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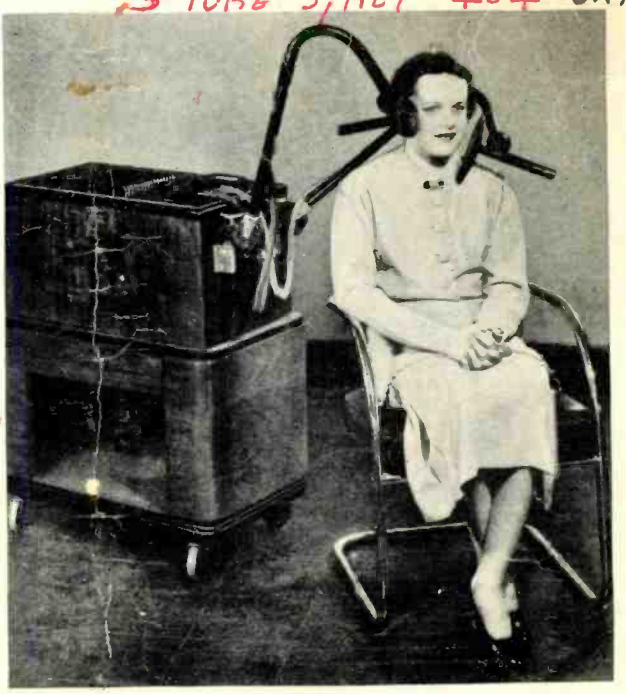
JANUARY MAGIC EYE CIRCUIT 491
6A8 6K7 6N7
3 TUBE S/HET 484



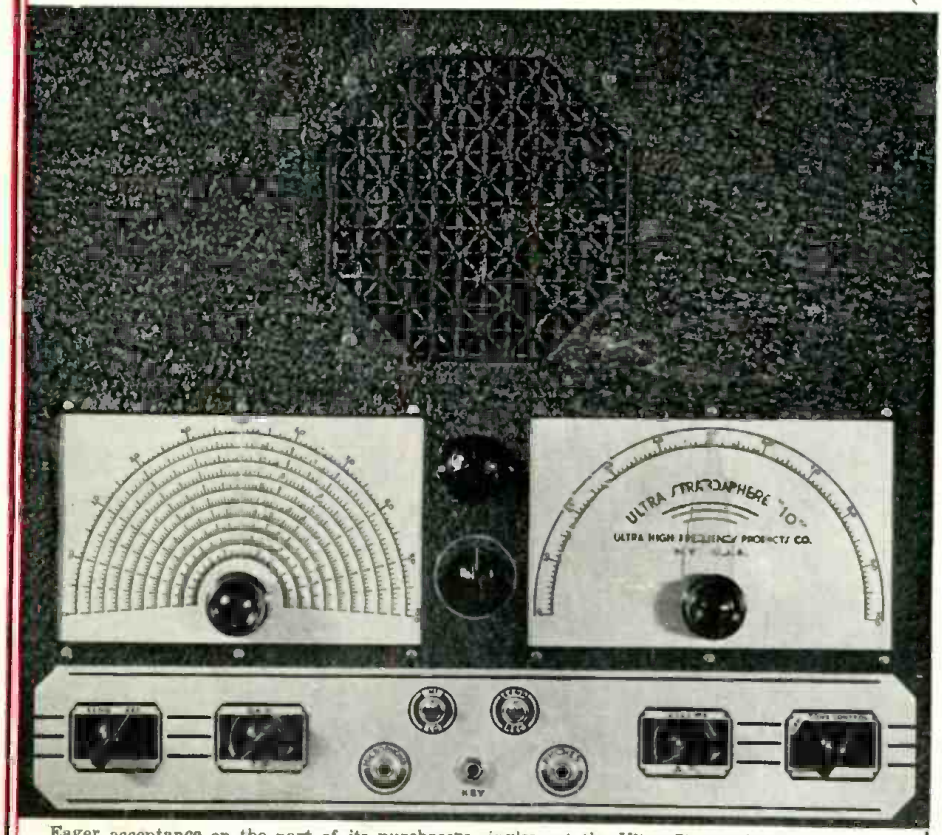
See Page 472

25¢ IN U.S. AND CANADA

HUGO GERNSBACK Editor

The Radio Experimenter's Magazine

THE NEW 1938 ULTRA STRATOSPHERE "10"
2½ to 4000 METER TRANS-RECEIVER (RECEIVES 2½ to 4000 METERS TRANSMITS 2½ and 5 METERS)



Eager acceptance on the part of its purchasers singles out the Ultra Stratosphere "10" as the value of the year. The number of letters of appreciation was far greater than normally expected to prove that dollar for dollar the many purchasers of the Ultra Stratosphere "10" found it a wise investment. Long lists of verified stations received with this amazing unit will make even the most successful D.X. listener enthusiastic of its performance. Described in detail Page 295, October issue *Short Wave & Television*.

- *Ten tubes.
- 1—6K7 Regenerative Tuned R.F. Amplifier.
- 1—6J7 Regenerative Detector.
- 1—6J5G Super Regenerative Detector & Transmitting Osc.
- 2—6C5 P.P. 1st Audio stage.
- 2—25L6 P.P. Beam power output stage & modulators.
- 2—25Z6 Parallel Rectifiers.
- 1—6G5 Electronic tuning indicator & R meter.
- *Receives from 2½ to 4000 meters.
- *Transmits on 2½ & 5 meters.
- *8" Dynamic Speaker.
- *Calibrated R.F. Gain Control.
- *A.F. Gain Control.
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- *Separate electrical bandspread.
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- *Built-in A.C. & D.C. Power supply.

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Set of 8 coils—15 to 550 meters	2.20
Set of 4 coils—450 to 4000 meters	2.00
American S. B. Handmike	2.95
Wired and tested extra	4.50

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SHORT WAVE AND TELEVISION

JANUARY - 1938

Vol. VIII No. 9

HUGO GERNSBACK, Editor
H. WINFIELD SECOR, Manag. Editor
GEORGE W. SHUART, Assoc. Editor

The Next issue comes out January 1st

STAR AUTHORS THIS MONTH:

Gerald S. Morris

C. W. Palmer

G. W. Shuart, W2AMN

Raymond P. Adams

Jim Kirk, W6DEG

Joe Miller

IN THE FEBRUARY ISSUE:

3-Tube Exciter which can be used as a simple transmitter. George W. Shuart, W2AMN.

Ultra High Frequency Converter, 4 to 11 meters, for use with any all-wave receiver.

How to build a simple VT. Peak Voltmeter Unit.

A simple Induction Phone System—how to build it. G. F. Huether, W2IHO.

How To Become a Television Engineer, H. W. Secor

Building A Lie Detector

IN THIS ISSUE:

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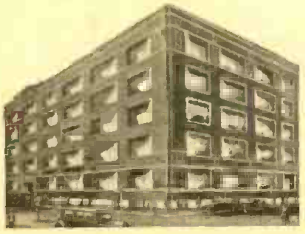

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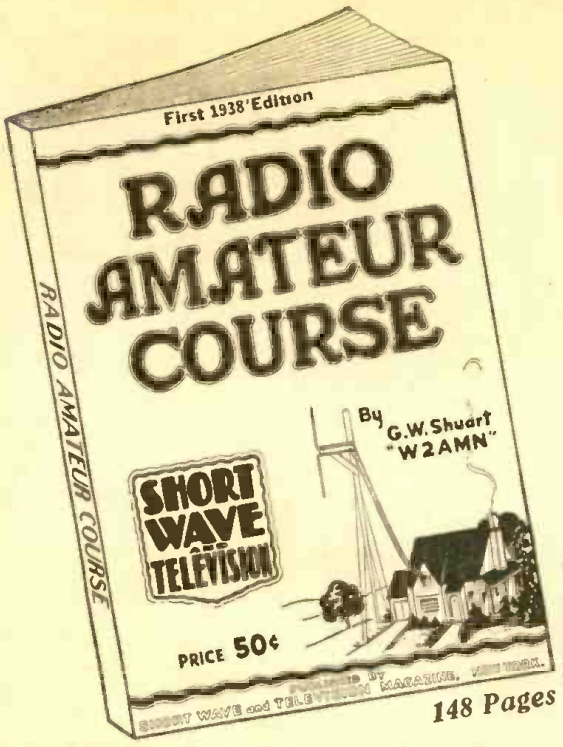

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SHORT WAVE AND TELEVISION

HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

LAW ENFORCEMENT and Short Wave Radio

By GERALD S. MORRIS

SUPERINTENDENT TELEGRAPH BUREAU, NEW YORK CITY POLICE DEPARTMENT

Gerald S. Morris, Chief Officer of the Telegraph Bureau, in charge of all electrical systems of communication of the New York Police Department.

● THE law enforcement agencies of the United States of America owe a debt to radio. While the science and profession of law enforcement is as old as civilization, until but a few short years ago police departments throughout the world had suffered from one serious handicap. This handicap was the difficulty that precinct or city headquarters had in communicating with such patrolmen as might be nearest the scene of a reported crime.

Back in the earliest days of history, men were dispatched from the headquarters to the scene of the crime afoot or on horseback. At a somewhat later date signal trumpets by day or signal fires by night were used as signals. More recently and within the memory of everyone, the means of signalling to the patrolman on duty was a flashing light upon the stanchion which supported the police call box. This, you will see, was a vast improvement. However, it was necessary that the patrolman see this light before he came to the box, perhaps several blocks, telephoned headquarters, was connected to the right supervising officer and then received his instructions. These, perhaps, sent him back to where he came from or near it. During the time all this procedure was occurring it was sometimes possible for the criminal to make his escape.

With the advent of short-wave police radio all this was changed. Headquarters was in instant direct communication with every mobile unit throughout the area under its jurisdiction. Perhaps a clearer idea of just how efficiently radio serves law and order can be had by a brief description of what transpires when a situation arises where a citizen wants a policeman, in a city which has a police radio system. A civilian merely goes to his telephone and says: "I want a policeman." His call is immediately connected to the switchboard at headquarters and through that directly to the radio room where it is taken by a dispatcher. In our headquarters this dispatcher sits at a large horse-shoe shaped table, beneath the glass top of which is a map of the five boroughs of Greater New York City, laid out in police precincts and detective divisions. On top of the glass are numbered discs, each of which represents a police car or detective cruiser. The dispatcher receiving the call writes the name and address of the complainant and the nature of his complaint on a small slip of paper. At the same time he notices which cars and cruisers are at liberty in that vicinity. He notes their numbers likewise on the paper, which he immediately hands to another dispatcher seated at the microphone.

While it takes many words to describe this simple procedure, it is actually accomplished in much less than a half a minute. The dispatcher at the microphone throws a control switch which puts one of New York City's three police radio stations on the air. He uses whichever station is nearest the location where the complaint originated. An audio oscillator note is then sounded to attract the attention of the patrolmen and detectives in their cars, and after a few seconds of this the address of the complainant and a code signal disclosing the nature of the complaint is transmitted, together with the numbers of the cars which are specifically assigned to respond to the alarm.

It is also a police regulation that any cruisers or patrol cars within five blocks of the address given shall likewise respond. All cars assigned to patrol are required to telephone their reports into headquarters as soon as possible after they have made their investigation or arrest.

Despite the crowded conditions of the city streets, the average time which elapses between the receipt of the citizen's complaint and the report of the cars assigned to the alarm is less than five minutes. This speed has resulted in a decrease in most major crimes as well as many minor ones such as the ringing of false fire alarms. The latter, though considered minor, is quite important as a great number of firemen sustain serious injury in responding to false alarms. For that reason a police car is now required to respond to every alarm of fire throughout the city.

In addition to the reduction of crimes per capita, there has been an increase in the percentage of arrests per crime committed.

Arrests made and property recovered by members of the police force assigned to Radio Motor Patrol cars:

YEAR	*ARRESTS*	*PROPERTY RECOVERED*
1932	1029	$ 258,691.63
1933	3330	$1,082,522.00
1934	4641	$1,482,750.00
1935	4946	$1,308,700.00
1936	4932	$1,162,539.00

As will be seen from the foregoing, a greater amount of property is likewise being daily restored to the citizens from whom

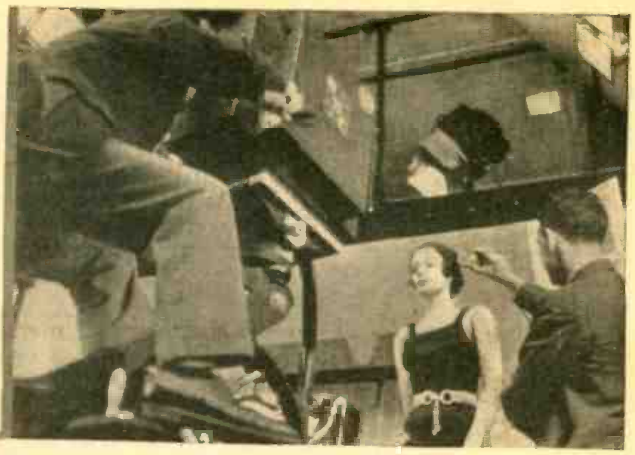
Thirteenth of a Series of "Guest" Editorials

(*Continued on page* 505)

Short Wave

→ Right—Here you see "Miss Patience" reporting for work before the Iconoscope camera in NBC's television studio. The man at the right is not holding a watch to the lady's ear. He's using a light meter to measure the amount of illumination on her imperturbable face.

← Left—This isn't an oil well derrick! It's the Chrysler Building! It's an exact electrical reproduction of the top of the New York skyscraper where the CBS new television transmitter is to be located.



→ Right—Tubes for Television. Gilbert Seldas (left), television program director, and D. Peter Goldmark, chief television engineer, inspect the largest and smallest water-cooled tubes used in the new CBS television transmitter. The large power tube has 15,000 watts peak output and is three feet long.

Below—In the new CBS television transmitter, this transformer, one of ten, weighs 6215 pounds and is cooled by 21½ pounds of oil. 120 gallons of water per minute are needed to cool other parts of the transmitter, a complete air conditioning unit cools the water. ↓

↑ Above—Margaret Erill, harpist, photographed in the television studio at Radio City during demonstration by NBC and RCA of the first practical larger-screen television. An image approximately three-by-four feet was shown. Eight complete scene shifts and more than 40 different camera positions were involved.

↑ Above—One of the CBS television experts is here seen trying out one of the image pick-up cameras, which is provided with a crane and seat so that the operator can swing around while televising the players in the studio. Frequently two cameras are used, one for close-ups and one for long shots.

→ Right—A high-frequency wave in the RCA Labs., when a power of 1.5 kilowatts at a wavelength of 3.3 meters is used in certain oscillator set-ups. The tubes used were water-cooled units connected in a push-pull circuit.

Pictorial

Left—This snappy looking musical ensemble is Ciriaco Ortiz's Tango Band, which is heard regularly over the famous Buenos Aires stations LRX and LRU.

→

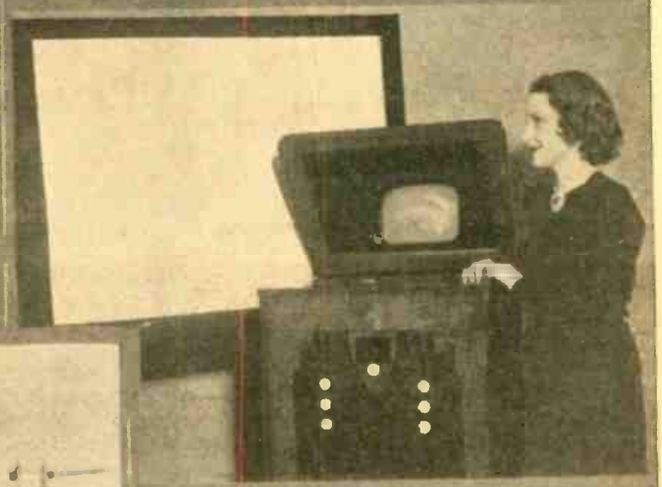
Right—Even the animals are now being treated by S-W Diathermy as this picture testifies. The apparatus in use is of German design. In view of the excellent results now obtained in treating human ills by short waves, why not treat ailing animals with them?

Right—Brain Waves! Thanks to the research of the Electro-Medical Laboratory Inc., of Holliston, Mass., science is now enabled to record "brain-waves" of human beings. This apparatus uses cathode ray tubes.

Photo courtesy of Allen DuMont Labs.

←

These two photos show the new RCA large image television apparatus. Betty Goodwin, NBC television announcer, is seen in both pictures. The left one shows the projector, while below we see the small image receiver compared with the new 3 x 4 ft. screen. ↓



Above—Short Waves in Japan. This photo shows how the aerial systems have been specially designed to be earthquake-proof at the Nagoya station.

Right—Scene in a short-wave broadcasting studio in Tokyo—a girls' orchestra playing popular tunes on pre-modern instruments as a novelty.

Left—Miss Memechiyo, hostess-announcer of the Japanese radio broadcasting center in Tokyo, at the microphone. Possibly many listeners have heard her pleasant voice.

The cover picture here reproduced, shows how the high-frequency field is applied to the head.

Human Ills Cured

By New Short Wave Technique

This month's cover

New method of treating abdominal ailments with short-waves—the high frequency field extends from one electrode to the other, and induces a vibratory action in that part of the body subjected to this field.

● THE accompanying diagrams show new methods of applying short-waves for the alleviation of human ills. The photo immediately above, which corresponds to our cover, illustrates how certain ailments of the head may be treated by placing the high-frequency electrodes on either side of the head. Many physicians who have experimented with short-wave diathermy, have achieved some very interesting and important results. Several interviews the editors have had with a number of electro-therapeutists have shown great enthusiasm for this new method of treating different types of ailments which would not yield to treatment by older methods. A considerable amount of experimentation is being carried on in order to determine just which frequencies are best suited for treating different ailments. Two different methods are illustrated in the accompanying photos for applying the high frequency field to a patient. The first employs two condenser or other type electrodes which are placed, for example, side by side over the abdomen. Here the high-frequency electrical field produced between the electrodes causes induced currents to be set up in the vicinity of the electrodes.

