. When used as a complete transmitter alone, this oscillator was link-coupled to an antenna tuning unit.

In no case was the screen current allowed to exceed 30 ma., and the plate current was always kept in the neighborhood of 90 ma. These values provided maximum operating efficiency and there is no reason for exceeding them.

Parts List for 804 Oscillator

2—250 mmf. condensers, National, T.M.S.
1—grooved coil form 2½" in diameter. 26 turns, National XR-10
5—.001 mf. mica condensers, 1—2,500 W.V., 4—1,000 W.V., Cornell-Dubilier
1—10,000 ohm 25-watt resistor, I.R.C.
1—30,000 ohm 75-watt resistor, I.R.C. (with 1 slider)
1—2.5 mh. R.F.C., National
2—5 prong isolantite socket, National
1—Single-pole double-throw midget switch, I.C.A.
1—0-50 ma. meter, Triplett
1—0-150 ma. meter, Triplett
1—quartz crystal, Bliley
8—stand-off insulators, National GS-5
1—804 pentode R.C.A. Radiotron
2—pointer type knobs, Crowe
1—base board 7¾ x 17 x 1" (painted black)

World-Wide S-W Review

(*Continued from page* 147)

understand the principle of operation.

It is stated by the writer, W. P. Cargill (G5LR) that the unit will operate quite well on either 14 or 7 mcs. by simply changing the crystal. He says: "The cost of the 14 mc. crystal is no more than that of a frequency-doubler stage, and this arrangement has certain advantages—it is compact, has only one tuning control and is ready for use at once, without neutralizing or other adjustments, and to change from one frequency to the other takes but a few seconds."

For the plate coil, 12 turns are used on 7 mcs. and 8 turns on 14 mcs., but the smaller coil functions quite well on both bands, with a decrease of about 5 per cent in the output on 7 mc. as compared with that when using the larger coil. Using one coil only, the frequency may be quickly changed by plugging in the other crystal and shifting one dial.

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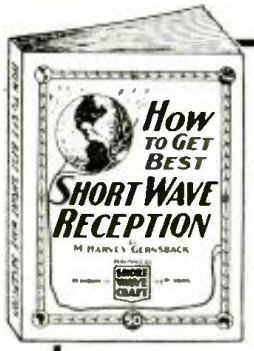

How to Get Best Short-Wave Reception

By M. HARVEY GERNSBACK

This book tells you everything you ever wanted to know about short-wave reception.

The author, a professional radio listener and radio fan for many years, gives you his long experience in radio reception and all that goes with it.

Why is one radio listener enabled to pull in stations from all over the globe, even small 100 watters, 10,000 miles away, and why is it that the next fellow, with a much better and more expensive equipment, can only pull in the powerful stations that any child can get without much ado?

The reason is intimate knowledge of short waves and how they behave. Here are the chapters of this new book:

1. What are Short Waves and what can the listener hear on a short-wave receiver or converter?
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3. How to identify short-wave stations.
4. Seasonal changes in short-wave reception.
5. Types of receivers for short-wave reception.
6. Aerial systems for short-wave receivers.
7. Verifications from short-wave stations.

The book makes excellent reading matter. There are many tricks in short-wave reception that even some of the "old-timers" do not know. Be sure to get it.

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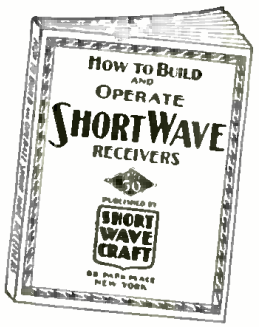

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Partial List of Contents

Getting Started in Short Waves—the fundamentals of electricity. Symbols the Short Hand of Radio—how to read schematic diagrams. Short Wave Coils—various types and kinds in making them.

Short Wave Aerials—the points that determine a good aerial from an inefficient one.

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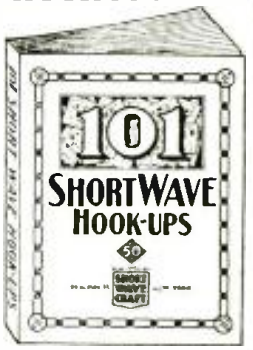
To be sure, all of the important sets which have appeared in print during the past five years are in this valuable book. Sets such as the Doerle, Dinanore, the "19" Twinplex, Oscillodyne, Denton "Stand-by," Megadyne Triplex 2, "Globe Trotter," 2-Tube Superhet, Minidyne, "Loop" Receiver, "Doerle" 2-tube Battery, "Doerle" 3-tube Battery, "Doerle" 2-tube A.C., "Doerle" 3-tube A.C., Doerle "Signal Gripper," Duo R.F. 4-tube Receiver, The Sargent 9-33 Tapped Coil Receiver, Globe-Girdler 7, The 2-Tube "Champ"—2 Tubes Equal 3, Ham-Band "2-Tube Pee-Wee" Wyeth All-Way 6, Denton Economy 3, 2-Tube "Regenerative-Oscillodyne" will be found here, with full descriptions. In many cases, we have also included a picture hook-up for those who do not wish to follow the regular symbolic hook-up, but wish to have a regular wiring diagram.

This is a very handy volume, especially for those "fans" who wish to study the best sets in the short-wave art, from one tube up to ten tubes.



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If you intend to become a licensed code operator, if you wish to take up phone work eventually—this is the book you must get.