A heating effect may or may not be noticeable to the patient, and as pointed out in a recent article in this magazine, some of the experts now believe that the benefits derived from treatments by short-wave diathermy, are not due to the heat induced, but rather to the high frequency vibration set up in the cells constituting the nerve and muscle structure under treatment.

One of the photos, that at the extreme left, shows another method of applying the high frequency or short-wave magnetic field to a patient; here the H.F.

(*Continued on page* 505)

Here is a different technique in applying the high frequency field, the currents circulating in the coil producing a field which passes through the body.

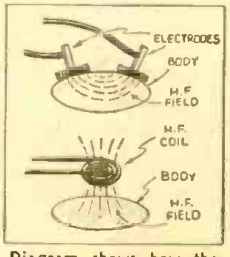
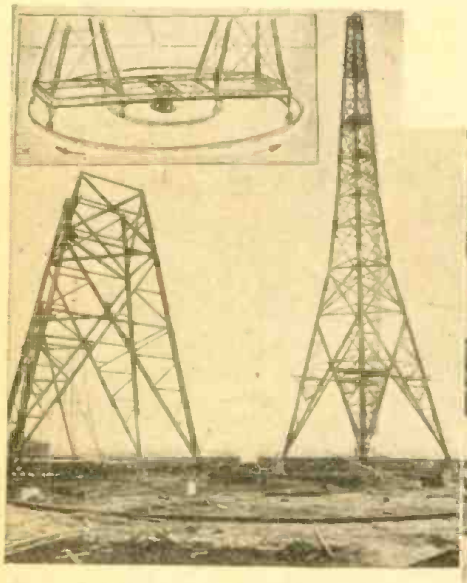


Diagram shows how the H.F. field acts on a body placed in proximity to the electrodes.

PCJ, Holland's, New Revolving Beam Antenna



Above—This photo shows the masts partly completed, and provides a very good view of the two rails; the outer one ready, the inner one half completed.

Center—This print very clearly shows the iron pivot, partly sunk into a concrete foundation. Around this pivot the old system of undercarriers, united by a steel bridge, will rotate.

This photo shows the two aerial masts in course of construction. The remarkable construction on top of the right one is part of the "beam" installation. This idea was first suggested by an American engineer.

● STATION PCJ, the well-known Holland short-wave broadcaster, has recently raised its power to 60 kw. making it one of the most powerful, if not the strongest short-wave station in the world, and not only this, but PCJ is sporting a new revolving beam antenna. The accompanying photos show the steel structure which supports the new beam antenna and as the diagram shows, the whole antenna can be rotated on circular tracks by remote control from the operator's station.

The aerial masts are built on heavy steel carriers mounted on wheels. The wheels of these carriers run on a circular track, which differs from the average railway track only in the much heavier construction of the rails and the greater distance between them. These steel carriers are united by a bridge, turning around its center (which is also the center

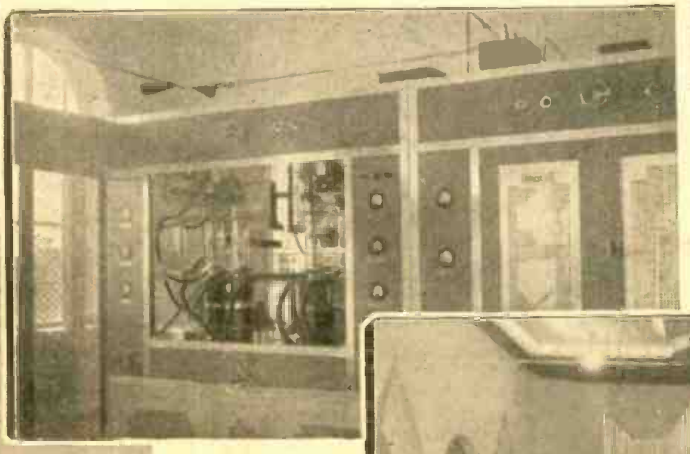
(*Continued on page* 505)

When 2RO—ROME—Goes On the Air

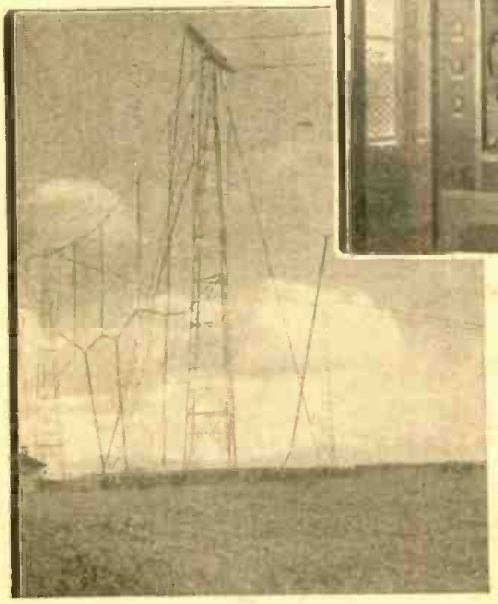
A number of interesting photos of artists, as well as of the studios and aerial system of station 2RO, Rome, Italy, familiar to all short-wave listeners.

Alva Simonetti, soprano, featured artist on American Hour—2RO, Rome.

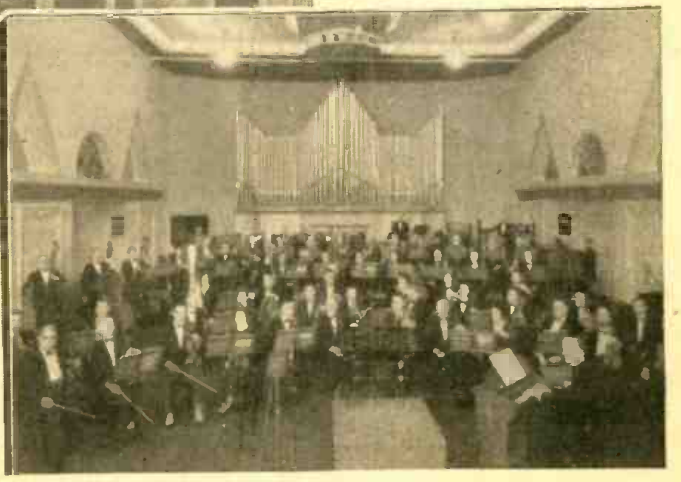
Enzo Aita, tenor, featured artist on American Hour—2RO, Rome.



Right—25 meter final amplifier (pre-final and modulator on right)



← The tower in foreground supports directional antenna to North America. 25 and 31 meter-dipoles are hung from left-hand tower.



→ Grand orchestra in studio "B," second largest in Rome. It is used mainly for operas, symphony and choral concerts.

● ONE of the old standbys for short-wave listeners is 2RO. This station has been broadcasting for a good many years and has always been well heard in this country, either on 11.81 or 9.635 mc.

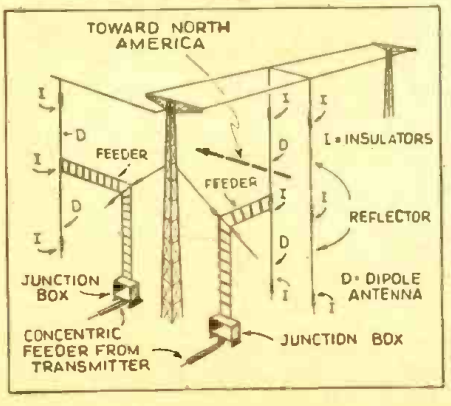
During our afternoon hours the station generally relays the programs of various Italian long-wave stations. Interspersed with these programs, however, are numerous news or propaganda broadcasts in a variety of languages. Special programs for North America are broadcast in English from 6:15-7:45 p.m. on Mondays, Wednesdays and Fridays. Programs for South America go out from 6:20 to 7:45 p.m. on Tuesdays, Thursdays and Saturdays. An English news bulletin is broadcast daily except Sunday from 6-6:15 p.m. (E.S.T.). All of these broadcasts are on 9.635 mc. By far the greater part of the programs broadcast are opera presentations in which the Italians excel.

One of the outstanding features of 2RO is its women announcers, whose voices are familiar the world over. The regular announcer, or should we say *announceress*, of the American Hour is Lisa Sergio, who is in the United States at the present time studying American broadcasting practice. She has appeared as guest announcer on many of the NBC programs.

Broadcasting in Italy, as in most European countries, is a state controlled monopoly and no advertising is permitted on the air.

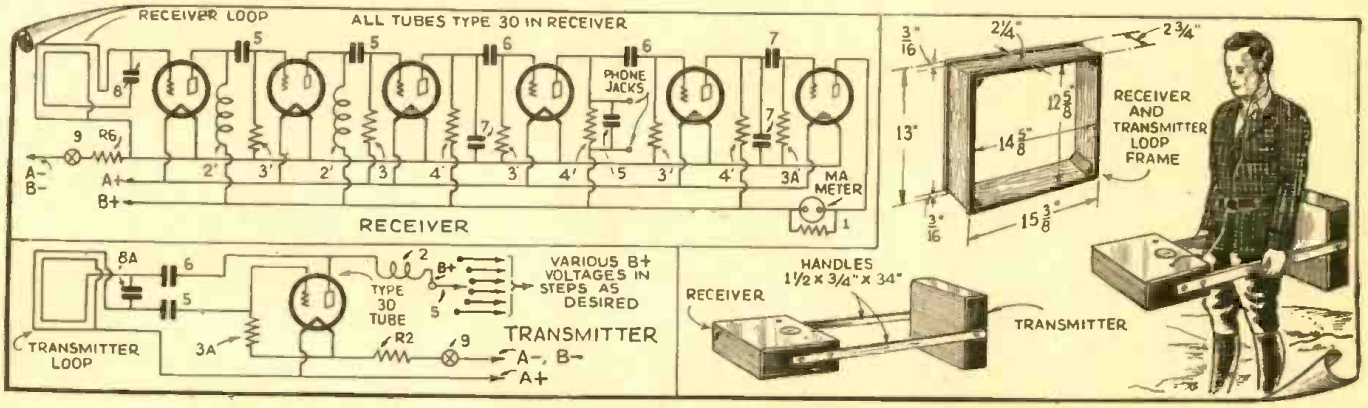
At present, the power of the transmitter is about 25 kw., but several new 100 kw. transmitters and an entirely new aerial system are in process of construction. When these are completed, the Italian station will probably be the most powerful in the world.

Below—Masts support directional arrays. Each directional array consists of a vertical dipole with its associated reflectors.



Below—Rome studios of the Italian Broadcasting System (E.I.A.R.).

New Experiments With Radio Apparatus



Another electrical use for radio parts, and a valuable one, is illustrated above. It comprises a simple pipe and ore locator.

Ore Locator

● A TREMENDOUS field for experimenters today is that of locating ore veins in the ground, as well as buried pipes, by an adaptation of some radio device. One idea is shown in the diagram herewith, using 2 volt tubes such as the 30 type (or the new RK-42, 1½ V. type), a single tube acting as the transmitter and six tubes being used in the receiver. The transmitting and receiving aerials are wound in the form of loops and the size of the loop frames are given in the drawing. The details of the parts appear in the following list.

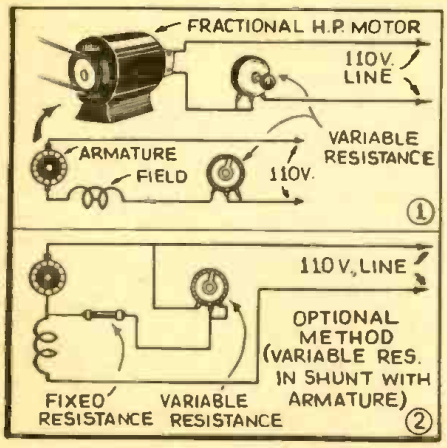
Key No.
"1" One milliammeter (d.c.) with sufficient shunt resistance to allow approximately ¾ full scale deflection with receiver switch "On" and transmitter switch "Off." Meter case should be bakelite.
"2" R.F. Chokes. 1500 turns each, of No. 34 copper wire, enamel covered. Random wound or "duo-lateral."
"3" One megohm resistors.
"3A" Three megohm resistor.
"4" One-tenth megohm resistor.
"5" Fixed condensers; capacity, .0005 mf.
"6" Fixed condensers; capacity, .006 mf.
"7" Fixed condensers; capacity, .001 mf.
"8" Adjuster, trimmer type condenser, capacity, 0 to .0005 mf.
"SA" Fixed condenser; capacity, .00025 mf.
"9" Switches, push-pull type preferred.
"10" Tip-jacks for phone connection. Phone jack can be used.
"S" Four point, single gang, selector switch.
"R1" 10 ohm filament resistor.
"R2" 5 ohms.
"R4" 2.5 ohms.
"R6" 2 ohms. (Use R1 for one type 30 tube. R2 for one type 31 tube. R4 for four type 30 tubes. R5 for five type 30 tubes. These resistors can be made up of 30 Nichrome wire, wound on a fibre strip. This wire has approximately one ohm resistance for each 1.6 inch of length. The length to use, therefore, for the various resistors is: R1, 16 inches. R2, 8 inches. R4, four inches. R5, 3½ inches.) The loop frames are wound with 80 turns No. 33 D.C.C. copper wire center-tapped.

In adjusting the apparatus, the transmitter and receiver fields will cancel at approximately right-angles to each other and no signals will be picked up by the receiver with this setting. The presence of metal in the transmitting field will disturb the balance and a note will be heard in the phones, and the tube voltmeter will register the strength of the disturbance.

Motor Speed Control With Variable Resistors

● THE problem which many electrical and radio experimenters are frequently confronted with is that of controlling or varying the speed of a small motor. The diagram shows two different ways in which this may be done, the first hook-up showing the connection of a variable resistance or rheostat in series with the motor. The second hook-up shown is a very useful one, especially where there is a varying load on the motor; here the variable resistance (and in some cases a fixed resistor also) is connected across the armature of the motor.

A third variation might involve both methods, the two variable resistors being controlled by one shaft and a single knob. The connection shown in the diagram is for a series-wound motor, one of the most common types met with in small motors. The rheostats especially adapted to this work are available on the market and they may be had in sizes of from 25 watts up to 1,000 watts. For controlling very small motors, a potentiometer of fairly low resistance may be used, but those wound with fine wire will usually heat up too much to be of practical value.

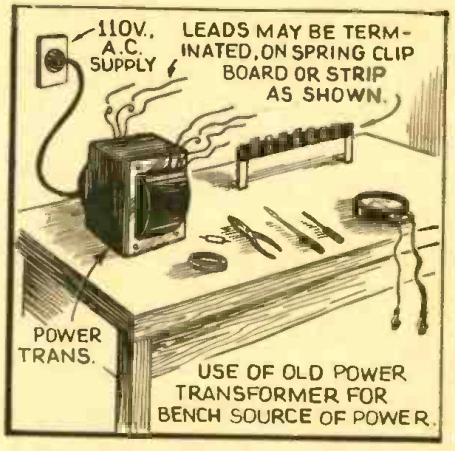


Two different ways in which to use variable resistors for controlling the speed of small motors are shown above.

Use for Old Power Transformers

● OLD power transformers will find a very useful rôle on the test bench, as a source of supply for different testing voltages. It is a good idea to connect the various lead wires from the transformers to a terminal strip, made from a piece of bakelite as shown in the sketch, the different binding posts or spring grip posts being labeled with the different voltages. A surprising number of experimenters and set repair men do not have a source of plate voltage supply for tests in the shop.

In some cases one of the high voltage windings may be burned out; in such cases a couple of these transformers may be tested and the good secondaries used in series.



Old power transformers serve very nicely as a source of different testing voltages for the work bench.

● ***SHORT WAVE & TELEVISION, "the radio experimenter's magazine", has—ever since its inception in 1930—brought you all worth-while radio experiments, particularly experiments as far as set-building, both receiving and transmitting, is concerned. However, radio experimenting reaches much further than this. It is possible today for radio experimenters to perform all sorts of experiments, which—while not strictly radio—are allied with it in many ways.***

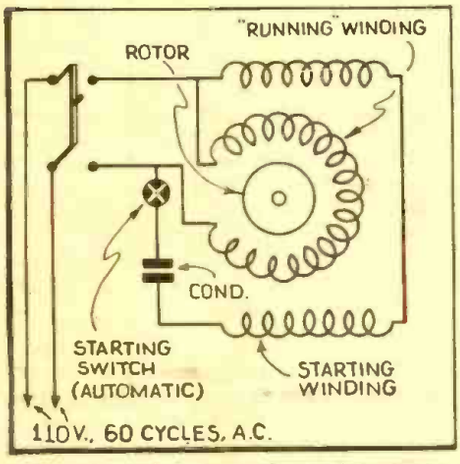
Today the experimenter has at his command many radio instrumentalities which the electrical experimenter did not have years ago. Consequently it is now possible to perform many experiments using radio parts of one type or another.

This month therefore, we inaugurate this new department, and we are certain that you will derive great benefit from it. A number of experiments are shown in these pages, and the department, if it meets with your approval, will continue from month to month.

Each month we will award 2 prizes, the first of $10, the second $5.00, for the best NON-RADIO uses of ordinary radio parts and radio instrumentalities. Hundreds of different ideas may be adapted for this contest; the editors will be grateful for your ideas.

Condensers for Starting A.C. Motors

● SMALL A.C. motors are frequently started by using a fairly large condenser in series with the starting winding, as shown in the accompanying diagram. Electrolytic condensers designed for intermittent A.C. duty may be used in connection with the starting of *split-phase* type motors. This type of condenser is also known as a starting condenser and electrolytic condensers, especially suited to this purpose or made with *two formed foils,* and are frequently referred to as *double formed* condensers, since both plates instead of one are formed. As the diagram shows, a starting switch, usually



How a condenser may be used to start a split-phase motor. An automatic switch is usually employed to open the condenser circuit as soon as the motor has attained normal speed.

built as part of the motor and automatic in action, is connected in series with the starting condenser and starting winding.

The condenser should only be connected for a few moments in the circuit while the motor is accelerating and as soon as normal speed has been reached, the automatic switch should open the condenser circuit. For experimental work the switch may be manually operated.

The capacity of the condenser will vary with the size of the motor and a little experimenting with various capacities may be necessary, additional condensers being connected in parallel until the proper value has been found.

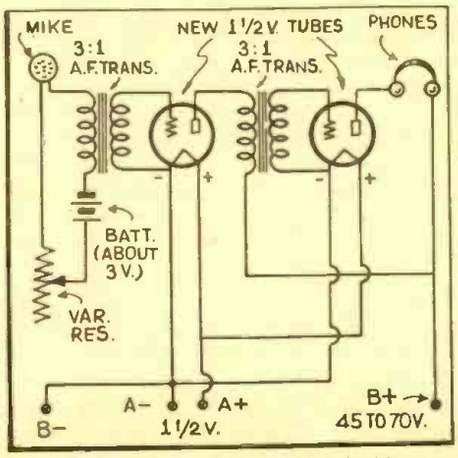
Hearing Aid for the Deaf

● A ONE or two stage vacuum tube amplifier, together with a fairly sensitive microphone and a pair of headphones, make a very good amplifier for use as a hearing aid for deaf persons. Many other uses for this type of apparatus may be found, notably for picking up sounds in a room, such as in detective cases, etc.

Aside from the amplification obtained by the use of the vacuum tubes and transformers, the sensitivity of the device is governed by the quality of the microphone and the sensitivity of the headphones. If the device is to be used for detective or similar work, where an ordinary conversation is to be picked up in a room with the microphone hidden behind a picture frame or under a table, etc., then a special microphone adapted to this purpose should be obtained.

Two of the new 1½ volt tubes (RK-42) are suggested for this apparatus, and these tubes will operate from an ordinary dry cell, or say two small "A" batteries which yield 1½ volts each, the batteries being connected in parallel. Where portability and light weight are necessary, one of the new exceptionally compact type 45 "B" batteries may be used and where more power is required, two of these 45 units may be connected in series to give 90 volts plate potential. Another tube which is non-microphonic and which the experimenter might like to try in such a circuit is the No. 864. It is rated at 1.1 volts filament potential and uses 250 ma. instead of the 60 ma. required by the RK-42. A resistance is necessary to reduce the 1½ volts down to 1.1 volts for these tubes.

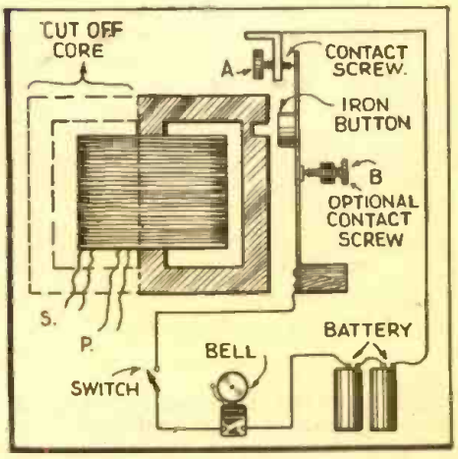
Some experimenters may prefer to build this apparatus with resistance-coupled stages instead of using transformers which would, of course, reduce both the cost and most important, the weight. The microphone circuit is supplied from the same battery as the filaments of the tubes. The phones may be of the usual high-resistance type, or one of the new miniature type phones which fit inside the ear may be employed, these now being available in high resistance for use in the plate circuit. Others, of low impedance, are available and have to be used with an output transformer.



Radio parts come in handy for building an instrument such as this, which will greatly amplify ordinary speech for those hard of hearing.

Relay Made From A.F. Transformer

● THE accompanying sketch shows how a sensitive relay may be made for radio control experiments, etc., from an old A.F. transformer; even though one of the windings is burnt out or open-circuited, the other winding will give sufficient power to work the relay. As the illustration shows, a slot is



Excellent relays may be made as shown above from old audio frequency transformers, even though one of the windings is open-circuited.

cut in the iron core with a nacksaw and the easiest way to cut this slot is to put several blades on the hacksaw so as to cut the full width of the slot at one time. The slot may be about ⅛" wide, and it may be cut to within $\frac{1}{16}$" of the full width of the core leg. The half of the core leg at the left of the transformer, as shown in the picture, is cut away by means of a hacksaw. A vibrator spring or armature has a soft iron button riveted to it and this is mounted so as to come opposite the slot.

If the armature is to close the local circuit when attracted by the iron core of the transformer, then the contact screw is mounted as shown at A. If it is to close the local circuit when the transformer coil circuit is opened, then the contact screw is placed at B. The local circuit comprises merely a couple of dry cells and a bell or a signal lamp, etc.

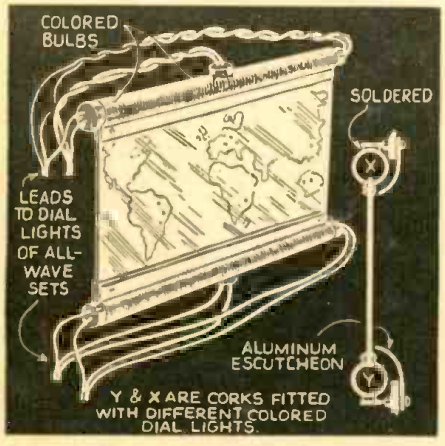
World-Wide Short-Wave Review

–Edited by C. W. Palmer

A Novel Radio Map

● ONE radio fan, in England, devised a most novel map which is used in conjunction with his all-wave receiver. This map, which was described in a recent issue of *Practical and Amateur Wireless (London)* consists of two pieces of glass, between which the map is pressed, two illuminated tubes at top and bottom and decorative escutcheons to cover the illuminating tubes.

The illuminating tubes are formed of thin sheet iron, by bending the flat metal around a broom handle or other suitable form, leaving two flanges for securing the metal cylinder to the glass plates. Inside these metal cylinders are placed a number of differently colored pilot-light bulbs, each color corresponding to a band on the receiver. The set is one of the type which has a different dial light color for each band and the lights in the map are supplied with current from the same leads, in parallel with the dial lights, so that whenever the receiver is turned on, the map is also illuminated and colored to match the dial—a different color for each band.



One of the most elaborate radio maps we have seen; it can be easily constructed by any ambitious short-wave Fan.

The map is painted with dots in color—depending on which band the particular stations are received, so that the stations which have been previously heard on any band can be picked out immediately by the color of the dot, the call letters and the frequency which are painted on the map in the same color as the dial light, and the map light.

The illuminated cylinders are secured to the glass plates by having the corners of the glass drilled by a glazier—or by doing the job yourself with a file and some turpentine.

This novelty map makes an attractive ornament for a den—besides being a useful tuning aid.

Transmitting and Receiving on 15 cm.

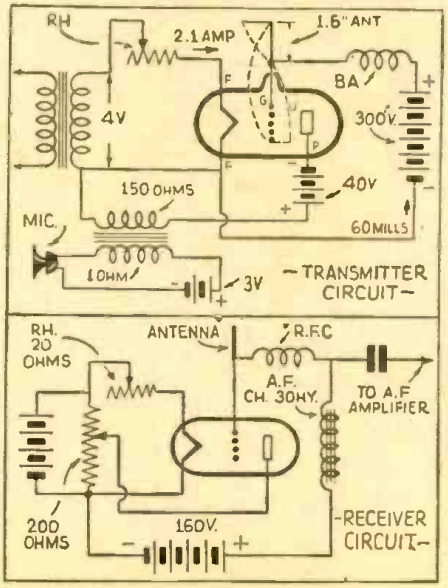
● THE French radio magazine *Toute le Radio (Paris)* contained, in a recent issue, a very interesting article on transmitting and receiving on wavelengths as low as 15 centimeters (about 6 inches), which can be applied to amateur radio experimental work.

The method of producing oscillations, without the need for magnetron tubes is credited to a French engineer—Francais Pierret. In this circuit, the plate of the tube is biased with a *negative* voltage of about 40 V. while the grid is supplied with a positive voltage of some 300 V. This action produces a movement of electrons which is extremely rapid around the grid and which produces a varying field, thus resulting in a flow of grid current.

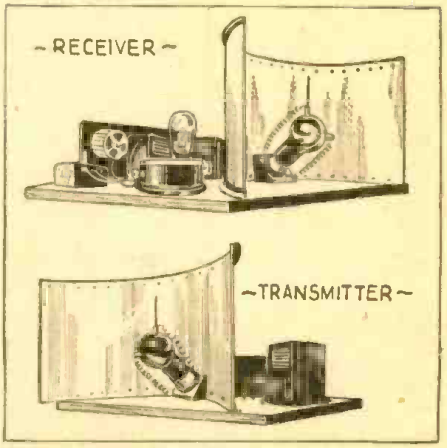
The frequency of the oscillations thus set up is determined entirely by the tube constants and in the tube (French) used by the author of the article, a frequency of about 15 cm. (6 inches) resulted.

The oscillations are radiated by the use of a half-wave radiator connected directly to the grid, and changes in the resonant frequency are accomplished by changing the filament, grid and plate potentials. Metal reflectors of parabolic shape placed about 10 centimeters (4 inches) behind the aerial wire concentrate the field for directional radiation.

The receiver also is of odd construction, having no tuning coils and having a slight negative voltage on the plate with a positive voltage of some 160 V. on the grid. An A.F. choke (iron core) of 30 henries inductance is connected between the battery and the grid to effect a detecting action. An R.F. choke containing 3 or 4 turns of No. 18 wire on a form the diameter of a pencil acts as a block for the oscillations picked up in the grid circuit. The plate bias is obtained by shunting a potentiometer of several hundred ohms resistance across the filament battery with the tap connected to the plate.



Transmitting and receiving on the ultra-short waves is possible with the circuits here illustrated.



Appearance of the ultra-short wave transmitter and receiver, showing the metal reflectors.

The receiver is also provided with a half-wave aerial, which, in both the transmitter and receiver, consists of a piece of stiff wire about 4 cm. (1.6 inches) long, soldered directly to the grid terminal of the tube.

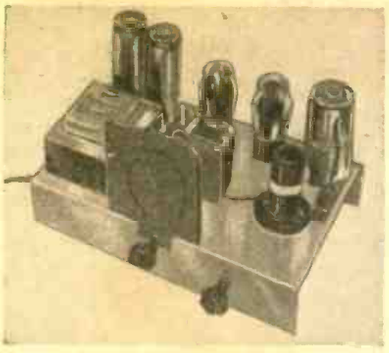
In choosing tubes for the receiver and transmitter, the characteristics of each should be as nearly alike as possible, and the tube structure should be such that a high positive grid voltage will not injure the tube elements or bring the grid to a red heat.

A Signal-Level Meter

● A USEFUL meter which serves the dual purpose of *output-meter* for lining up new receivers to insure maximum results and relative *signal-level* meter or *R-meter* for determining the signal strength of stations being heard is made very simply, according to a short description in a recent copy of *The Australasian Radio World (Sydney)* from an audio transformer, a carborundum crystal detector and a milliammeter.

A crystal detector and a low-range milliammeter, and you have an excellent output and signal-level meter.

(*Continued on page* 507)



Above we have a picture of a receiver incorporating the inversed Reinartz circuit here described.

The Inversed Reinartz

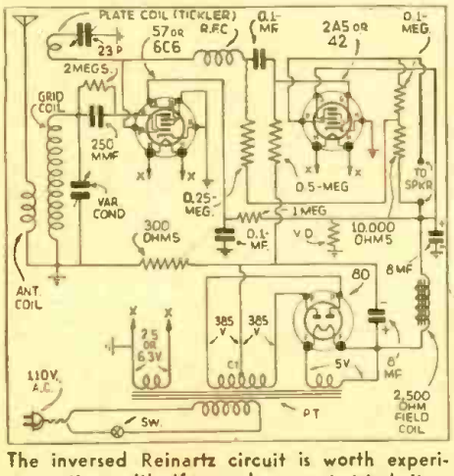
● AN interesting little set was recently described in *Wireless Weekly (Sydney)* by the editor of that lively little magazine from "down and under."

It appears that the editor in question made a visit to the U.S., last year, and stumped our friend John L. Reinartz with the question of what is the "Reinartz" circuit.

On returning to his native haunts, ye editor stored up this hit of information (or the lack of it) and now we have the "Inversed Reinartz." This set is, strictly speaking, composed of a regenerative detector, resistance-coupled to a pentode output tube which uses reversed feed-back to reduce the distortion which is invariably present in pentode output tubes. A *10 per cent inversed feed-back circuit* is used in the output circuit, which is obtained by feeding the plate supply of the detector from a resistance network in the plate-screen circuit of the pentode. This supplies the plate voltage to the detector and at the same time feeds a small amount of the signal voltage in the plate circuit of the output tube back into the grid with a phase relation which causes degeneration—with a resulting improvement in tube characteristics and reduction in harmonic content.

This simple little set meets two requirements of our readers—(1) it is a simple set with high-quality characteristics for those who want a small set for short-wave broadcast reception, and (2) it is a simple matter to change over existing sets using pentode output tubes to use the *reversed feedback* arrangement shown, with a resulting improvement in quality of reception.

The values of the parts are shown on the circuit. Plug-in coils of standard size are O.K. for the tuning with a 50 or 100 mmf. condenser, depending on the size condenser called for with the coils you intend to use. The R.F. choke should be one of good make, having an inductance of about 10 millihenries inductance.



The inversed Reinartz circuit is worth experimenting with if you have not tried it.

Do You Want $25.00?

● *THE editors are offering $25.00 for a good 1-tube set, either in the form of a short-wave receiver or a converter. Please note that there is little use in sending in an ordinary hook-up for a 3-element tube as most of the circuits possible with these tubes have been published.*

What the editors want are new circuits designed around one of the latest type tubes having a multiplicity of grids. Refer to the March, 1937, issue, page 675, where a very ingenious 1-tube S-W converter circuit is shown. This will give you some idea of what we are after. Refer also to other 1-tube diagrams published in this and other numbers, all of which will give you some ideas to work on.

As a preliminary, you may send in a diagram and a description of the set and a good clear photo or two of it. A list of parts should accompany the description and the editors, who will act as the judges, and whose opinion will be final, reserve the privilege of requiring the set to be sent to them for inspection and test if they so desire.

With the dual purpose tubes now available many ideas will suggest themselves. For example—Receivers with R. F. and Detector stages; Detector and A.F. stage; Detector and Plate-Supply Rectifier; 1-tube Super-het; Reflex set, etc.

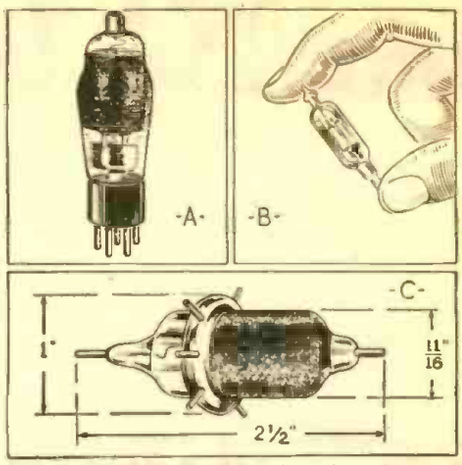
A New Tiny Tube

● THE acorn type tube which has found much favor in the U.S. for high-frequency work has now found itself carried half-way across the world. The English Osram type ZA1 is an exact replica of the American made 955—though made in England by the Osram company.

A new tube of very small dimensions which has just been placed on the market in England is the Mazda midget diode type D1. This tube is similar to the Acorn types in that the leads are brought out as stiff wires through the glass seal, instead of the usual plug-in type base. This makes the tube very small and also tends to reduce the inter-electrode capacity, which may cause a dropping-off of high frequencies when a diode tube is used as a detector.

Another Mazda tube which has found its place on the English market is the type AC/SP3 which has an extremely steep plate-grid characteristic curve and has been designed particularly for television receivers. The high mu factor permits an appreciable amount of gain to be realized in the I.-F. stages of a superheterodyne television receiver, in spite of the high intermediate frequency which must be used to provide the two or three million cycle band needed for good definition in receivers of this type.

Another interesting development in tubes in Europe, in general, is the introduction of the so-called "International" series of tubes —which utilize the well-known octal base with either metal or glass tube construction. This is certainly a step in the right direction (that is, standardization of tube characteristics and base connections throughout the world.)



A—The English Mazda AC/SP3 for television; B—New midget diode type D1; C—The Osram ZA1, an R.F. pentode.

A Low-Voltage Receiver

● RECEIVERS which will operate on short waves with very low plate voltages have been in some demand recently for portable work by hams and short-wave listeners alike.

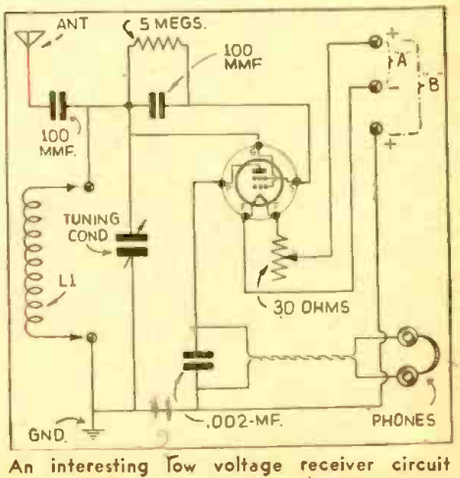
A circuit—called *"Le Negadyne"* in the magazine in which it appeared—*Radio Constructeur (Paris)*—is not a new one, having had some publicity in the U.S. as well as in Europe some ten years ago.

However, this circuit provides a fine regenerating detector, which will work on high frequencies—well into the ultra-short wave band—with only a few volts of "B" voltage applied.