Partial List of Contents

Ways of learning the code. A system of sending and receiving with necessary drill words is supplied so that you may work with approved methods. Concise authoritative definitions of radio terms, units and laws, brief descriptions of commonly used pieces of radio equipment. This chapter gives the working terminology of the radio operator. Graphic symbols are used to indicate the various parts of radio circuits. General radio theory particularly as it applies to the beginner. The electron theory is briefly given, then waves—their creation, propagation and reception. Fundamental laws of electric circuits, particularly those used in radio are explained next and typical basic circuits are analyzed. Descriptions of modern receivers that are being used with success by amateurs. You are told how to build and operate these sets. Amateur transmitters. Diagrams with specifications are furnished so construction is made easy. Power equipment that may be used with transmitters and receivers, rectifiers, filters, batteries, etc. Regulations that apply to amateur operators. Appendix which contains the International "Q" signals, conversion tables for reference purposes, etc.

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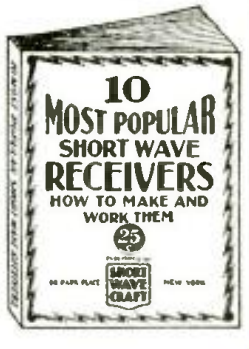
Louis Martin's Idea of A GOOD S-W RECEIVER, by Louis Martin.



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Can 5 Meter Waves Extend Beyond the Horizon?

(*Continued from page* 138)

sensitive detector of the receiver at the distance given on the ordinate. It is interesting to note, however, that the slope of this curve falls off rapidly as the height of the transmitter increases, particularly above 2,000 feet.

Since the early days of 5-meter working it has been known that a slight bending of the waves occurs, resulting in slightly larger distances being covered. The same thing appears to occur with light rays, for local inhabitants claim that the Eddystone lighthouse can be seen from the summit of Cader Idris (2,927 ft.) on a clear day, a distance of 170 miles. Since the writer has never been up Cader Idris on a clear day he cannot substantiate this claim! Fig. 2 shows the effect of this bending property.

Extremely long distances have recently been covered. The Berlin television transmissions from the Brocken Mountains have been received daily by the English Post Office Engineers, and the German authorities have recently been receiving enthusiastic reports from amateurs in Buenos Aires and New York. In the last two cases the reliability of the reception has not been maintained.

In the United States of America, consistent two-way communcation between the Blue Hill Observatory of Harvard University and West Hartford has been regularly obtained at a distance of ninety-three miles. Scheduled reception on 234 days out of 239 days has occurred, and the conditions were such as to make it a commercial proposition. Farther, Chicago and New York City have been linked by 5-meters, the distance in this case being no less than 720 miles!

Turning to our own country, we had Mr. Douglas Walters (G5CV) radiating a small signal from the top of Snowdon and being picked up 207 miles away. Further, the Eddystone transmitter (G6SL), situated at Birmingham, 400 feet above sea level, has been received South of London, a distance of 110 miles. The latter is not a freak result, since the transmitter is situated in the heart of a big city, as the accompanying photograph shows. The theoretical reception distances of the last two stations have been indicated on the curve of Fig. 1.

Two questions arise out of the above reports. First, what atmospheric conditions cause such results, and, secondly, what can we learn from these pioneering experiments?

Readers are well acquainted with the indirect ray method of reception used on ordinary short wavelengths. On the broadcast band the direct ray becomes attenuated after fifty to eighty miles—on short waves it disappears after about twenty miles, but signals reappear in the form of an indirect wave, perhaps 5,000 miles away. It is not too fantastic to presume that on the ultra-short wave-lengths, where the direct ray is purely optical, that the indirect ray appears at such a distance that it only comes back to this earth during rare atmospheric conditions.

It seems to the writer that these long-distance records should be divided into two categories, namely:—

(*a*) Reception from 20 to 100 miles.

(*b*) Reception at great distances, i.e., above 1,000 miles.

Taking case (*a*), we have some valuable information available from the American experiments, covering reception up to 100 miles. These experiments have shown that stratification of the lower atmosphere bends the ultra-short waves over a much larger path of reception. Photographic recordings taken over a long interval of time have shown that there is a close relation between the periods of large temperature inversion in the lower atmosphere and the periods of very strongly received signals. The term "temperature inversion" should be defined.

Normally, as is generally known, the temperature of the air decreases, or has a

(*Continued on page* 189)

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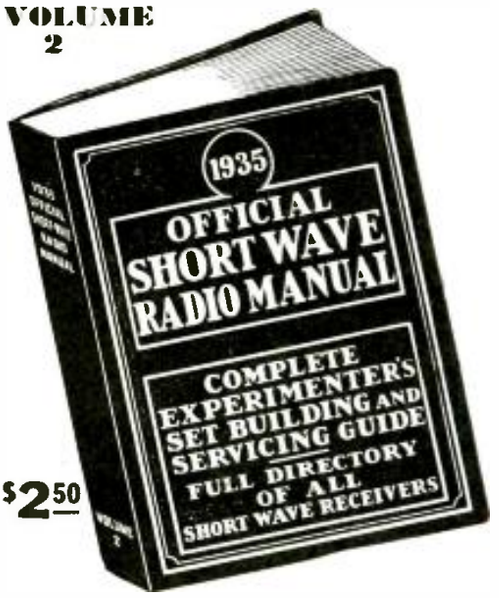