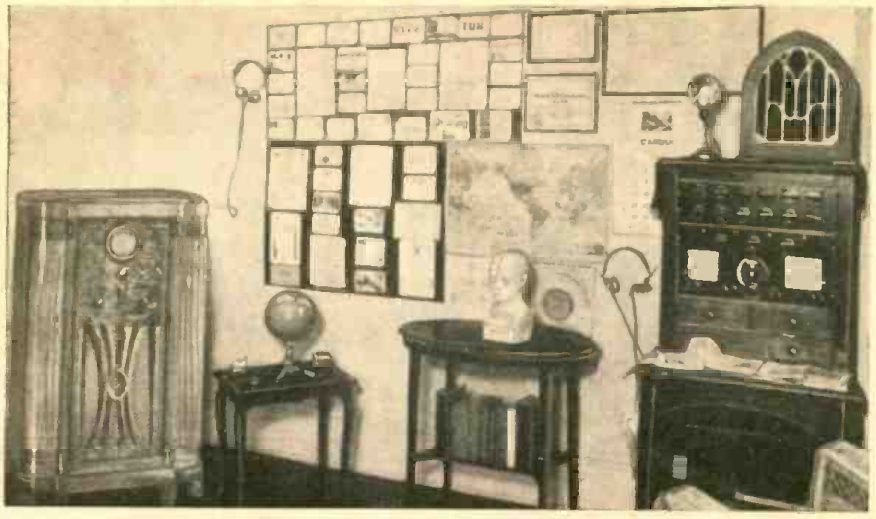
The circuit of the *Negadyne* as shown in *Radio-Constructeur* magazine is reproduced in the accompanying sketch. The tuning condenser value depends on the wave band to be covered. About 50 mmf. for the short wave bands and 5 mmf. for the ultra-short wave bands, with suitable coils is satisfactory. Any well-made short-wave coils can be used, if the plate coil is removed, leaving only the grid or tuned coil.

It will be noticed from the circuit that a tetrode tube (screen-grid) is used with an unusual connection of the two grids. Detection takes place at the second grid, while the first grid provides the condition of negative resistance which is so essential for sustained oscillation in a vacuum tube circuit.

This is a fine circuit for experimentally inclined readers. The values of parts are not critical and really surprising results can be obtained with high quality parts.



An interesting low voltage receiver circuit known as the Negadyne.



The elaborate listening "den" of Dr. J. S. Pugh of Dallas, Texas. The all-wave Philco receiver is shown at the left of the photo and the National AGS at the right. Dr. Pugh's SWL card appears at right.

M.D. Goes In For S-W Listening

The very handsome layout illustrated in the photo at the left is the short and broadcast wave listening "den" of Dr. J. S. Pugh, of 616 North Texas Bldg., Dallas, Texas. Dr. Pugh has heard sixty-five countries and has fifty countries verified. He uses a 60 ft. doublet antenna; the receivers used at his listening post are a National AGS, which may be seen in the cabinet at the right of the photo (with a complete set of plug-in coils visible just below the loudspeaker) and a Philco all-wave receiver.

UNCONTROLLED

Bouquets and Brickbats

Thanks for the "Brickbat!"

Editor,

I have been a newsstand subscriber of your magazine since 1933. *Short Wave Craft* for '33, '34, and '35 was a very good magazine. But for the past year and a half it's a dog (Our pet name for bad pictures.) Your average *short wave listener* couldn't afford to build even the rankest television set. When cathode ray tubes and electronic guns, etc., can be bought at a reasonable price, then your "Hams" and "Fans" will get busy. You're wasting paper at present. I doubt like blazes if you have increased your circulation any. Why not a proving ground of the receivers you advertise?

The Scout Trophy contest is a joke. Any pin-head, with enough money to buy a super-blooper and time to listen wins. The questions and answers are the only decent thing—or are they? Or, must one send the Question Box editor a quarter to find out that an .01 mf. condenser is to be used, not an .0001 mf. instead. After reading the *flowery junk* in the *Short Waves & Long Raves* column in the October issue, I determined that you should have at least one brick-bat!

Lay off the flashy covers, the "plugs" for commercial sets; look over a '34 or '35 magazine and give the S.W.L.'s and *beginners* a decent magazine.

Dig up Doerle and put him back to work. None of us mind looking at advertisements, but for all of us, put some articles between said "advs." After all, most every advertisement appeared last month. 73.

JIM LYDON, Projectionist,
The Hamilton Theatre,
256 Bowdoin St.,
Dorchester, Mass.

(Ouch! Who threw that brick! Well, it seems, Brother Jim, that quite a few readers are interested in "what's doing" in television. So it looks as though we must publish a few photos and some description of the latest television inventions. Regarding the Scout Trophy Contest, we think that the man with the superior set should win, due to the greater sensitivity and selectivity of such a set. At any rate it's a pretty sporting proposition, isn't it, if a fellow with a 3 or 5 tube receiver wins? We're trying to follow some of your other suggestions and hope in time to fully satisfy you. We shall be glad to receive further constructive criticisms.—Ed.)

We Salute Dr. M. Hausdorff!

Photo at the left shows the very business-like short-wave listening station of Dr. M. Hausdorff, of Lugano, Viganello, Switzerland. His station call letters are HB9RBX. Italian, French, and English are spoken at this station and a very beautiful QSL card is sent to listeners who contact Dr. Hausdorff.

What Do You Say, SWL's?

Editor,

It gives me a pain in the starboard gain control, to read the squawks and grumblings of these neophyte brethren who make a habit of soliciting QSL cards. It would be better, much better, if they would stick to collecting bottle tops, book match covers or stamps, and leave the exchanging of QSL cards to those of the licensed fraternity that go in for that sort of thing. This SWL QSL situation is getting to be an infernal nuisance, the SWL don't send amateurs cards because they want the amateur to have an accurate report on his signal, their only interest is collecting cards. (And how come the SWL cards always give R9 reports?)

Just whoinel wants to get a card stating, (heard you R9 in Static Island, N.Y., while talking to VK9ZL). Any amateur that has operated a transmitter for a few weeks, knows the capabilities of it, and the consistent distance he can work, and neither wants nor requires reports from SWLs. The amateur that collects QSL cards, wants his cards to read "Worked" not "Heard." I advise SWLs to pay a visit to some of their local amateurs, and see how many SWL cards they will find tacked to the wall. I've been around a bit in the seventeen years that I have operated amateur stations, and the only place I've ever seen "Heard" or SWL cards, was *stowed away in some drawer or in the waste-basket.* So why don't the SWLs wise up and save their time and money, and send their cards to the short wave broadcast stations, who will no doubt appreciate the reports.

(Continued on page 527)

OSCILLATIONS

from Our Readers

A Dandy "Ham" Rig

Editor,

Herewith a photograph of my amateur station for your *very good* magazine.

The rig consists of three stages; namely, an RCA—802 Tri-Tet crystal oscillator capacity coupled to an RCA—841 which is used as a straight buffer link coupled to an Eimac 50T final amplifier. The transmitter rack consists of five shelves, the one on the bottom housing the filament transformers, one for each tube including the 866's and 5Z3 rectifier tubes. A large transformer which delivers 1000 or 1500 volts under load is used exclusively for the final. Another transformer, delivering 700 volts is used for the oscillator and buffer. The second shelf houses the filter condensers and chokes for both power-supplies. The third shelf houses the oscillator and buffer stages which are completely shielded from each other. The fourth shelf contains the final amplifier. The top shelf houses the Collins Pi antenna-matching network.

The transmitter is operated on the 14, 7, and 3.5 MC bands, having plug-in coils for each band. 80 meter crystals are used to double to 40; 40 meter crystals to 20. The antenna is a Hertz 66' flat-top with a single wire matched impedance feeder. The antenna height is 50' above the ground. Inputs up to 200 watts are used on the 40 and 80 meter bands and 100 watts on 20 meters.

Contacts have included all U. S. Districts, Canadian VE-3, VE-4, VE-5, Mexico, Cuba, New Zealand, and Australia.

The receiver is a National SW-3 which is shown on the extreme left hand side of the desk, a single '45 audio amplifier furnishes the additional audio to drive the dynamic speaker shown on the shelf. The station's monitor is shown to the right of the receiver.

HAROLD E. DAVIS, W5FFW
439 South Troost Ave.,
Tulsa, Oklahoma.

Harold E. Davis, W5FFW, of Tulsa, Okla., has a dandy "rig."

A Good Suggestion

Editor,

I am a short wave listener away out here in the Hawaiian Islands and I would like to exchange SWL cards with other listeners all over the world, so come on OM, OL, OG, YL, XYL.

I have been a reader of your wonderful magazine for a long time and I think that it is about the best publication I have ever looked at.

Mr. Editor, there is one thing that I have often wondered, that is could it be arranged to publish in your good magazine a list of S.W. Stations that are known to *not* send out verifications. I think that would be a very good thing for the new listeners to know; in fact I would like to know it myself.

So at this time I thank you for your wonderful magazine, and if you can help me to exchange SWLs, I will be very glad.

I will say "Aloha nui loa," from Hawaii.

WILLIAM H. HAWKINS,
810 Kopke Street,
Honolulu, Hawaii.

"Pre-Selector" Works Swell!

Editor,

I have just completed the pre-selector printed in your 1937 September issue. It works swell and it has improved my reception very much. I have also built many two and three-tube sets described in your magazine and have heard *foreign* countries on every one.

I am a constant reader of your magazine and think it is the *best* magazine that is being printed today in the line of radio.

KENNETH THOMAS, 318 S. 10th St., Quincy, Ill.

Likes The "Kink" Dept.

Editor,

Three years ago I became interested in radio and television. An old-timer in radio told me to pick up a copy of *Short Wave and Television*. I took his advice (I now realize what excellent advice it was) and have continued to be a reader of *Short Wave and Television*. In your magazine I have found just what I wanted, explained in clear and understandable language that a *beginner* can understand.

Your articles and illustrations on *television* clicks with me 100 percent.

I sometimes ask myself, "How could I ever do without your useful Kinks?" Here's hoping you get more and better *kinks*.

Your circuits bearing the "tested and approved, certified seal" have always proved much better than my greatest expectations. Java, Germany, England, Guatemala, Italy, Peru, Japan, Colombia, Canada, Venezuela, Cuba, Mexico, etc., are often picked up on my *Short Wave and Television* "certified" circuit.

I would greatly appreciate corresponding with persons in any country. I have a useful free gift for foreign readers who write me an interesting letter. I'll be more than glad to answer all mail I receive.

To all short-wave and television enthusiasts and to the editors of *Short Wave and Television* I say, 73.

EUGENE COTTER,
1104 East Elm Street,
West Frankford, Illinois,
U.S.A.

(Thanks very much, Eugene, and we hope to receive many more constructive letters from our readers. If you don't see what you want in the magazine, tell the Editors, as that is the only way in which they will become acquainted with the requirements of yourself and other readers. When enough requests are received for a certain type of article or set, we'll try to obtain it.—Editor.)

A Boost from New Zealand!

Editor,

I am submitting my QSL card and a photo of my receiving station. If you would mention it in *Short Wave & Television*, that I would be pleased to exchange QSL's and photographs with United States SWL's, I would be very grateful.

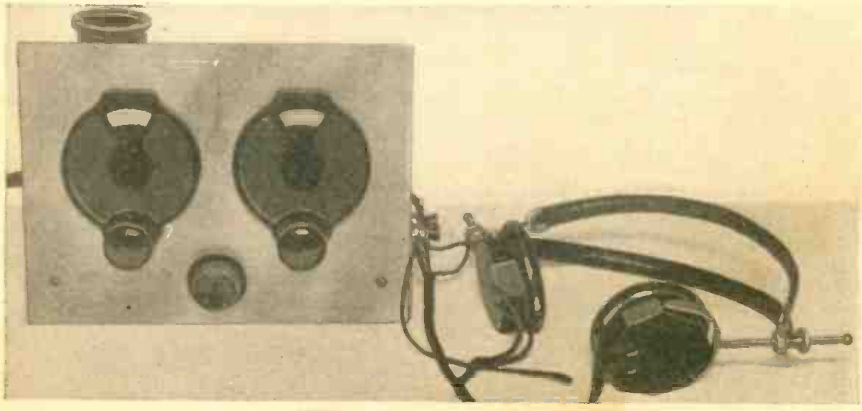
(Continued on page 527)

Short-wave "listening post" of W. D. McComb of Auckland, New Zealand.

A 2-Tube Receiver for the Beginner

Detector and two audio stages are obtained with only 2 tubes—the tubes used are the new 1.5 volt type, which operate from a single dry cell. Band-spread is provided and this makes an ideal receiver for the beginner.

By George W. Shuart
W2AMN



With this little 2-tube receiver, which has band-spread incorporated, short-wave stations in foreign countries may be tuned in easily with surprising strength.

● IT IS safe to say that nearly all radio fans and experimenters start their careers with *battery-operated* receivers. There are two definite reasons why, first—a battery-operated receiver is less costly than other types which are operated from the power mains, and second, a battery-operated receiver is less complicated in construction and more likely to yield good results at the first try.

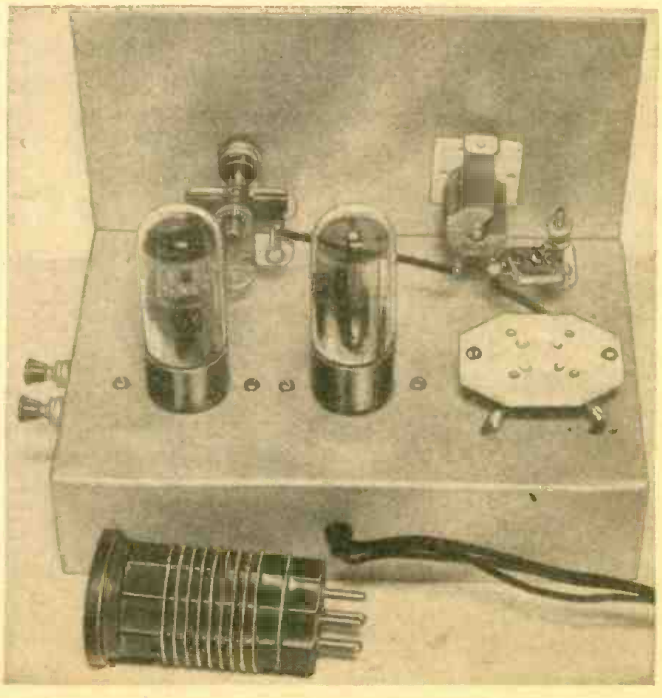
Battery type receivers are not new by any means, but this one is different and more appealing to the beginner because of the type tubes used. The battery type tubes with which we are most familiar are those requiring two volts for the filament, usually obtained from two dry cells with a series resistor in order to drop the three volts supplied by the batteries to two volts for the tubes.

New 1½ Volt Tubes Used

The new Raytheon battery-type tubes require just one and one-half volts, which makes them workable from one dry cell. This greatly simplifies matters because with the older type tubes and two dry cells there was danger of operating the filaments at too high a voltage and thus ruining the tubes in a short time. In order to obtain proper results and normal tube life one had to make use of a voltmeter, which most beginners could not afford or did not want to invest in. These new tubes solve all our problems, including tube life and the investment angle.

At this writing there are only two types of these new tubes available. The RK-42 is comparable to the type 30 and the RK-43 is very much like the 19 twin triode. It is not at all unlikely that other types, such as the screen-grid R.F. tube and the pentode audio amplifier, will be made with 1½ volt filaments in the near future.

Those of our readers who already have battery sets which are giving satisfaction, can replace their present type 30's and 19's with these new tubes with equal results. The only change will be in the filament supply as outlined before. The rheostat may be left in the circuit and the resistance increased as much as required for normal operation. Of course it would not be advisable to use the new tubes in receivers using two volt tubes not made with the 1½ volt filaments, because there is danger of applying the higher voltage to the new tubes in an unguarded moment and burning out their filaments.



The plug-in coil for the desired band fits into the socket at the right of the set. The two 1.5 volt new type battery tubes are here observed in place on the chassis.

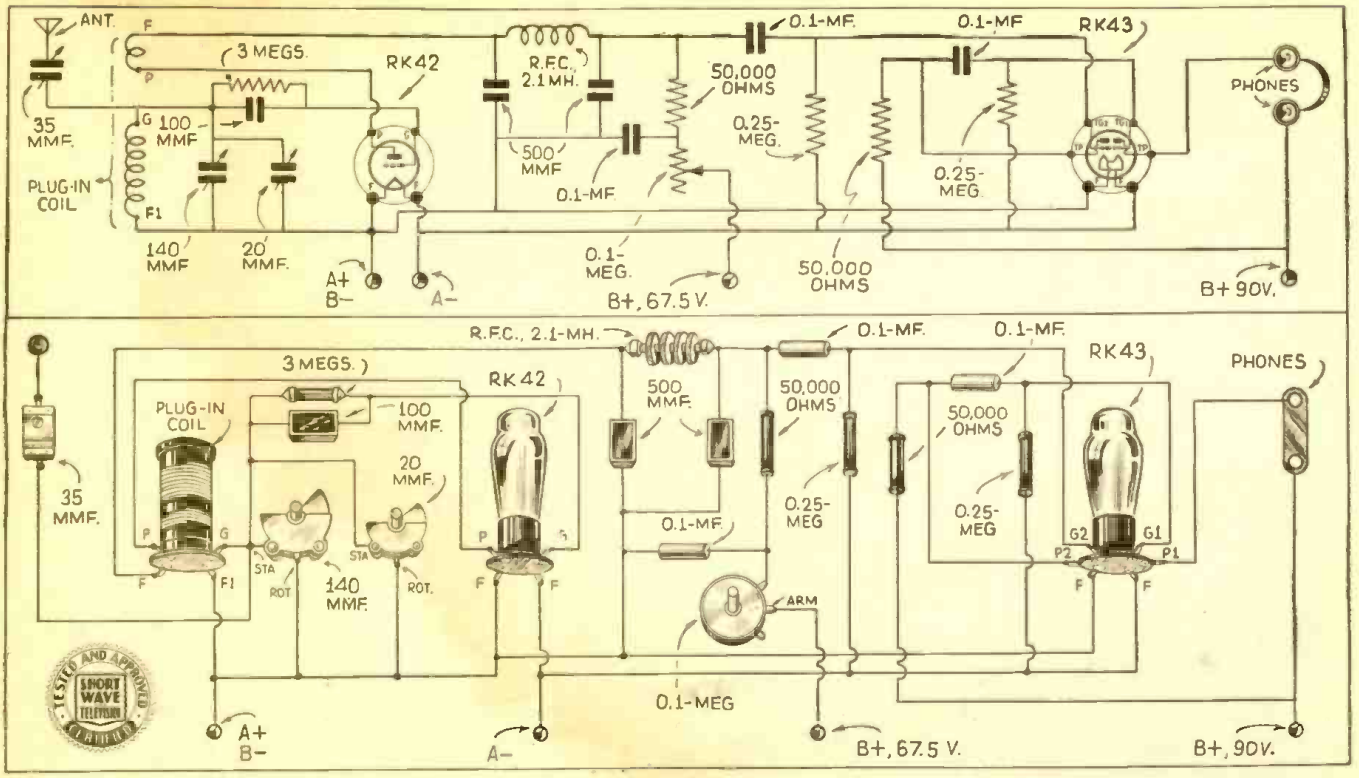
Detector and 2 Audio Stages with but 2 Tubes

The receiver shown in the photos uses the RK-42 as a regenerative detector and the RK-43 as two stages of resistance-coupled audio frequency amplification. This combination provides three-tube performance with only two tubes. A receiver such as this one is capable of receiving short-wave stations from all parts of the world. There is practically no limit to the distance which this receiver will cover. So long as general receiving conditions are favorable, this little set will work wonders.