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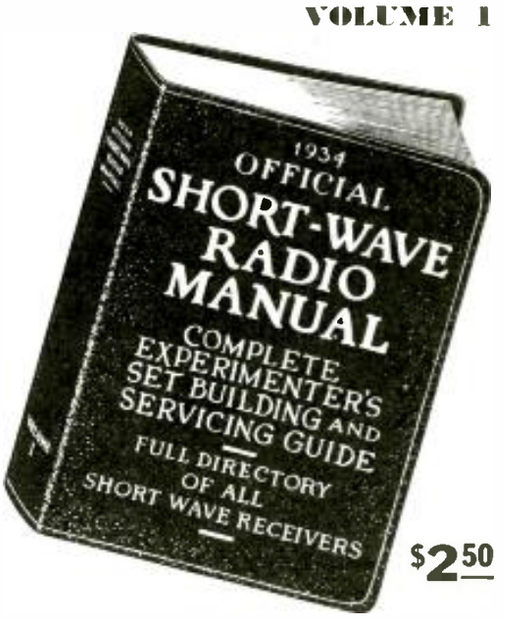

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5 Meter Waves Beyond the Horizon

(*Continued from page* 187)

lapse rate of 1 deg. C. for every 300 feet rise in elevation. Sometimes, however, the temperature does not fall as rapidly as this, in fact it may rise, and a temperature inversion is said to take place. To put it simply, a layer of warm air on top of a layer of cool air causes good reception conditions. It was found that if a subnormal lapse rate occurred between 900 and 7,500 feet high, then a large signal was obtained over the path of reception. When the air mass conditions were not so heterogeneous and a normal temperature lapse rate occurred, signals dropped back to very low levels. Comparison of hourly readings taken shows that signal strength is lowest at mid-day and high during the period 10 p.m. to 7 a.m. So clearly do the signal strength and lapse rate measurements coincide that it is even suggested that 5-meter receivers and transmitters may be used in the future by the meteorologist. In the case of extremely long distances being covered (*b*), the information available is very vague. Some authorities have suggested that the sky wave pierces the upper ionized layers and is finally reflected back from some heavenly body!

However, it is highly probable that a highly ionized layer does exist well above the Heaviside and Appleton layers, as shown in Fig. 3 (a), and signals are not often heard, either because of the limited number of listening posts or else the layer is insufficiently ionized for reflection. Alternately, two layers a few hundred miles above the earth's surface could cause distant signals by a combination of refraction and reflection, as indicated in Fig. 3 (*b*).

Which of these thories is correct time and experiment alone will tell, and up to the time of writing we can draw the following conclusions for an elevated transmitter of relatively high power (25-50 watts):—

(*a*) 5-meter signals give good reliable signals for police working, etc., up to five or six miles in densely populated areas.

(*b*) Thirty miles is the normal reliable distance over which reception can be obtained under usual circumstances, i.e., over flat, open country.

(*c*) Signals up to 100 miles can be received only if the lapse rate of the lower atmosphere is subnormal.

(*d*) Greater distances are obtained during rare atmospheric conditions.

Wireless World, London.

The All-Wave "Aircraft 3"

(*Continued from page* 141)

creased with the variable condenser all the way out.

The 140 mmf. condenser and the 325 mmf. condenser have the ends of the last plates slightly nicked so that when the condensers are all the way open they become *short-circuited*. Hence, when using the set on the *broadcast* band or on the short waves, the 325 mmf. is opened fully, thus being *shorted* out of the circuit. On long-wave operation, the 140 mmf. condenser is shorted out in the same way, permitting the 325 mmf. variable to tune the long-wave coil and bring in the desired long-wave stations.

Grid-leak Detection Used

The other features of the circuit are more or less conventional, including grid-leak detection and the standard method of regeneration control. Although it is possible to operate a small magnetic speaker on a great many of the strong stations with this set, it has been designed especially for *earphone* reception.

Construction of Set

An aluminum panel was selected, 7⅞"x 8 11/16"x1/16" in thickness, fastened to a wood base or sub-panel by means of wood screws.

The three tube sockets are mounted in a row on the wood base; also, the grid-leak and condenser and a few other small fixed condensers. The other parts are mounted on the aluminum panel. Be sure to insulate the 325 mmf. variable from the panel. The illustration shows the arrangement very clearly. The plug-in coil can be seen at

(*Continued on page* 191)

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I consider myself belonging to the following class (put an X in correct space): Short Wave Experimenter ☐ Short Wave Fan ☐ Radio Engineer ☐ Student ☐

I own the following radio equipment:

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Name .....

Address .....

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The SHORT WAVE LEAGUE was founded in 1930. Honorary Directors are as follows:

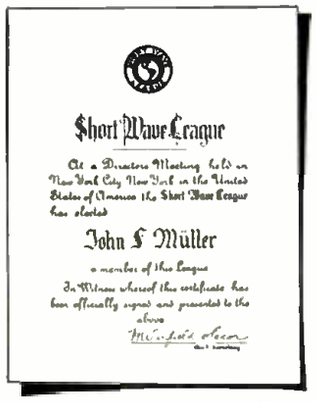
Dr. Lee de Forest, John L. Reinartz, D. E. Replogle, Hollis Baird, E. T. Somerset, Baron Manfred von Ardenne, Hugo Gernsback, Executive Secretary.

The SHORT WAVE LEAGUE is a scientific membership organization for the promotion of the short wave art. There are no dues, no fees, no initiations, in connection with the LEAGUE. No one makes any money from it; no one derives any salary. The only income which the LEAGUE has is from its short wave essentials. **A pamphlet setting forth the LEAGUE'S numerous aspirations and purposes will be sent to anyone on receipt of a 3c stamp to cover postage.**

FREE MEMBERSHIP CERTIFICATE

As soon as you are enrolled as a member, a beautiful certificate with the LEAGUE'S seal will be sent to you, providing 10c in stamps or coin is sent for mailing charges.

Members are entitled to preferential discounts when buying radio merchandise from numerous firms who have agreed to allow lower prices to all SHORT WAVE LEAGUE members.