The receiver is built on an aluminum chassis with an aluminum panel. The chassis is 5 inches wide, 2 inches deep and 8 inches long. The panel is 5 x 8 inches. This seems to be the most suitable size for one and two-tube receivers. Looking at the back of the receiver we find the plug-in coil on the right and the detector tube is next in line, with the audio amplifier on the extreme left.

Band-Spread Tuning Provided

Two tuning condensers are used in this receiver, one is for *band-spread* tuning and



Wiring diagrams, both schematic and picture type, for the 2-tube beginner's receiver are herewith presented. Even though the reader has had but little experience in building sets, he will find the picture diagram very simple to follow.

the other is what is termed a *band-setting* control. The small condenser is connected in parallel with the larger one and has a capacity of 20 mmf. The large one has a capacity of 140 mmf. This is the most simple method of obtaining *band-spread* and its effectiveness is born out by its use in thousands of receivers now in use by amateurs for communication purposes. The front view of the receiver places the band-spread condenser on the right and the main tuning or band-setting condenser on the left. The control located between the two dials and at the lower edge of the panel is the *regeneration control.* This is a 100,000 ohm potentiometer, although only two terminals are used, making it work as a series resistor which varies the plate voltage applied to the detector tube in order to control regeneration. This method of controlling regeneration in a triode detector is the smoothest and is most satisfactory in many other respects.

Starting with the antenna condenser a description of the circuit follows: This condenser is a 35 mmf. adjustable type, used to couple the antenna to the grid circuit of the detector. Its adjustment is rather critical in that it must be adjusted for each plug-in coil in order to obtain optimum results. The coils used are standard Hammarlund four-prong two-winding coils. However complete data is given in the table at the end of the article in order that the experimenter may construct his own coils if he so choose. These coils are wound so that the tickler or small winding is at the prong end of the form. The proper connection of the terminals of the coil is very important. The extreme bottom lead of the tickler winding goes to the plate of the detector tube, while the extreme top lead of the grid coil goes to the grid of the tube. The other connections are clearly shown in the diagram. The two windings must be wound in the same direction with the above method of connection.

The size of the grid-leak is not important but must be between 3 and 5 megohms. The other resistors in the audio circuit are likewise not critical as to values—those shown in the diagram provide proper results.

No external bias batteries are needed with the connections shown in the diagram. The grid returns are connected to the A minus, while the B minus is connected to the A plus. This puts a slight bias on the audio tube while the detector grid returns to the A plus and receives no bias. The grid-leak in the detector circuit is for biasing.

Tuning the receiver is the same as for any other receiver and the way to learn is by practice, there being no set rule. A few pointers may help the beginner—Plug in the coil which covers the lowest wave band; this is the easiest to adjust. Then advance the regeneration control about three-quarters of its range and tune with the large tuning condenser. A whistle or some other signal will be heard. An adjustment of the antenna condenser and the regeneration control together with retuning the main dial, will show the operator what each control does and how it affects reception. Practice on this band until you are familiar with the operation of the receiver and then try your luck on the other bands. As the wavelength becomes shorter the controls become more critical. The use of the band-spread condenser is simple; set it at mid-scale on the dial and tune with the large condenser. Then, with the large one set to bring in the band in which we wish to operate, we use the *band-spread* condenser for further tuning. A single wire seventy-five feet long from set to far end of aerial, is the best *general-coverage* antenna for a set of this type.

Parts List For Receiver

I.R.C. RESISTORS

1—3 meg 1/2 watt resistor
2—1/4 meg 1/2 watt resistor
2—50,000 ohm 1/2 watt resistor
1—100,000 ohm potentiometer

CORNELL-DUBILIER

1—.0001 mf. mica cond.
2—.0005 mf. mica cond.
3—.1 mf. bypass cond.

HAMMARLUND

1—set SW-4 plug in coils
1—140 mmf. variable cond.
1—20 mmf. variable cond.
1—4 prong socket
1—6 prong socket
1—35 mmf. trimmer cond.

RAYTHEON

1—RK 42 tube, 1 1/2 volt type
1—RK 43 tube, 1 1/2 volt type

BRUSH DEVELOPMENT CO.

1—pr. crystal head-phones

Coil Data for 2 Tube Beginner's Receiver

Range Meters	Grid Turns	Tickler	Winding Space	Size Wire
135-270	82	16	1 7/8"	No. 28
66-150	38	11	1 5/8"	No. 26
33-75	18	6	1 1/2"	No. 24
17-41	9	5	1 1/4"	No. 16
9-20	3 1/2	3	1"	No. 14

All coils wound on 1½" diameter ribbed forms. Space between grid coil and tickler ¼". Winding space is *length of winding*. Primary is wound between turns of grid coil. All ticklers wound with No. 30 D.S.C. wire.

(*Continued on page* 512)

PORTABLE

By Raymond

This is one of the finest all-wave portable sets that we have seen. The weight is divided by placing the batteries in a separate cabinet.

● ONE of the feature imperatives in the design and construction of a portable receiver is that the job shall be reasonably compact; an instrument which is to be carried about should take up as little space as possible. But this does not imply compactness as an end of all effort and something to be achieved in accentuated degree at the expense of efficiency, proper parts placement and the accessibility of all wiring and components. A portable instrument which features small size over and above all else will and can hardly achieve functional perfection and its usefulness as a working piece of apparatus becomes questionable to say the least.

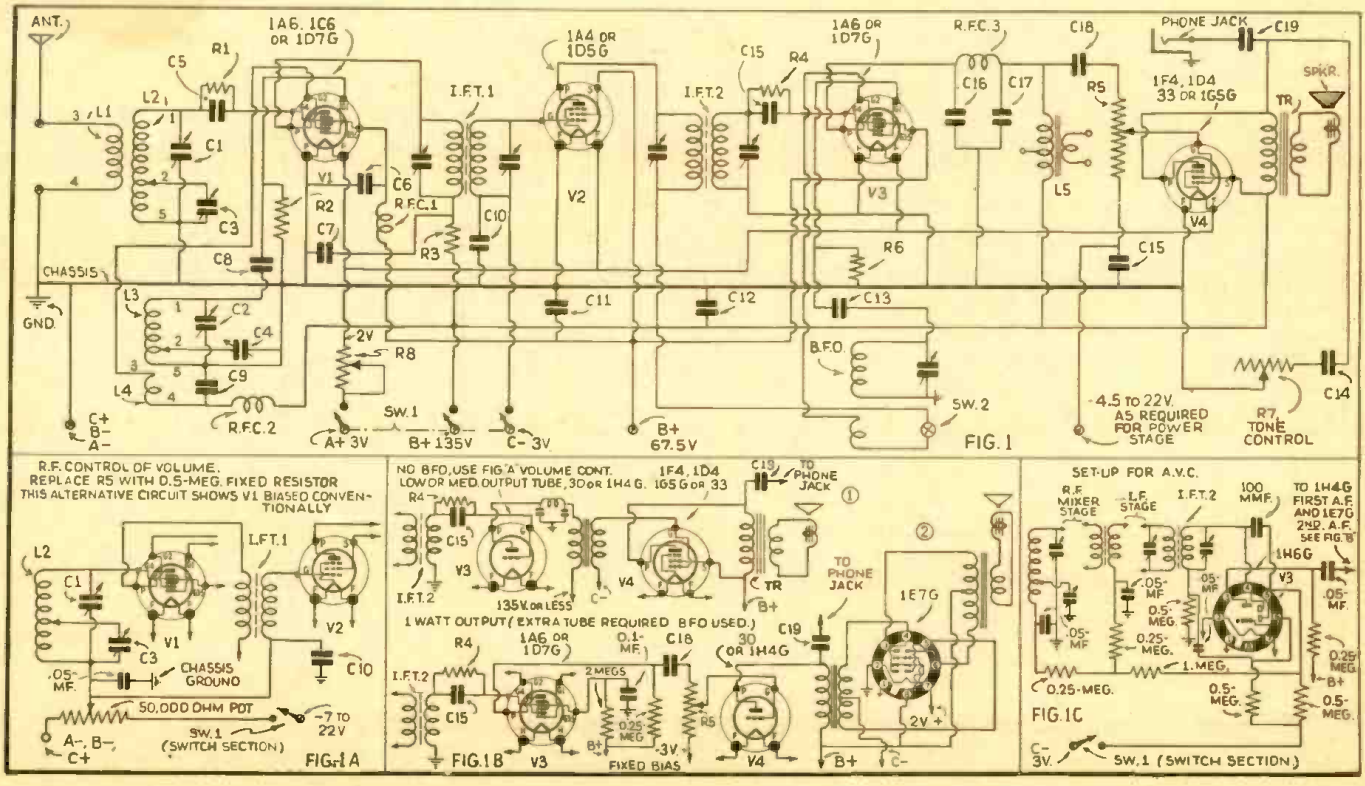
With these facts in mind, and with some experience in the design and use of portables behind him, the writer recently set about the construction of a job which, using a minimum of tubes and properly arranged and wired components, would be just what the doctor ordered—a sensible, practical, economical all-wave superhet, essentially portable, but with compactness put definitely in its place.

The result of this activity is the receiver now to be described—a sensible 4-tube battery-operated instrument, easily handled, complete, and effective. Somewhat unusual by reason of its two-piece design, this little super remains just as *effectively* compact as any job, developed for similar usage. Ample space in both cabinets permits the pigeon-holing and carrying about of plug-in coils, headphones, a spare tube, antenna wire and one or two tools which might come in handy in making minor repairs and adjustments on occasion—items which we all know to be imperative accessories to any *portable* and which, if the receiver housing is too compact to permit their placement inside, must be separately handled.

Schematic wiring diagram for the 4-tube portable All-wave receiver is shown below; picture diagram on the opposite page. ↓

General Features

As we have indicated, the construction is physically split into two units, of like size and appearance—both equipped with leather carrying handles and both built of crackle-finished, heavy-stock steel plate, affording complete protection to inside parts. One of these cases houses the required A, B, and C batteries; it carries, too,



Band-Spread • Beat-Oscillator

SUPERHET 4

P. Adams

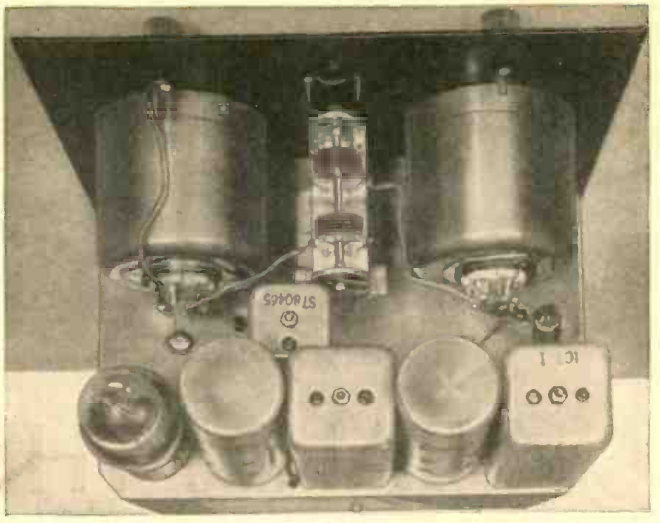
a compartment for phones, antenna wire, etc. The second cabinet contains the receiver proper—the chassis, the controls and the 3-inch P.M. speaker; the space between the speaker pot and the back of this cabinet is used as a housing for extra plug-in coils. Battery unit and receiver are connected together for set operation by means of a five-foot cable with plugs at both ends; the cable may be conveniently stored in the upper compartment in the power-supply case.

Tubes required: The four tubes required are a 1D7G pentagrid mixer (or 1A6 or 1C6, with socket change), 1D5G I.F. amplifier (or 1A4), a second 1D7G (or 1A6) as second detector and beat oscillator, and a 1G5G output pentode. So far as the second detector and the audio tubes go, the line-up is typical rather than definitive. If no beat note is required, the second pentagrid may be replaced by either a triode, a straight screen-grid job, or a diode-triode or diode-pentode combination; if the 1G5G does not afford a desirable output for speaker operation, it may stand substitution in the way of 33, (with socket change and increased B voltage) or a 1E7G; and in the event of use of the latter tube, either a diode-triode second detector followed by an A.F. triode, or a triode detector followed by an A.F. triode, would seem proper for good driving to 1 watt output.

The speaker is small, exceptionally sensitive, gives good tone, and is ideally suited to the design, both electrically and physically.

Plug-in R.F. (radio frequency) coils—two for each band to be covered—are used; these are equipped with knobs for convenient *front-panel* change. Coverage of *short-wave, broadcast,* and *long-wave* bands is possible—the one limitation, of course, being the available room for coil storage. All I.F. transformers are of the *iron-core* type, resulting in high usable gain. All high frequency parts are isolantite mounted.

Below—picture wiring diagram which will enable even the beginner to build this very efficient 4-tube portable.

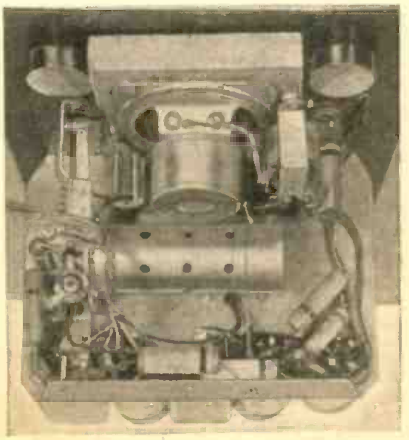


Top view of the 4-tube portable R.F. section, showing the I. F. transformers and plug-in coil shields.

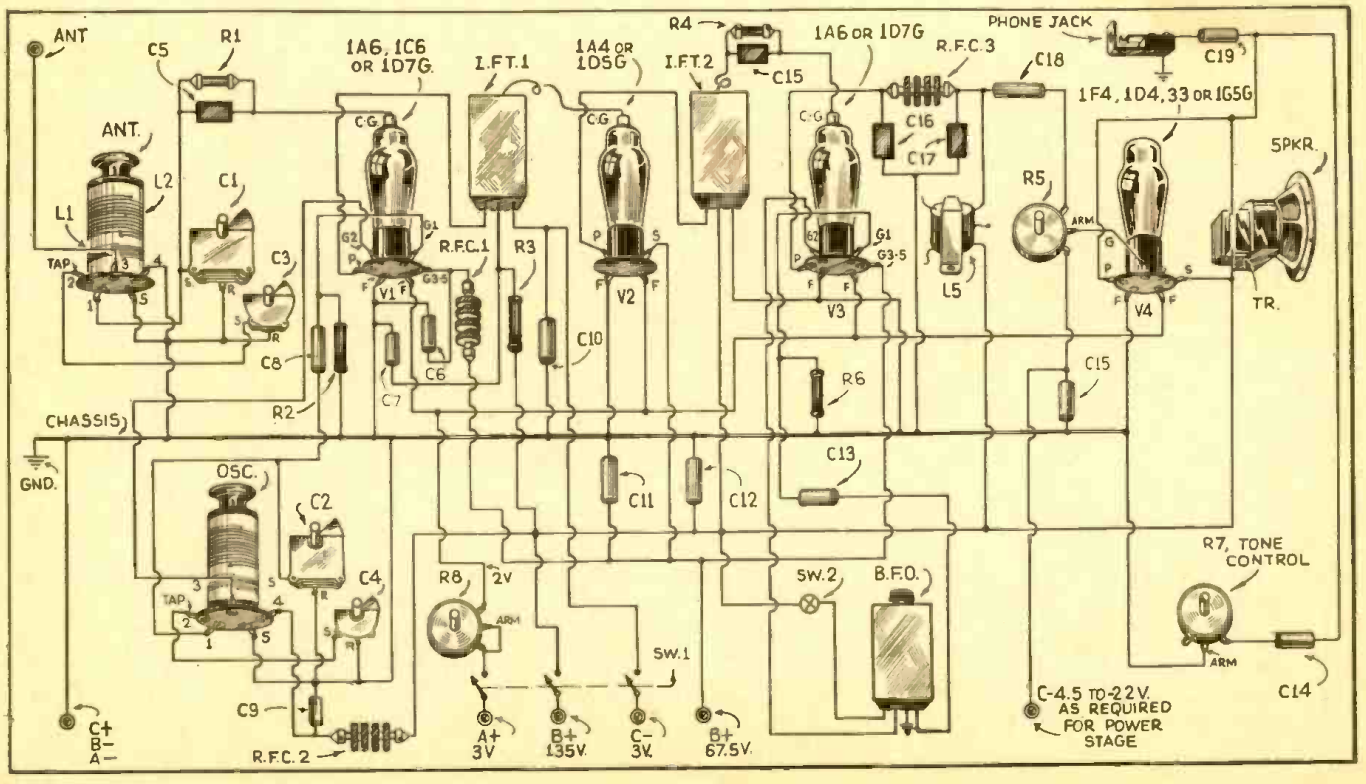
We might mention—before passing on to an analysis of the circuit—that the receiver is most universal in its possibilities of service and application; it is good as a straight broadcast job (here two sets of coils only will be required), as an all-wave receiver for general portable use, and as a battery super for the communicating amateur.