If you wish your name engraved on the Free membership certificate, as illustrated above, please send 25c to cover cost.

SHORT WAVE ESSENTIALS LISTED HERE SOLD ONLY TO SHORT WAVE LEAGUE MEMBERS

They cannot be bought by anyone unless he has already enrolled as one of the members of the SHORT WAVE LEAGUE or signs the blank on this page (which automatically enrolls him as a member, always provided that he is a short wave experimenter, a short wave fan, radio engineer, radio student, etc.).

Inasmuch as the LEAGUE is international, it makes no difference whether you are a citizen of the United States or any other country. The LEAGUE is open to all.

SHORT WAVE LEAGUE LETTERHEADS

A beautiful letterhead has been designed for members' correspondence. It is the official letterhead for all members. The letterhead is invaluable when it becomes necessary to deal with the radio industry, mail order houses, radio manufacturers, and the like; as many houses have offered to give members who write on the LEAGUE'S letterhead a preferential discount. The letterhead is also absolutely essential when writing for verification to radio stations either here or abroad. It automatically gives you a professional standing.

A—SHORT WAVE LEAGUE letterheads, per 100 ..... 50c

OFFICIAL SHORT WAVE LISTENER MAGAZINE

The finest magazine of its kind ever published—totally different in get-up and contents from any other. Contains the largest listing of short wave stations in the world, up-to-the-minute, including "Police," "Television" and short-wave stations, as well as a special list of the star short-wave stations with their frequencies and call letters. Also contains photos and descriptions of short-wave broadcasting stations in various parts of the world with photos of short wave studio artists—How to locate "weak" distance stations, and other hints for the "short-wave listener"—Question and Answer Department for the "listener"—Silver Cup Trophy for best photo of readers' listening "Posts," etc

B—Official Short Wave Listener Magazine ..... Prepaid 15c

RADIO MAP OF THE WORLD AND STATION FINDER

The finest device of its kind published. The world's map on heavy board is divided into 23 sections, while the rotary disc shows you immediately the exact time in any foreign country. Invaluable in logging foreign stations. Also gives call letters assigned to all nations. Size 11"x22".

C—Radio Map of the World and Station Finder ..... Prepaid 25c

GLOBE OF THE WORLD

This highly important essential is an ornament for every den or study. It is a globe, 6 in. in diameter, printed in fifteen colors, glazed in such a way that it can be washed. This globe helps you to intelligently log your foreign stations. The base is of solid walnut, and the semi-meridian of a nickel-like metal. Entire device substantially made, and will give an attractive appearance to every station, emphasizing the long-distance work of the operator.

D—Globe of the World ..... Prepaid 89c

SHORT WAVE LEAGUE LAPEL BUTTON

This beautiful button is made in hard enamel in four colors, red, white, blue and gold. It measures three quarters of an inch in diameter. By wearing this button, other members will recognize you and it will give you a professional air. Made in bronze, gold filled, *not plated*. Must be seen to be appreciated.

E—SHORT WAVE LEAGUE lapel button ..... Prepaid 35c

EE—SHORT WAVE LEAGUE lapel button, like the one described above but in solid gold ..... Prepaid $2.00

SHORT WAVE LEAGUE SEALS

These seals or stickers are executed in three colors and measure 1¼ in. in diameter, and are gummed on one side. They are used by members to affix to stationery, letterheads, envelopes, postal cards and the like. The seal signifies that you are a member of the SHORT WAVE LEAGUE. Sold in 25 lots or multiples only.

G—SHORT WAVE LEAGUE seals ..... per 25, Prepaid 15c

SHORT WAVE MAP OF THE WORLD

This beautiful map, measuring 18x26 in. and printed in 18 colors is indispensable when hung in sight or placed "under the glass" on the table or wall of the short wave enthusiast. It contains a wealth of information such as distances to all parts of the world, political nature of the country in which a broadcast station is located, etc., and from the manner in which the map is blocked off gives the time in different parts of the world at a glance.

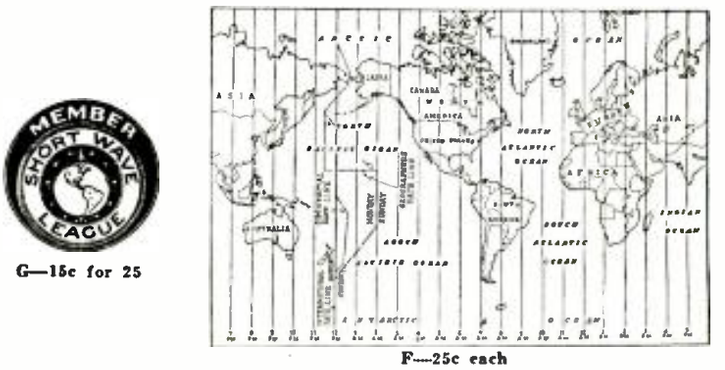
F—SHORT WAVE Map of the World ..... Prepaid 25c

PLEASE NOTE THAT ABOVE ESSENTIALS ARE SOLD ONLY TO MEMBERS OF THE LEAGUE—NOT TO NON-MEMBERS WITH EXCEPTION OF ITEM B.

Send all orders for short wave essentials to SHORT WAVE LEAGUE, 99-101 Hudson Street, New York City.

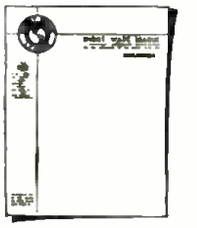
If you do not wish to mutilate the magazine, you may copy either or both coupons on a sheet of paper.

SHORT WAVE LEAGUE 99-101 Hudson St., New York, N. Y.



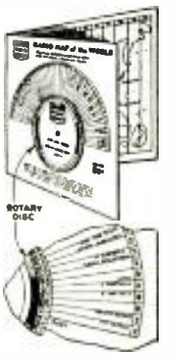
F—25c each

G—15c for 25



A—50c per 100

B—15c per copy



C—25c each

D—89c each

E—35c each

SHORT WAVE LEAGUE, 99-101 Hudson Street, New York, N. Y.
Gentlemen:
I am already an enrolled member in the SHORT WAVE LEAGUE ☐
I am a new member and attach my application to this coupon ☐
Please send me the following short wave essentials as listed in this advertisement:

.....

.....

.....

.....

for which I enclose $ ..... herewith.
(The LEAGUE accepts money order, cash or new U. S. Stamps in any denomination. Register cash and stamps.)

Name .....
Address .....
City and State .....
Country .....
7-36

Please mention SHORT WAVE CRAFT when writing advertisers

• Index to Advertisers •

(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)

"Aircraft 3"

(*Continued from page* 189)

the upper left, with the *station selector* at the top center. The four battery leads come out of the panel at the lower right.

Complete List of Parts Required for the All Wave Aircraft Three

C1—Hammarlund Star Midget Variable Condenser type SM-15
C2—Cornell-Dubilier Mica Condenser, .00005 mf., type 5W-5Q5
C3—Hammarlund Midget Variable Condenser, type MC-140-M
C4—Hammarlund Midget Variable Condenser, type MC-325-M
C5—Cornell-Dubilier Mica Condenser, .0001 mf., type 2W-5T1
C6—Cornell-Dubilier Mica Condenser, .0005 mf., type 5W-5T5
C7—Cornell-Dubilier "Cub" Tubular Condenser, .01 mf. type BA-4S1
C8—Cornell-Dubilier "Cub" Tubular Condenser, .01 mf. type BA-4S1
C9—Cornell-Dubilier "Dwarf Tiger" Condenser, .005 mf., type DT-6D5
C10—Cornell-Dubilier "Cub" Tubular Condenser, 1 mf., type BA-4P1
C11—Cornell-Dubilier Mica Condenser, .0005 mf., type 5W-5T5
R1—I.R.C. Metallized Resistor, 1 meg., ½ watt
R2—Electrad Regeneration Control Potentiometer with Switch (Sw2), 75,000 ohms, type 202
R3—I.R.C. Metallized Resistor, 170,000 ohms, ½ watt
R4—I.R.C. Metallized Resistor, 1 meg., ½ watt
R5—I.R.C. Metallized Resistor, 170,000 ohms, ½ watt
R6—I.R.C. Metallized Resistor, 1 meg., ½ watt
R7—Electrad Filament Control, 30 ohm, type 270-W
SW1—Single-Pole, Single-Throw, Rotary Switch
SW2—Switch on Electrad Potentiometer R2
BP1—Antenna Binding Post, Eby
BP2—Ground Post, Fahnstock Clip (Fastens directly to panel)
V1, V2, V3—30-type Tubes
L1—Set of Five Hammarlund 4-prong Plug-in Coils, covering 17 to 550 meters
L1—Special Long-wave Coil (See directions in text)
1—Four-prong Alden Coil Socket
3—4-prong Wafer Sockets for tubes
1—Four lead battery Cable with different colored wires
1—Blan Aluminum Panel 7⅞"x8 11/16"x1/16"
1—Wood Base (sub-panel)
1—Carrying Case, (see sketch)
5—Knobs
1—Bar Knob
1—Crowe Calibrated Dial and Crowe Nameplates
1—pair of light-weight Acme earphones, with ear cushions
2—Compact type 45-volt "B" Batteries
2—Compact type 1½ volt dry cell ("A" batteries). Eveready
1—Roll Hook-up Wire, push-back type
Assorted Hardware, wood screws etc.

Short Wave Scout News

(*Continued from page* 156)

At this time, this station can be heard almost any morning at 6 a.m., E.S.T.

DZB, 10.04 mc. heard very well on the 24 at 3.15 p.m., E.S.T. Also HI3U, Santiago City, Dom. Rep. on 6.38 mc. at 6.25 mc., coming in a good QSA5, R8.

At 6:35 p.m., E.S.T. on 24th March, W2XAD on 15.33 mc. sent a special test program which was received very well.

TI8WS, Puntarenas, "Ecos del Pacifico." on 7.55 mc. heard with a fair signal, but badly QRm'd and plenty atmospherics. Time 9:28 p.m., E.S.T.