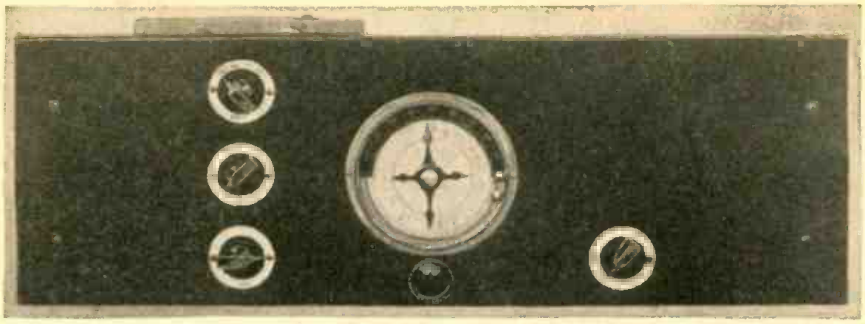
Superhet Circuit Used Is Very Effective

An R.F. stage was held out of the (*Continued on page* 508)



Above—The audio-frequency section of the receiver.





Front view of the 4-band superhet receiver.

This receiver gives 4-tube results with 3 tubes. Among other features it has band-spread, beat-frequency control and band-switching. The set is of rack and panel type construction and its low construction cost will appeal to all S-W "Fans".

A 4-BAND, THREE-TUBE Superheterodyne Receiver

By Jim Kirk, W6DEG

● SOME of the objectives sought in designing this set were, simplicity, economy, commercial appearance, ease of construction, convenience of operation, rack and panel standardization and provision for enlargement without discarding any parts.

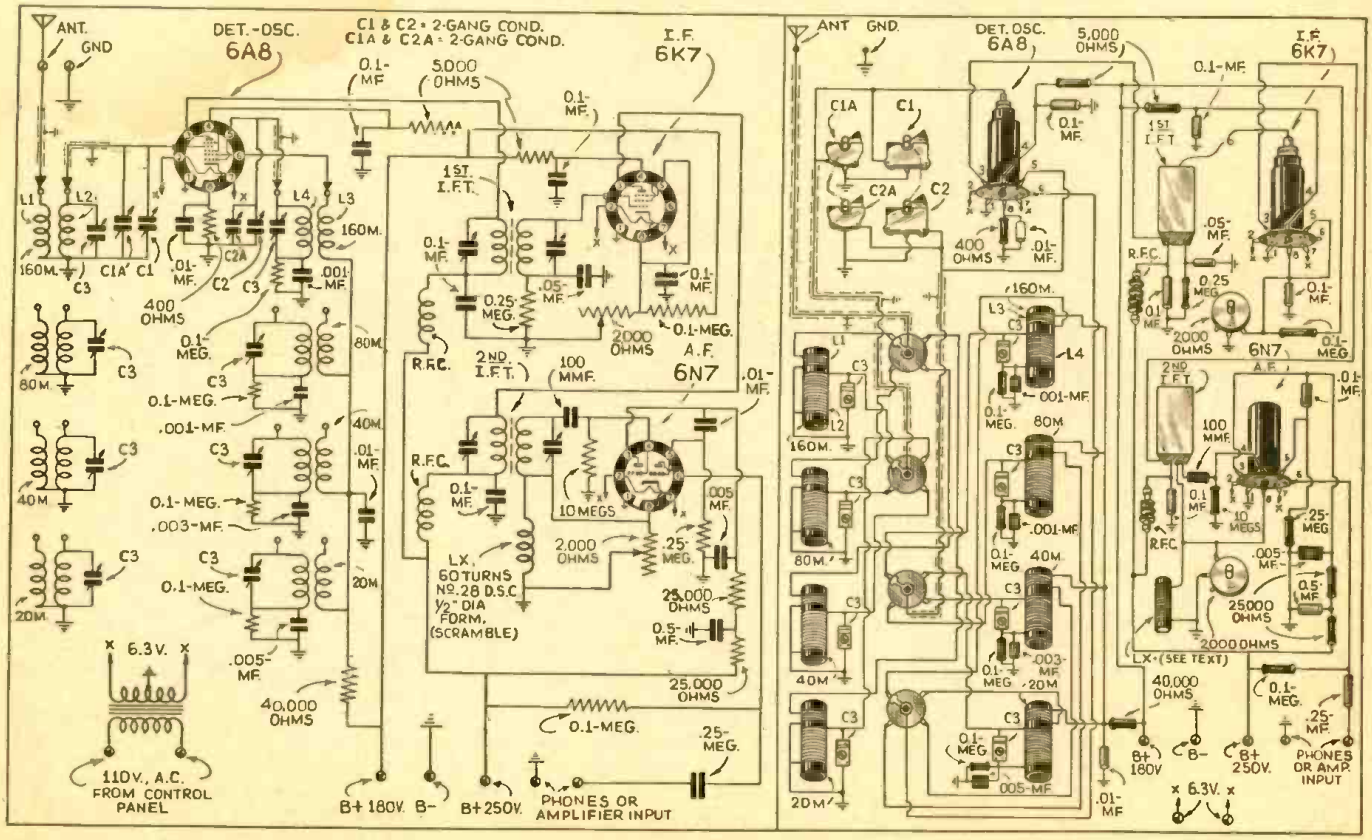
Simplicity: Simplicity was obtained by practical one dial band-spread tuning in connection with a band-set padder. Only five controls appear—the main dial, the padding condenser, the band-switch, the volume control and the beat-frequency oscillator and regeneration control.

Economy: Economy was aimed at by employing only parts absolutely necessary, and building parts whenever possible instead of purchasing expensive ones.

Other features: The commercial appearance, ease of construction and convenience of operation are all tied up in the rack and panel construction used. Of course, rack and panel construction meant *band-switching* instead of plug-in coils (unless a space could be left above the set to plug in coils and that was not thought desirable). Even if rack and panel construction had not been used, *band-switching* is much to be desired for rapid changing and eliminating a basketful of coils.

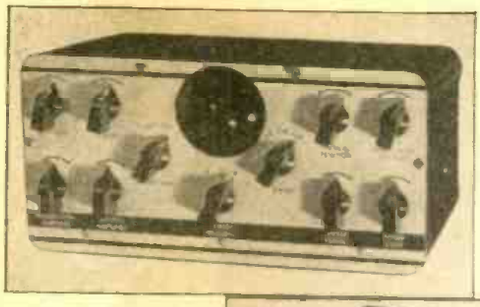
Panels: I have tried many different forms of panels at a great expense before I hit upon the panel material I am using now. What I was looking for was low cost, sturdiness, appearance, and ease of working. Thick aluminum, crackle finished or polished, was tried first. It answered every requirement except low cost. When I used thin panels to cut down the cost, they were too flimsy. Thick steel panels were not much less in cost and they required too much labor to prepare and drill. Plywood or Masonite satisfied the requirements except that they did not shield and could not be easily and cheaply finished and still look as handsome as metal. So the final choice was plywood panels with a crackle-finished thin metal front.

When it is desired to make changes all that is generally (*Continued on page* 519)



Wiring diagram for the 3-tube receiver which gives 4-tube results. The different frequency bands are available at the turn of a switch.

The LATEST in Short-Wave Apparatus



Above—Front view of the new Thordarson oscilloscope; the parts for building it, together with diagrams and instructions, are now available to every experimenter. (No. 672)

Right—Rear view of the very complete oscilloscope.

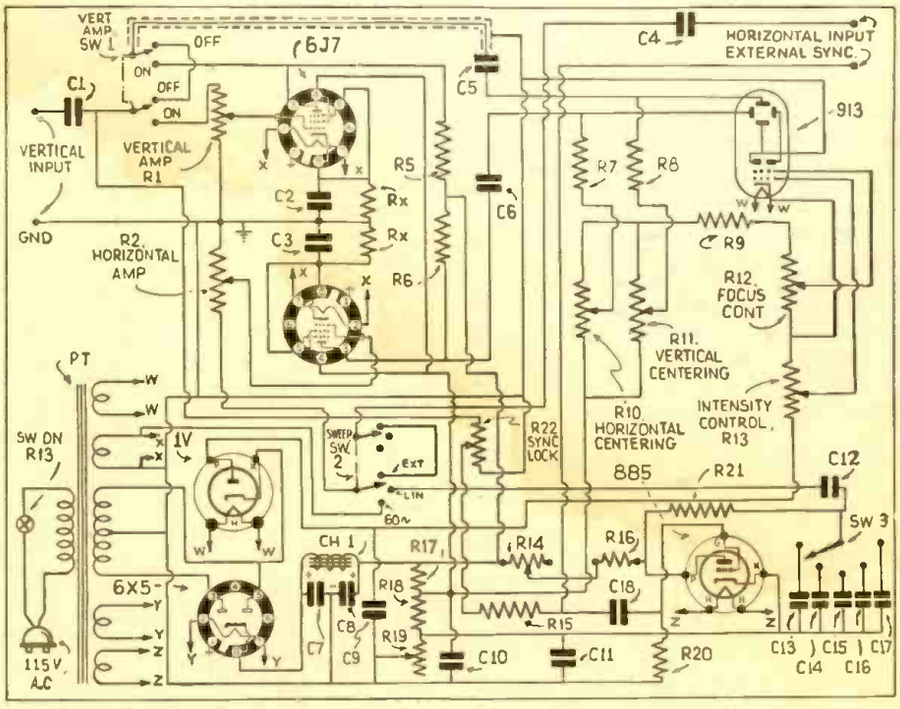
The new apparatus here described has been selected for description by the Editors, after a rigid investigation of its merits.

New Cathode Ray Oscilloscope

● A handsome looking and very complete oscilloscope, using the 913 cathode ray tube, is shown in the accompanying photos. This oscilloscope was developed by the Thordarson engineers, and it will perform practically all of the tasks that any radio experimenter might encounter and there is a provision for *double-image* R. F. alignment. This instrument may be used for measuring the percentage modulation of a transmitter, analyzing and locating hum; measuring audio distortion in either the transmitter, speech equipment or the receiver and the alignment of receivers with high fidelity A.F., R.F. and I.F. sections. Instructions and diagrams showing how to use the oscilloscope are furnished, also complete instructions of just how to wire the instrument and mount the parts.

The experimenter will be interested in the circuit diagram given here together with the parts list. One of the leading lens-makers devised a special non-distorting lens for this instrument, and this is mounted in front of

(*Continued on page* 524) →



Wiring diagram of new Cathode Ray Oscilloscope of the "build-yourself" type.

New 5-Tube Battery Superhet

● THE photo at the left shows a new battery-type, all-wave receiver which, beside tuning in the broadcast band, also receives *foreign* short-wave broadcasts in the 5,800 to 15,400 kc. range. It is a 5-tube superheterodyne designed by Crosley engineers. The set has the new illuminated mirrodial. Batteries required are a 2 volt air-cell, or a 2 v. storage or 3 volt dry "A," and 3-45 v. "B." (No. 669.) *Prepared from data supplied by the courtesy of the Crosley Radio Corp.*

13-Tube Superhet Has Touch Tuning

● THE handsome looking console radio receiver illustrated at the right is the new Lafayette 13-tube superheterodyne with electric touch tuning. This set is equipped with eight buttons for receiving broadcast stations. Adjustment is exceedingly simple and can be made by anyone with no previous experience. Thanks to a new circuit design, frequency drift is virtually eliminated the engineers claim, assuring peak resonance tuning at all times.

Among its many other fea-

(*Continued on page* 507)

Names and addresses of manufacturers of apparatus furnished upon receipt of postcard request; mention No. of article.

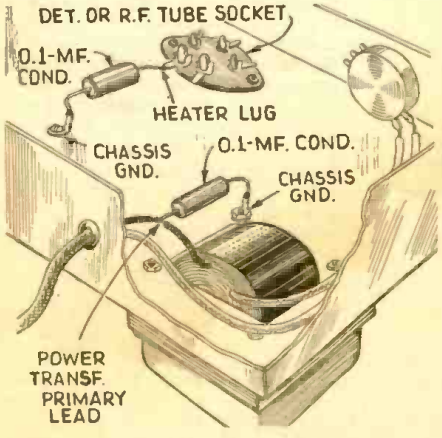
The Listener Asks

Questions asked by not-so-technically inclined listeners are answered in this new department.

TUNABLE HUM IN RECEIVERS

Q. *In operating my short-wave receiver I notice that as soon as a station carrier is tuned in a hum is heard. This hum never occurs at any other time. What can I do about it?*

A. This type of trouble is fairly common in electrically operated receivers. It is caused by interaction between the heaters and cathodes of the tubes. The remedy is quite simple; connect an .1 mf. paper by-pass condenser from the chassis ground to one of the heater leads of an R.F., I.F. or detector tube of the receiver. Also connect a condenser of similar value from one side of the 110 v. primary of the power transformer to the chassis. This second condenser should have a working voltage of at least 400 volts. In almost all cases this will cure the trouble.



Additions to receiver for reducing tunable hum

ODDITIES OF SHORT WAVE RECEPTION

Q. *During the past summer I heard many European stations during the evening on the 19 meter band with very good signals. Now I find that these stations have gradually faded out and are seldom heard. Is my receiver at fault?*

A. This is a natural phenomena associated with short waves and has nothing to do with your receiver. Certain wavelengths are good for long distance reception only at certain seasons of the year.

In the summer months the higher frequencies give much better results than the lower frequencies, whereas in the winter months the lower frequencies give the best results. The stations you heard during the summer on certain wavelengths naturally will not be heard very well with the coming of winter.

Most stations change their wavelengths with seasons and you will now find that the principal European stations are operating on so-called winter frequencies, which are considerably lower than those employed in the summer. If you take the trouble to tune in the lower frequency short-wave broadcast bands, you will now find the same European stations coming in very well. When spring returns the situation will reverse itself.

DIFFERENCE IN TIME

Q. *Will you please tell me the difference in time between a few of the principal cities in the world.*

A. The attached chart shows the difference in local time of various cities all over the world. This chart is computed with 12 o'clock noon, Eastern Standard Time, the time of New York City, as a reference.

New York	12 Noon
Chicago	11 a.m.
San Francisco	9 a.m.
Hawaii	6:30 a.m.
Sydney	3 a.m. (Tomorrow)
Tokyo	2 a.m. "
Manila	1 a.m. "
India	10:30 p.m.
Moscow	8 p.m.
South Africa	7 p.m.
Berlin	6 p.m.
Holland	5:20 p.m.
London	5 p.m.
Rio De Janeiro	2 p.m.
Buenos Aires	1 p.m.

TUNING DIAL DRIFT

Q. *I find that on my short-wave receiver it is necessary to reset the dial three or four times to hold a station in tune during the first hour the set is on. What causes this, and what can I do about it?*

A. This trouble is caused by several factors in the receiver and is generally a function of the design of the set. After a receiver is turned on it begins to warm up. The longer it is in operation the hotter it becomes. This causes expansion of metal parts and it is this expansion which alters the values of the tuning circuits to a considerable extent, making it necessary to retune the receiver. The effect is most noticeable on the higher frequencies where small changes in the components cause a large change in frequencies.

This trouble is usually due to faulty receiver design and a good receiver should not drift more than 1° on the dial between the time it is turned on and the time it is thoroughly warmed up. Not much can be done to correct this condition in a factory-made receiver, because it depends upon the position of parts, ventilation in the chassis, and quality of the components in the affected parts of the receiver. In a home-built receiver care should be taken that adequate ventilation is provided around the oscillator, first detector tubes and their associated parts.

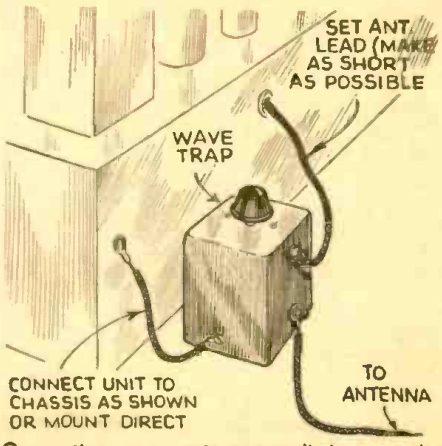
The use of air dielectric trimmer condensers in the oscillator tuning circuits greatly reduces this trouble. The particular type of circuit used for the oscillator plays a large part in the amount of drift. *Electron-coupled* oscillators are much less affected than other types.

ELIMINATING CODE INTERFERENCE

Q. *I have an all-wave superhet receiver. I am frequently bothered with code interference which appears on all bands no matter what the setting of the tuning dial. What steps can be taken to eliminate this?*

A. This type of trouble is peculiar to superheterodyne receivers and is caused by code stations operating on the same frequency as that to which the intermediate frequency amplifier of the receiver is tuned. The signal generally comes in through the aerial, passes through all the preselector stages and into the I.F. amplifier.