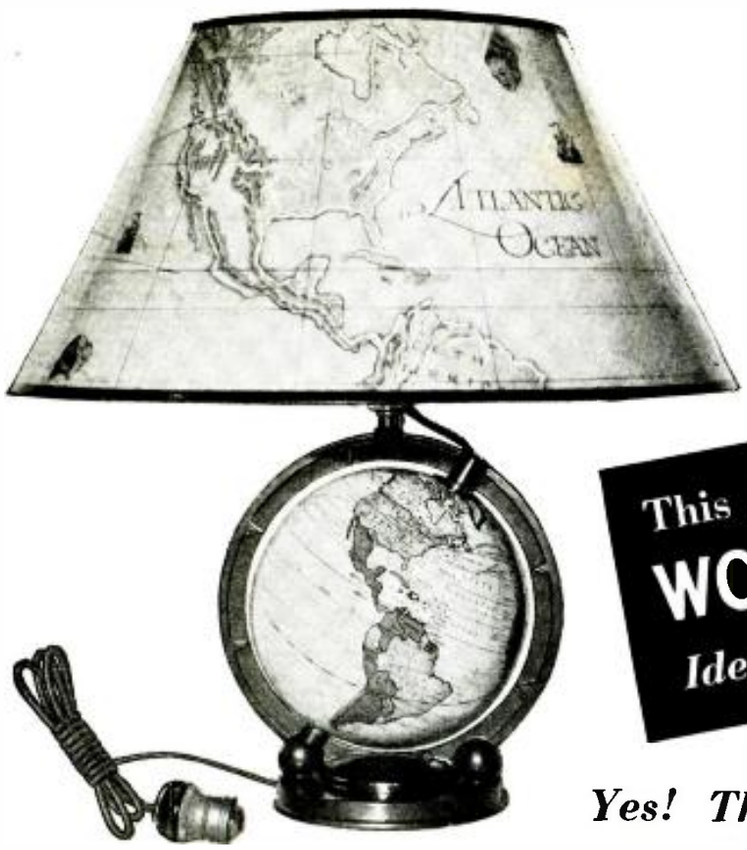
TIEP, "La Voz del Tropico," 6.71 mc. received very well at 9:35 p.m., E.S.T. on March 24, QSA 5 R9.

CO9WR, Sancti Spiritus, Cuba, on 6.28 mc. with an R9 signal at 10 p.m., E.S.T. on 28th March. The address given was P. O. Box 85, Sancti Spiritus, Cuba.

VE9HX, Halifax, 6.11 mc. was heard at 7:30 p.m., badly heterodyned by another Spanish station on the same frequency, HJ4ABP.

RNE, Radio Centre, Moscow, on 12 mc. now heard in the afternoons, and was received here with R8 signal, XECR, 7.38 mc. came in with a beautiful signal QSA5R8.

ALBERT J. YOUNG,
General Post Office,
Port of Spain,
Trinidad, B.W.I.



Free!

This *useful* and *ornamental* WORLD-GLOBE LAMP *Ideal for short wave fans*

Yes! The globe revolves!

NEVER in the six years that SHORT WAVE CRAFT has been published, have we found *anything* that is as *useful* and *ornamental* as the WORLD-GLOBE LAMP we now offer free to our readers.

This beautiful WORLD-GLOBE LAMP measures 17½" high. The attractively colored shade, with nautical and map designs, is 8" in height and 16" in diameter. It is made of fine quality parchment, highly glazed, to assure long life. A slightly damp cloth quickly removes dust from the shade. The 6¼" globe, printed in many colors, has a *full meridian,* and *rotates.* Hundreds of names—countries, cities, rivers, oceans and others are *clearly printed on the globe.*

Another feature on this WORLD-GLOBE LAMP is the *movable hour scale* found at the north pole. This permits determining the correct time in any part of the world.

The metal parts are finished in antique bronze. A piece of heavy green felt is glued under the base, therefore it may be placed *anywhere,* without fear of marring table, desk, etc.

The weight of the WORLD-GLOBE LAMP is nearly three pounds. When packed for shipping, six pounds.

Here is the way to get this beautiful prize. Fill in the coupon in the left hand corner—cut it out and mail it to us together with your remittance of $2.50. You will receive a full year's subscription (12 months) to SHORT WAVE CRAFT—*the greatest short-wave magazine in the world today.* In addition, we will send you absolutely FREE one of these handsome WORLD-GLOBE LAMPS. *Old subscribers* may renew their subscription now for another year following expiration of their present one and still receive this WORLD-GLOBE LAMP.

Only a limited number of WORLD-GLOBE LAMPS are available. Take advantage of this offer *without delay* in order to insure receiving *your free gift.* RUSH THE COUPON TODAY.

MAIL COUPON TODAY!

Just a Word About SHORT WAVE CRAFT

The magazine you are now reading clearly indicates the contents of future issues. Over a quarter of a MILLION of the most successful SHORT WAVE technicians *in all parts of the world obtained their radio education through the*

Regular departments appearing in each issue

Hugo Gernsback's Editorials—*forward looking*
Radio Amateur Course—*complete series.*
World Wide Short Wave Review—*exclusive.*
Short Wave Scout News.
What's New in Short Wave Apparatus.
Constructional articles on *tested and approved sets.*
Short Wave Stations of the World—*corrected monthly.*
Short Wave Questions and Answers—*educational.*
Short Waves and Long Raves—our readers' FORUM.
Short Wave "Kinks"—with prize offerings.
Short Wave League—discussions of our members.
When to Listen In—naming the best foreign programs.

Every issue contains over 150 photographs and wiring diagrams. *Read* SHORT WAVE CRAFT *every month to keep abreast with new things happening in this field.*

How to Order Your WORLD-GLOBE LAMP

Simply fill in the coupon at the left and mail together with check or money order. Register letter if cash or coin is sent. To cover shipping charges on WORLD-GLOBE LAMP, add to your remittance the amount indicated. If you are located: East of the Mississippi add 47 cents; Between the Mississippi and the West Coast add 70 cents; Foreign Countries add 84 cents. Any excess remittance will be refunded.

SHORT WAVE CRAFT
99 HUDSON STREET **NEW YORK, N. Y.**

SHORT WAVE CRAFT SWC-736
99 Hudson Street, New York, N. Y.

Gentlemen: Enclosed you will find my remittance of $2.50 (plus ... cents shipping charges) for which enter my subscription for SHORT WAVE CRAFT for one year (12 issues). This amount entitles me to a WORLD-GLOBE LAMP free. See chart next to coupon for shipping charges on WORLD-GLOBE LAMP.

( ) Enclosed find my remittance of $2.50, please send me the WORLD-GLOBE LAMP by express, collect.

Name .....

Address .....

City ..... State .....

Send remittance in form of check or money order—register letter if it contains cash, stamps, or currency.

EAGLE BROS. CO., PRINTERS

HAYNES R·S·R

5-TUBE RECEIVER

2½ TO 555 METERS

HAS BEEN ACCEPTED AS THE "IDEAL EXPERIMENTER'S SET"

ENTHUSIASTIC reports from the hundreds of R-S-R users testify to the consistent, fine foreign reception these receivers are delivering all over the country.

NOT just another radio, but a really fine regenerative receiver, properly engineered from beginning to end. Smooth, stable regenerative control with electrical bandspread over its entire tremendous tuning range plus extremely sensitive super-regenerative action below 15 meters. Whether it is long distance foreign reception you want or a 40 megacycle, high fidelity local broadcast—a flip of a switch and "you're there" with the HAYNES R-S-R.

Look at These Features!

- ★ Self contained power supply.
- ★ Multi-band switching (no plug-in coils) down to 15 meters.
- ★ High efficiency plug-in coils below 15 meters with super-regeneration.
- ★ Electrical plus mechanical band-spread.
- ★ Dual regeneration control.
- ★ Hiss control on super-regeneration.
- ★ Perfect logging and absolute stability on super-regeneration.
- ★ Dynamic speaker and earphone reception.
- ★ Tubes used—2 6K7's, 1 MG25Z5, 1 MG43, and 1 76.

EDITORIAL COMMENTS

The New York Sun; Mar. 7th:—

Circuits worthy of space are not numerous this season, but the R-S-R is an exception. When demonstrated to the editors, the receiver functioned so smoothly that it was obvious its many features would appeal to the home experimenter. Here in one cabinet is a receiver that will reach from the top of the broadcast band down through all the short-wave channels to the ultra short-wave band, where the two-way police systems are active and where television will soon be carving its way.—Ed. Note.

Radio News; May '36:—

"A Real Go-Getter—Under test in two New York City Listening Posts, the receiver considerably exceeded expectations. Short-wave stations were tuned in, all on the loudspeaker, from Spain, Italy, England, France, Germany, Colombia, Cuba, Canada (and of course the U.S.), on the 25-, 31- and 49-meter bands. Amateur stations were tuned in on all bands, the most distant being on the 20- and 75-meter bands."

Short Wave News & Technical Review; May '36:—

"It (the R-S-R) is a well-designed regenerative and super-regenerative circuit with exceptionally fine control and, given a fair location and good antenna, excellent long distance reception can be accomplished with it on all of the short wave bands . . . It is a whole lot of receiver for very little money."

—And Many Others, Too Numerous To List.

These opinions are the result of actual unbiased tests made by the editors of these publications.

NOTE

The R-S-R is already being copied. We expected this. When a job is well done it is always imitated. We could produce the R-S-R a little cheaper by cutting corners here and there; using a cheaper speaker; etc.
This, however, is not our idea of good economy. The R-S-R is built to Mr. Haynes' exact specifications and every part we use in it has been approved by him.
There is only ONE authentic HAYNES R-S-R and it is built by RACO.

ORDER DIRECT FROM THIS AD

Complete R-S-R set; wired, tested, with 5 tubes, speaker, and cabinet. Ready to plug in and operate..... **$24.65**

Complete kit; unwired, including dynamic speaker, power supply and wired switch-coil assembly (less cabinet and tubes)..... **$14.95**

All Electric 2-Tube Transceiver

For the ham or beginner looking for a permanent installation, completely A.C. operated, we recommend this 3 in 1 balanced combination transceiver.

The tubes used are 1—53 dual purpose triode, 1—80 rectifier. Absolutely humless when working 5 and 10 meter bands. Extremely sensitive, and extra ordinary long tuning and receiving range.

Complete Kit of Parts, less tubes, cabinet, unwired	$8.95
Wired and Assembled	2.50
Crystallized Cabinet	1.50
Kit of 2 Tubes	1.10

Wiring diagram and instructions with each Kit.

3-Tube Portable Transceiver

Completely self contained unity coupled 5 meter transceiver using two 19 tubes and one 30. An unusually powerful, long range battery transceiver possessing excellent stability and good modulation.

Push-pull 19 oscillator with two stage push-pull class B audio in both sending and receiving positions giving true 5 tube performance. Batteries used: 3-45 V.B. and 2 No. 6 dry cells.

Complete kit, less cabinet, tubes, unwired	$10.95
Assembled, wired	3.00
Cabinet	1.50
3 matched tubes	1.65

A 3-TUBE POWER TRANSCEIVER That Tops Them All!

Here is the latest model of the well-known RACO 5 and 10 meter power transceiver which has made such a remarkable record for long distance, high quality transmission. Uses two 42's and an 80 with 20 watts input to plates. Operates direct from 110 volt A.C. line. Separate regeneration and volume controls on reception; modulation control on transmission. Gives powerful speaker reception, or automatic earphone jack cuts out speaker. This job is in a class by itself among transceivers and is becoming too well known to require additional praise by us.

Complete kit, less speaker, tubes and cabinet, unwired	$11.50
Cabinet and speaker	2.75
Wiring	3.50
3 tubes	1.60

RADIO CONSTRUCTORS LABS.