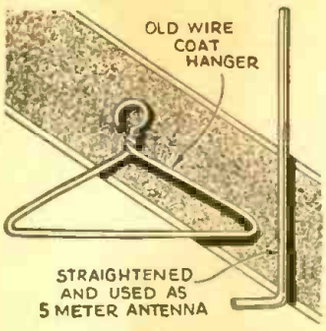
The remedy is to insert a wave trap which is tuned to the set's intermediate frequency between the aerial and receiver. *This trap must be placed very close to the receiver.* In fact, the ideal position would be to mount it on the receiver chassis. The sketch shows the proper method of connecting such a unit to a receiver. The aerial connection on the receiver goes to one terminal and the lead-in wire from the aerial system connects to the other terminal. The wave trap has an adjustment control built into it. To secure the proper adjustment turn the receiver on and wait until the code interference starts, then slowly turn the adjustment control on the wave trap until the interference disappears. Once this adjustment has been made no further attention is necessary. The unit has absolutely no effect on the receiver's efficiency in picking up stations. A trap which may be tuned from 400 to 500 kc. is proper for most receivers.



Connecting a wave-trap to eliminate code interference

Short Wave Kinks

Each month the Editor will award a 2 year subscription for the best short-wave kink submitted. All other kinks published will be awarded eight months' subscription to **SHORT WAVE & TELEVISION**. *Look over these "kinks"; they will give you some idea of what is wanted. Send a typewritten or ink description, with sketch, of your favorite to the "Kink" Editor.*



A COAT HANGER AERIAL

1st Prize Winner

One of the most serious problems confronting America today is what to do with old coat hangers! This problem is second only to that of disposing of old razor blades.

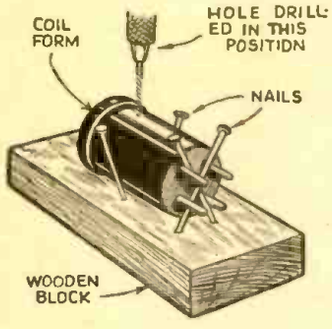
The problem of old coat hangers has been neatly solved for short-wave addicts by this Kink. All you do is take an old wire hanger and straighten it out into a nail form as shown in the sketch. It makes an admirable 5-meter antenna.—*Harold Brace, Jr.*

•

COIL HOLDER

Here is a handy device to hold a coil form rigid while it is being drilled.

As the sketch shows, four nails are placed in a wooden block to form a sort of cradle for the coil form. The prongs of the form engage two of the nails and prevent the form from turning. It is then a simple matter to drill the required hole.—*L. B. McCullough, M.D.*



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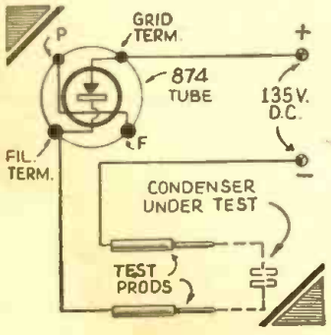
A CONDENSER TESTER

An effective condenser tester can be rigged up by using an old 874 gaseous tube. The wiring arrangement is shown in the diagram.

A pair of test prongs is necessary to test the condenser. Place the test prongs across the two terminals of the condenser. If the condenser is good, the tube will glow for an instant and then go out. If the condenser leaks, the tube will light continuously with a faint glow depending upon the magnitude of the leak. On the other hand, if the condenser is shorted, the tube will light continuously with a very bright glow, the same as it would if the two test prongs were shorted together. This test is most accurate for paper condensers.—*John Rocke.*



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DIAL REPAIR

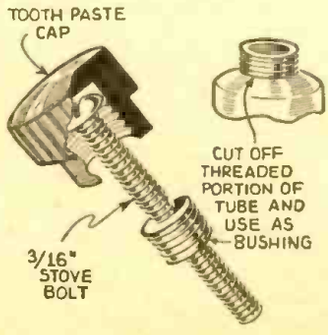
Tuning dials which make use of a friction belt frequently develop trouble when the belt begins to slip. An inexpensive remedy is to remove the belt, sandpaper the pulley faces slightly to roughen them and then rub beeswax on the pulley side of the belt. When the belt is replaced the slipping will have been eliminated.—*W. S. Crooks.*

•

KNOB FROM A TOOTH-PASTE CAP

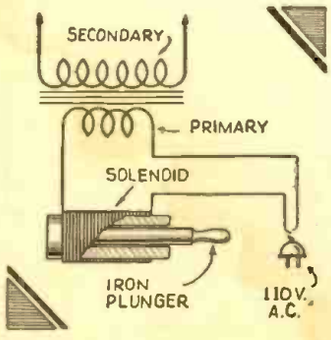
A new use for toothpaste caps is illustrated. Take the cap from a large size toothpaste tube, and a 3/16" flathead stove bolt, place the head of the stove bolt in the threaded interior of the cap. Cut off the threaded portion of the old tube of toothpaste and pass this over the stove bolt and screw it into the threads of the cap to act as a bushing to hold the bolt in place as shown in the sketch. Then take a penknife and force it between the bolt and the bushing, spreading the bushing to make a tight fit.

Another variation is to pour sealing wax into the cap instead of using the threaded portion of the toothpaste tube. The result is a neat knob-headed screw, which may be used in the construction of an antenna trimmer.—*Alexander Johnson.*



VOLTAGE REGULATOR

A simple device for regulating the primary voltage of a power transformer is shown. The unit is simply a variable inductance. Moving the iron plunger in and out of the coil varies the inductance. The coil consists of 30 turns of No. 18 D.C.C. wire, wound on a 1½" dia. tube about 3" long. The plunger may be a piece of iron pipe 5" long and just large enough to fit snugly into the tube. A wooden handle is attached to the end of the pipe. This Kink, of course, will only work on A.C.—*Robert F. Scott.*



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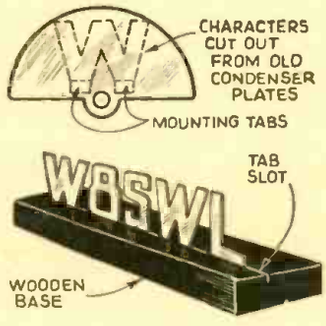
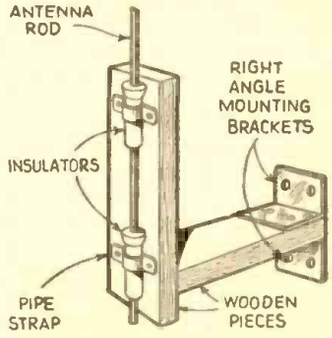
OLD CONDENSER PLATES



Old condenser plates seem to have more uses than model "T" Fords. By removing the plates from the condenser and cutting out characters with a sharp pair of metal shears, an attractive set of call letters can be made at no expense, as shown in the illustration. A pair of tabs should be cut out at the bottom of each character to facilitate mounting them.

After cutting out the letters they should be hammered flat and possibly burnished to suit the user's taste. A mounting base of wood or bakelite may be used.—*Milton Hawley.*

ANTENNA MOUNTING



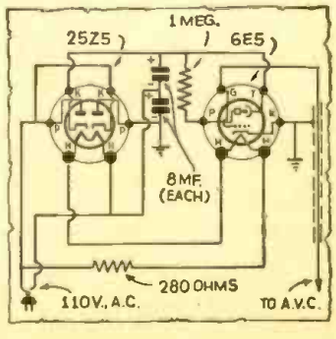
A simple mounting for a half-wave 5-meter antenna using a 5/16" dia. rod may be made from two lead-through insulators, two pipe straps, two pieces of wood and a couple of angle brackets. The sketch shows how the antenna rod is passed through the two insulators which in turn are secured to one of the boards by means of the pipe straps. The second piece of wood and the right-angle brackets are used to stand the assembly away from the wall of the shack.—*Jack Lehman.*

•

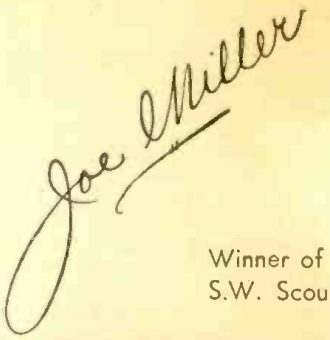
OUTPUT METER

A practical output meter making use of a "magic eye" tube is shown in the diagram. The unit is entirely self-powered and will operate from 110 Volts A.C. A 25Z5 tube is used as a voltage-doubling rectifier to supply voltage for the target and plate of the tuning indicator tube. Although a 6E5 is shown, it is quite possible to use any of the other 6.3 volt heater "magic eye" tubes.

The grid of the 6E5 is connected to the A.V.C. line of the receiver which is being aligned. To align, merely feed a signal into the set and adjust until some deflection is noted on the "magic eye." Adjust trimmers for minimum shadow on the "eye."—*Clarence H. Cramer.*



Let's Listen In With Joe Miller



Winner of the 30th
S.W. Scout Trophy

We wish to reiterate here that all reports from readers are very welcome, whether used or not, and that all DXers should send in a monthly list of their DX results. Please keep in mind that sending us amateur DX lists is useless, unless the frequency of each ham is given, and also the time of day heard. This helps other DXers to know *where* and *when* to search for stations reported when data is published.

We bring up a point here which has been impressed upon us by the numerous reports we receive monthly. It is that many of our DXing readers, when reading of the DX catches reported in these columns, feel that other *dial-twisters* may be able to hear these stations, but that they themselves cannot! That is like admitting one is *licked* before one starts fighting!

We believe most beginners feel that way, when they first start *combing* the dials for DX, as we felt that way when we began, because we did not know any better!

Let us make clear that any and all of the catches reported here may be heard by any DXer, who is already equipped with a fairly good receiver, a good antenna installation, a good station list, but mainly, plenty of patient perseverance!

One simply cannot sit down at his receiver, tune for a rare station, and expect it to come through the first time, unless he be very, very lucky! One must keep at it, day after day, and eventually, if all factors, such as DX conditions, are favorable the catch may be heard. Simply because such a station is not heard the first time is no indication that it is impossible to log!

After DXing for a few months, we began to realize that there was hardly a station in the whole wide world that could not be logged, provided we kept at it long enough. Then and there we decided to go after all the rare 'uns, and made up a list of stations, arranged according to reported times on air, or schedules, and, arising early every morning, tuned for one after another, according to our time schedule.

Though just beginning, we started to hear first one, then another, of the listed catches, and before long much of our list was crossed off, and logs of these entered in our station book! A sort of elimination system, and it surely worked! A *system of DXing* is what is needed, if a DXer is really out to compile an impressive list of real DX catches. Tuning haphazardly is all right in its way, but to make out a list of good DX, and then log one after another, by systematic tuning, is like setting oneself a goal, and achieving it, something to feel proud of, indeed! Then, when ones goal is achieved, and the veris begin to come in, don't sit back and feel satisfied! Set yourself a new goal, and *keep on* with the good work! A sure way to success is to follow these mottoes of ours, "plug at it," and "never be satisfied."

There are many more good DX receivers sold than there are *good* DXers, remember that. Success in this grand game is mainly up to yourself, provided you already have the ordinary mechanical essentials.

And now to DX:

SOUTH AFRICA

ZTJ, 9.615 mc., Johannesburg, is of course the outstanding DX event of the month. This station came on the air a few weeks ago, and when we heard ZTJ's signal strength, we were, to say the least, surprised. We gave it an R99 report, and other DXers throughout the U. S. and in Canada report it at least as loud as that, though some go us a few better, reporting ZTJ R999+++, hi! This should give all of our DX friends an idea as to how this heretofore rare catch pounds in here in North America.

● ***Did you hear a new station? If you have logged a new short-wave broadcast station not listed or mentioned in the "Listen In" department, or in our regular station list, be sure to write the DX Editor, c/o Short Wave & Television, and give him this information for the benefit of other listeners and readers. A postal card will do, and please give the data on the station as briefly as possible. Don't forget to mention any special musical or other identifying signals that you may note.***

ZTJ announces as "9.606 kc.," but is actually heard near 9.615 mc. The power is reported by I.D.A. to be 22 kw., certainly the most powerful African S-W broadcaster in existence. Sked is daily, except Saturday, 11:45 p.m.-12:45 a.m., E.S.T., when heard best, and daily, except Sundays, 9-11:40 a.m. On Sundays, programs begin at 7-8 a.m., ending at 11:40 a.m. According to Ashley Walcott, W6, one announcement heard said that ZTJ returns to the air again at 12 noon, but only on their 6.0975 mc. frequency.

Announcements are often given, but rarely identifications; about the only one made is just after the Reuter *news bulletin* at midnight, merely *"Klipheuvel station."* Programs begin and end with bugle calls, and setting-up exercise are a notable feature of each program. Bugle call at beginning is *"Reveille,"* and at end of program *"Cookhouse"* is played by the bugle.

Reports are asked to be sent to P.O. Box 4559, Johannesburg, South Africa, same QRA (address) as for old ZTJ.

The following DXers reported ZTJ, and we thank them for their fine data: Murray Buitekant, Ralph Gozen, Mario Bruscia, all W2, Ashley Walcott, W6, Jim Lanyon, VE5, Robert H. Budden, VE2.

NETHERLANDS INDIES

YCP, 9.12 mc., Balikpapan, Dutch Borneo, was heard lately at 5:26 a.m., with a good signal. At 5:30 a.m., PLV, 9.42 mc., Bandoeng, Java, was heard, then YBG, 10.43 mc., Medan, Sumatra, was heard at 5:33 a.m. Another, an unidentified Javan, we are sure, was heard near 9.20 mc., at 5:28 a.m., also. We certainly "cleaned up" that a.m.

ASIATIC REVIEW

XGOX, now on 9.80 mc., Nanking, China, is being heard again, daily 7-10 a.m. Sundays till noon. At 7:30 a.m. English news is read by a woman. This Xmtr relays XGOA's programs, XGOA being China's great 75 kw., BCB (broadcast band) station. Above data by courtesy of Ashley Walcott, W6. Harry Honda, W6, reports XGOX at 9:30 a.m. "Philco Radio," of Saigon, Indo China, has returned its 49 meter relay to the air, after several months' silence. Now the station is on 6.22 mc., operating from 4:30 or 5:30 a.m., till 9:30 a.m. daily, on same schedule as the 11.70 mc. Xmtr. Modulation has been improved considerably.

JZK, Tokio, Japan, on 15.16 mc., has been discontinued on the Overseas Broadcast; JZJ, 11.80 mc., to be used only. This latest flash from Harry Honda, W6.

MISCELLANEOUS

"Radio Martinique," located at Fort-de-France, Martinique, now on 9.69 mc., is being reported by Jim Lonyon, VE5, with a FB signal between 7:45-8:15 p.m., E.S.T. The QRA is P.O. Box 126, Fort-de-France. This is a new country, and should be verified by all DXers. A lady announces frequently; station closes down with the *"Marseillaise."* Jim also reports an Uruguayan station on 9.65 mc. relaying programs from Buenos Aires, and believes that the station is CXA8. This station heard in evening of course.

OZF, 9.517 mc., Skamlebak, Denmark, is broadcasting daily 2-4:15 p.m. towards South America and Eastern Asia, and 4:15-6:15 p.m., E.S.T., for Greenland and North America. Power is 6 kw., and station is known as *"the Danish Short-Wave Station."*

QRA is: Mail and Telegraph Dept., Technical Division, No. 32 Bernstorffsgade, Copenhagen, Denmark.

RKI, announced on 7.52 mc., is heard from 7-9:15 p.m. on 7.70 mc., in conjunction with RAN, both Xmtrs being located in Moscow.

Very little also reported of any DX value, so we'll go into the amateur bands for our news—quite a bit of it this month.

* * HAM STARDUST * *

AFRICA

The South Africans on 20 meters are already coming through, and on 10 meters have already come and gone.

In our 10 meter log, tuning weekends only, we've been able to enter ZS6T, ZT6AK, CN8AV, ZT6J, ZS6AJ, ZU6P, ZT2G, and ZE1JR to our African log, already having ZU6P QSL'd on 10. Also heard the latter 4 on 20. Roger Legge, W2, reports hearing ZU6P, ZT6AK, ZT2B on 10.

On 20, we have so far heard, mainly between 10:45 p.m.-12:30 a.m., E.S.T., the following: ZS3F, 14.320 mc.; ZS5M, 14.315; ZS2N, 14.01; ZS6AJ, 14.14 and 14.02; ZT5S, 14.43; ZS5AB, 14.06 and ZU6P, 14.06. Also SU1KG on 14.02.

Others reported by Ashley Walcott, W6, Jim Doyle, W9, are ZS1B, 14.065 and 14.315; ZS1AV, 14.272; ZU1T, 14.07; ZT5P, 14.27; ZS6AA, 14.33; ZS6AM, 14.08; ZS6AY, 14.315; ZT6AK, 14.06; ZT6S, 14.08; ZT6Y, 14.055, and ZU6N, 14.11. Most of these reported by Ashley, who adds that Africans on 20 have died out lately, oddly, when they are just beginning to come through in the east.

Other Africans reported are ZE1JA, 14.315, Southern Rhodesia, and FB8AH, 14.275, Madagascar, by Ashley. FB DX, OB!

W. S. Wade, W7, reports CN8MB, Morocco, 14.12, at 6:40 p.m., and has also heard ZT6Y. Roger Legge reports ZS2N.

Reported by "Reg," W6ITH, are: ZS2Z, 14.04; ZT2G, 14.07 and 14.265; ZT6Y, ZU6AF, 14.35 and 14.052. Also ZU6N, ZS6AJ and ZU6P.

ASIA

VS1AF, 14.14, Singapore, reported by Jim Lanyon and Ashley Walcott. Also, VS1AI, 14.05, by Ashley.

Incidentally, we regret very much having received data on a Special Broadcast from HS1BJ, Bangkok, Siam, too late for timely publication here. Sangiem Powtongsook, our Siamese radio friend and operator of HS1BJ, sent us a letter by air-mail informing us of the "Special," but he could not write us till too late, not knowing whether he would be able to put on the "Special."

Since then he has made arrangements, and we have had notice of this *Special* printed in the I.D.A. and I.S.W.C. bulletins, to inform as many friends as possible of this very fine "Special Broadcast."

Date of "Special" was Nov. 11-12-13-14, from 6:15-7 a.m., E.S.T., on 14.07 phone, using 25 watts power output. Zepp antenna, half-wave, beamed over North Pole to New York. Program was of native recordings, opening and closing with the national anthem.