RACO PRODUCTS

136 LIBERTY STREET
DEPT. 5W-7 NEW YORK CITY
EXPORT DEPT.—105 HUDSON ST.

J. E. Smith
President
National Radio
Institute

I WILL HELP YOU

START A SPARE TIME OR FULL TIME RADIO SERVICE BUSINESS

WITHOUT CAPITAL

HERE ARE A FEW EXAMPLES OF THE KIND OF MONEY I TRAIN MY MEN TO MAKE

Now Has Fine Business

"I have a fine business servicing sets. I am making a good living—seldom have a week under $40. If it wasn't for N. R. I., I would probably be tramping the streets.

Glenn C. King,
46 Division Ave., S.,
Grand Rapids, Mich.

$15 a Week in Spare Time

"My spare time earnings average $15 a week. Since studying with you I have earned about $7,000 to $8,000 in Radio. I owe my success to the good method of the N. R. I."

C. N. Heffelfinger,
R. F. D. No. 1,
Temple, Penna.

Best Equipped Shop in Town

"In the last year, we have moved our Radio shop and we now have the best equipped Radio Repair Shop in East Toledo. We also have a shop at 624 Milton Street. We have three fellows working for us."

W. R. Brown,
309 Main St.,
Toledo, Ohio.

You Get PRACTICAL EXPERIENCE with Radio Equipment I Give You

I'll show you how to use my special Radio equipment for conducting experiments and building circuits which illustrate important principles used in such well-known sets as Westinghouse, General Electric, Philco, R.C.A., Victor, Atwater-Kent, and others. You work out with your own hands many of the things you read in our lesson books. This 50-50 method of training makes learning at home easy, interesting, fascinating, intensely practical. You learn how sets work, why they work, how to make them work.

Free Book Tells How. Mail Coupon!

The world-wide use of Radio sets for home entertainment has made many opportunities for you to have a spare time or full time Radio service business of your own. The day you enroll I start sending you Extra Money Job Sheets which quickly show you how to do Radio repair jobs common in most every neighborhood. Many N. R. I. men make $5, $10, $15 a week extra in spare time while learning. I show you how to install and service all types of receiving sets. I give you Radio equipment and instructions for conducting experiments for building circuits and testing equipment, and for making tests that will give you broad practical Radio experience. Clip the coupon below and get my free 64-page book, "Rich Rewards in Radio"—it gives you a full story of the success of N. R. I. students and graduates, and tells how to start a spare time or full time Radio service business on money made in spare time while learning.

Many N. R. I. Men Make $5, $10, $15 a Week Extra in Spare Time While Learning

Many of the twenty million sets now in use are less than 50% efficient. I will show you how to cash in on this condition. I will show you the plans and ideas that have enabled many others to make $5, $10, $15 a week in spare time while learning. George W. Honert, 248 Water St., Ligonier, Ind., made over $500 from the start of the Course to its completion.

Get Ready Now for a Radio Business of Your Own and for Jobs Like These

Broadcasting stations use engineers, operators, station managers, and pay up to $5,000 a year. Radio manufacturers use testers, inspectors, foremen, engineers, servicemen and buyers and pay up to $6,000 a year. Radio dealers and jobbers employ hundreds of servicemen, salesmen, managers, and pay up to $75 a week. Television promises many good jobs soon. Television is leaving the laboratory in an impressive way. One million dollars is being spent on two stations. Receiving sets are being designed and built. New opportunities—many of them—are right ahead. My book tells you of the opportunities in these fields, also in aviation Radio, police Radio, short wave Radio, automobile Radio and other new branches of this fast growing industry. Get it.

I Train You at Home in Your Spare Time

Hold your job until you're ready for another. Give me only part of your spare time. You do not need a high school or college education. Hundreds with only a common school education have won bigger pay through N. R. I. Graduate J. A. Vaughn jumped from $35 to $100 a week. Fred Dubuque doubled his earnings in one year. The National Radio Institute is the Pioneer and World's Largest organization devoted exclusively to training men by Home Study for good jobs in the Radio industry.

You Must Be Satisfied

I will give you an agreement to refund every penny of your money if you are not satisfied with my Lesson and Instruction Service when you complete my Training. And I'll not only give you thorough training in Radio principles, practical experience in building and servicing sets, but also Advanced Specialized Training in the type of Radio work you choose.

Get My Free Book of Facts

Mail the coupon for "Rich Rewards in Radio." It's free to any ambitious fellow over 15 years old. It tells you about Radio's spare time and full time opportunities; about my training; what others who have taken it are doing and making. Mail coupon now in an envelope, or paste it on a 1c post card.

J. E. SMITH, Pres.
Dept. 6GB3
National Radio Institute
Washington, D. C.

Get My FREE LESSON on Radio Servicing Tips

I'll prove that my Training gives practical, money-making information, that it is easy to understand—that it is just *what you need* to master Radio. My sample lesson text, "Radio Receiver Troubles—their Cause and Remedy" covers a long list of Radio receiver troubles in A.C., D.C., battery, universal, auto, T.R.F., super-heterodyne, all-wave, and other types of sets. And a cross reference system gives you the probable cause and a quick way to locate and remedy these set troubles. A special section is devoted to receiver check-up, alignment, balancing, neutralizing and testing. Get this lesson *Free*. No obligation. *Just mail coupon.*

MAIL COUPON NOW

This Coupon is Good For One FREE COPY OF MY NEW BOOK

J. E. SMITH, *President*,
National Radio Institute,
Dept. 6GB3,
Washington, D. C.

Dear Mr. Smith: Without obligation, send me the Sample Lesson and your free book about spare time and full time Radio opportunities, and how I can train for them at home in spare time. (Please print plainly.)

Name.....*Age*.....

Address.....

City.....*State*.....14x1

Find out about the World Famous Course that Pays for Itself

If you do not want to cut this cover—simply write us on a post card