A picture, and letter from Sangiem was printed in November issue of *S.W. & T.* Sangiem is Ass't. Engineer at HS8PJ, Siamese national station.

We are very grateful to Sangiem for his FB kindness in going to all that trouble, and we know that he will get many FB reports with that swell layout, as W6ITH reported HS1BJ R99++ recently, in a QSO with Sangiem!

↑ Above—The interesting QSL card shown above was received from VS6AQ, Hongkong, and it's printed in black and white.

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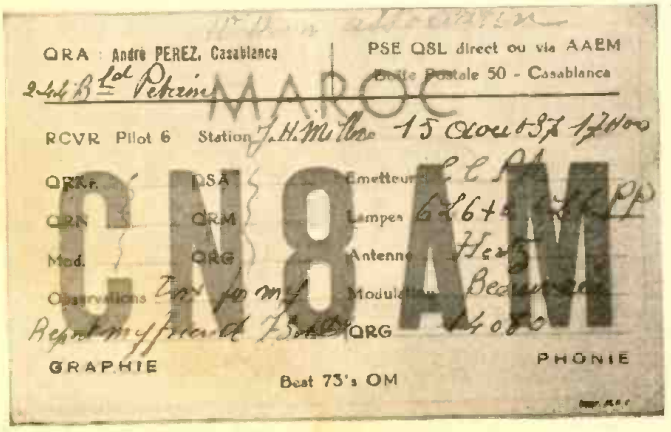

← Left — CN8AM — French Morocco, sends out this very distinctive card; the call letters and the word Maroc are printed in brown.

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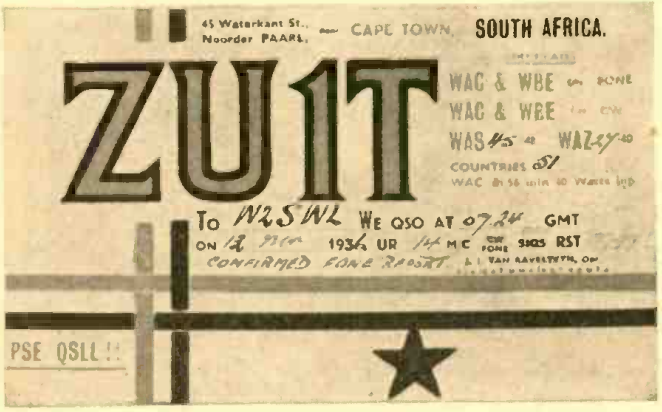

↑ Above—This unusual card comes from ZU1T, in Cape Town, South Africa, and is printed in three colors—red, blue and brown. Look for this station on 20 meters.

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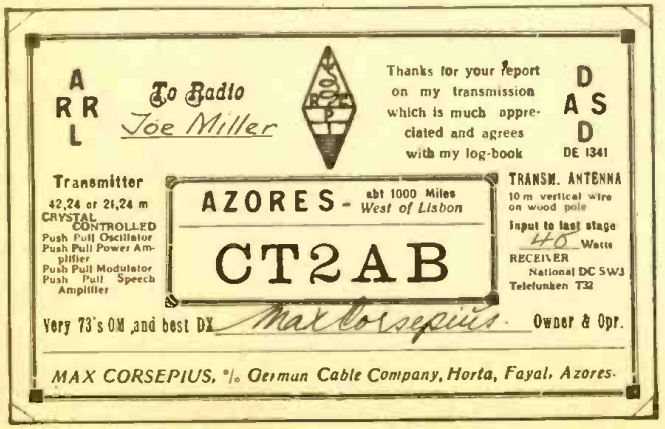


← Left—The neat QSL card sent by station CT2AB in the Azores. This card has a center panel printed in red.

Jim Doyle, W9, reports Y12BA, 14.35, at 12:50 a.m., also reported by W. S. Wade, W7. This is in Iraq. Jim Doyle also reports XU8HN, 14.3, PK2WL, PK4WS, XZ2BZ, PK1VM, VS2AK, VS1AI; nice DX, OB!

On 10 meters VU2CQ is reported by Chas. Baker, W2KTF, after dark. G6BH says VU2CQ is near 28.3, and that the Indian pounds in (in England).

Asiatics reported by Ashley are VS6AG, 14.084; Hong Kong, XZ2DY, 14.34, Burma, and also in Burma, heard by W6ITH, are XZ2EH, 14.04; XZ2BZ, 14.33; XZ2JB, 14.152, besides XZ2DY.

FI8AC, 14.27, French Indo-China, reported by John De Myer, W8, and Ashley. Says *"France-Indiana-No. 8, America-Canada,"* in giving call. QRA is P.O. Box 13, Hanoi, and name is R. Lebon. A very FB catch.

PK6WF, 14.08, Dutch Guinea, reported by John De Myer and Irv. Goodeve, W8, early morning.

Other Asiatics, heard and QSO'd by W6ITH, are: PK1VM, 14.1; PK2WL, 14.22; J2NG, 14.06; J2MI, who will increase power from 200 to 800 watts, 14.08; PK4WS, 14.1; VS1AD, 14.245; KA1JR, 14.254; KA1MM, 14.18; KA1AP, 14.06; KA1ME, 14.15, who is building a 1 kw. Xmtr for 10 and 20 meter phone; KA1DT, 14.21; KA1HS, 14.2 and 14.24, who will have a 1 kw. Xmtr by end of year. XU8HW, 14.03, Shanghai, will be in Manila till war's over.

YS2AK, 14.26 and 14.146, Federated Malay States, also reported by W6ITH. KA1CS, 14.14; KA1YL, the Yacht *Latitude*, reported by Ashley.

(*Continued on page* 514)

World Short-Wave Stations

REVISED MONTHLY

Up-to-the-Minute List of Broadcasters and Phones

Broadcasters Calls in bold type: Phones in light type

Reports on station changes are appreciated.

Mc.	Call	
		↓ S.W. BROADCAST BAND ↓
31.600	W3XEY	**BALTIMORE, MD.,** 9.494 m., Relays WFBR 4 pm-12m.
31.600	W2XDV	**NEW YORK CITY,** 9.494 m., Addr. Col. Broad. System, 485 Madison Ave. Daily 6-11 pm.; Sat. and Sun. 1.30-6, 7-10 pm.
31.600	W4XCA	**MEMPHIS, TENN.,** 9.494 m., Addr. Memphis Commercial Appeal. Relays WMC.
31.600	W8XAI	**ROCHESTER, N. Y.,** 9.494 m., Addr. Stromberg Carlson Co. Relays WHAM 7.30-12.05 am.
31.600	W8XWJ	**DETROIT, MICH.,** 9.494 m., Addr. Evening News Ass'n. Relays WWJ 6-12.30 am., Sun. 8 am-12 m.
31.600	W9XPD	**ST. LOUIS, MO.,** 9.494 m., Addr. Pulitzer Pub. Co. Relays KSD.
26.400	W9XJL	**SUPERIOR, WIS.,** 11.36., Relays WEBC daily.
26.400	W9XAZ	**MILWAUKEE, WIS.,** 11.36 m., Addr. The Journal Co. Relays WTMJ from 1 pm.
26.100	GSK	**DAVENTRY, ENG.,** 11.49 m., Addr. B. B. C., London. Operates irregularly
26.950	W6XKG	**LOS ANGELES, CAL.,** 11.56 m., Addr. B. S. McGlashan, Wash. Blvd. at Oak St. Relays KGFJ 24 hours daily.
21.550	GST	**DAVENTRY, ENG.,** 13.92 m., Addr. (See 26.100 mc.) Irregular at presen.
21.540	W8XK	**PITTSBURGH, PA.,** 13.93 m., Addr. Grant Bldg. Relays KDKA 6.45-9 am. Exc. Sun.
21.530	GSJ	**DAVENTRY, ENG.,** 13.93 m., Addr. (See 26.100 mc.) 5.45-8.55 am., 9.15-10.30 am.
21.520	W2XE	**NEW YORK CITY,** 13.94 m., Addr. Col. Broad. Syst., 485 Madison Ave. 7.30-10 am., Sat. and Sun. 8 am.-1 pm.
21.470	GSH	**DAVENTRY, ENG.,** 13.97 m. (See 26.100 mc.), 5.45-8.55 am., 9.15 am.-12 n.
		↓ S.W. BROADCAST BAND ↓
21.420	WKK	**LAWRENCEVILLE, N. J.,** 14.01 m., Addr. Amer. Tel. & Tel. Co. Calls S. Amer. 7 am.-7 pm.
21.080	PSA	**RIO DE JANEIRO, BRAZ.,** 14.23 m.. Calls WKK daytime.
21.060	WKA	**LAWRENCEVILLE, N. J.,** 14.25 m. Addr. (See 21.420 mc.) Calls England morning and afternoon.
21.020	LSN6	**BUENOS AIRES, ARG.,** 14.27 m., Addr Cia. Internacional de Radio. Works N. Y. C. 7 am.-7 pm.
20.860	EHY-EDM	**MADRID, SPAIN,** 14.38 m., Addr. Cia. Tel. Nacional de Espana. Works S. Amer. mornings.
20.700	LSY	**BUENOS AIRES, ARG.,** 14.49 m., Addr. Transradio Internatl. Tests irregularly
20.380	GAA	**RUGBY, ENG.,** 14.72 m. Calls Arg., Brazil mornings.
20.040	OPL	**LEOPOLDVILLE, BELGIAN CONGO,** 14.97 m. Works ORG mornings.
20.020	DHO	**NAUEN, GERMANY,** 14.99 m., Addr. Reichspostzenstralamt. Works S. Am. mornings.
19.900	LSG	**BUENOS AIRES, ARG.,** 15.08 m., Addr. (See 20.700 mc.) Tests irregularly.
19.620	WKN	**LAWRENCEVILLE, N. J.,** 15.14 m., Addr. A. T. & T. Co. Calls England daytime.
19.680	CEC	**SANTIAGO, CHILE,** 15.24 m., Addr. Cia. Internacional de Radio. Calls Col. and Arg. daytime.
19.650	LSN5	**BUENOS AIRES, ARG.,** 15.27 m., Addr. (See 21.020 mc.) Calls Europe daytime
19.620	VQG4	**NAIROBI, KENYA,** 15.28 m., Addr. Cable and Wireless, Ltd. Calls London 7.30-8 am.
19.600	LSF	**BUENOS AIRES, ARG.,** 15.31 m., Addr. (See 20.700 mc.) Tests irregularly.
19.480	GAD	**RUGBY, ENG.,** 15.4 m. Calls VQG4 7.30-8 am.
19.355	FTM	**ST. ASSISE, FRANCE,** 15.5 m. Calls S. America mornings.
19.345	PMA	**BANDOENG, JAVA,** 15.51 m. Works Holland 5.30-11 am.
19.260	PPU	**RIO DE JANEIRO, BRAZ.,** 15.58 m., Addr. Cia. Radiotel. Brasileira. Works France mornings.
19.220	WKF	**LAWRENCEVILLE, N. J.,** 15.6 m., Addr. A. T. & T. Co. Calls London and Paris daytime.
19.200	ORG	**RUYSSELEDE, BELGIUM,** 15.62 m. Calls OPL mornings.
19.160	GAP	**RUGBY, ENG.,** 15.66 m. Calls Australia 1-8 am.
19.020	HS8PJ	**BANGKOK, SIAM,** 15.77 m. Mondays 8-10 am.
18.970	GAQ	**RUGBY, ENG.,** 15.81 m. Calls S. Africa mornings.
18.890	ZSS	**KLIPHEUVEL, S. AFRICA,** 15.88 m., Addr. Overseas Comm. of S. Africa, Ltd. Calls GAQ 9-10 am.
18.830	PLE	**BANDOENG, JAVA,** 15.93 m. Calls Holland early am.
18.680	OCI	**LIMA, PERU,** 16.06 m. Tests with Bogota, Col.
18.620	GAU	**RUGBY, ENG.,** 16.11 m. Calls N. Y. daytime.
18.450	HBF	**GENEVA, SWITZERLAND,** 16.26 m., Addr. Radio Nations. Tests irregularly.
18.345	FZS	**SAIGON, INDO-CHINA,** 16.35 m. Works Paris early morning.
18.340	WLA	**LAWRENCEVILLE, N. J.,** 16.36 m., Addr. A. T. & T. Co. Calls England daytime.
18.310	GAS	**RUGBY, ENG.,** 16.38 m. Calls N. Y. daytime.
18.299	YVR	**MARACAY, VENEZ.,** 16.39 m. Works Germany mornings.
18.250	FTO	**ST. ASSISE, FRANCE,** 16.43 m. Works S. America daytime.
18.200	GAW	**RUGBY, ENG.,** 16.48 m. Works N. Y. C. daytime.
18.135	PMC	**BANDOENG, JAVA,** 16.54 m. Works Holland mornings.
18.115	LSY3	**BUENOS AIRES, ARG.,** 16.56 m., Addr. (See 20.700 mc.) Tests irregularly. Broadcasts 4-5 pm. Friday.
18.040	GAB	**RUGBY, ENG.,** 16.83 m. Works Canada morning and afternoon.
17.810	PCV	**KOOTWIJK, HOLLAND,** 16.84 m. Works Java 6-8 am.
		↓ S.W. BROADCAST BAND ↓
17.800	TGWA	**GUATEMALA CITY, GUAT.,** 16.84 m., Addr. Ministre De Fomento. Irregular.
17,790	GSG	**DAVENTRY, ENG.,** 16.86 m., Addr. B.B. C., London. 3.15-5.30 am., 5.45-8.55 am., 9 am.-12 n., 12.20-3.45 pm.
17.785	JZL	**TOKIO, JAPAN,** 16.87 m. Tests irregularly.
17.780	W3XAL	**BOUND BROOK, N. J.,** 16.87 m., Addr. Natl. Broad. Co. 9 am.-9 pm.
17,770	PHI	**HUIZEN, HOLLAND,** 16.88 m., Addr. (See PHI, 11.730 mc.) Daily except Wednesday, 8.25-10 am., Sat. till 10.40 am., Sun. 7.25-10.25 am. Wed. 8-10.30 am.
17.760	DJE	**BERLIN, GERMANY,** 16.89 m., Addr. Broadcasting House. 12.05-11 am.; also Sun. 11.10 am.-12.25 pm.
17.760	W2XE	**NEW YORK, N. Y.,** 16.89 m., Addr. Col. Broad. System, 485 Madison Ave. Daily 6.30-8 pm.
		↑ S.W. BROADCAST BAND ↑
17.755	ZBW5	**HONGKONG, CHINA,** 16.9 m., Addr. P. O. Box 200. 4-10 am. irregular.
17.741	HSP	**BANGKOK, SIAM,** 16.91 m. Works Germany 3-5 am., 8-9 pm. Works JVE 11 pm.-6 am.
17.650	XGM	**SHANGHAI, CHINA,** 17 m. Works London 7-9 am.
17.520	DFB	**NAUEN, GERMANY,** 17.12 m. Works S. America, near 9.15 am. Works Siam 3-5 am., 8-9 pm.
17.480	VWY2	**KIRKEE, INDIA,** 17.16 m. Works London 7.30-8.15 am.
17.310	W2XGB	**HICKSVILLE, L. I., N. Y.,** 17.33 m., Addr. Press Wireless. Box 296. Tests 11 am.-1 pm. except Sat. and Sun.
17.120	WOO	**OCEAN GATE, N. J.,** 17.52 m., Addr. A. T. & T. Co. Works ships irregularly.
17.080	GBC	**RUGBY, ENG.,** 17.56 m. Works ships irregularly.
16.835	ITK	**MOGADISCIO, ITAL. SOMALILAND,** 18.32 m. Calls IAC around 9.30 am.
16.270	WLK	**LAWRENCEVILLE, N. J.,** 18.44 m., Addr. A. T. & T. Co. Works S. Amer. daytime.
16.270	WOG	**OCEAN GATE, N. J.,** 18.44 m., Addr. A. T. & T. Co. Works England Late afternoon.
16.240	KTO	**MANILA, P. I.,** 18.47 m., Addr. RCA Comm. Works Japan and U. S. 5-9 pm. irregularly.
16.233	FZR3	**SAIGON, INDO-CHINA,** 18.48 m. Calls Paris early morning.
16.030	KKP	**KAHUKU, HAWAII,** 18.71 m., Addr. RCA Comm. Works Dixon 3-10 pm.
15.880	FTK	**ST. ASSISE, FRANCE,** 18.9 m. Works Saigon 8-11 am.
15.865	CEC	**SANTIAGO, CHILE,** 18.91 m. Calls Peru daytime irregular.
16.810	LSL	**BUENOS AIRES, ARG.,** 18.98 m., Addr. (See 21.020 mc.) Works London mornings and Paris afternoons.
15.660	JVE	**NAZAKI, JAPAN,** 19.16 m. Works Java and Siam 3-5 am.
15.620	JVF	**NAZAKI, JAPAN,** 19.2 m. Works Cal. near 5 am. and 8 pm.
15.550	CO9XX	**TUINICU, ORIENTE, CUBA,** 19.29 m., Addr. Frank Jones? Broadcasts irregularly evenings.
15.450	IUG	**ADDIS ABABA, ETHIOPIA,** 19.41 m. Works Rome 9.15-10.30 am.
15.440	XEBM	**MAZATLAN, SIN., MEX.,** 19.43 m., Addr. Flores 103 Alto. "El Pregonero del Pacifico." Irregularly 7 am.-10 pm.
15.415	KWO	**DIXON, CAL.,** 19.46 m., Addr. A. T. & T. Co. Works Hawaii 2-7 pm.
15.370	HAS3	**BUDAPEST, HUNGARY,** 19.52 m., Addr. Radiolabor, Gyali Ut 22. Sun 9-10 am.
15.360	DZG	**ZEESEN, GERMANY,** 19.53 m., Addr. Reichspostzenstralamt. Tests irregularly.
15.355	KWU	**DIXON, CALIF.,** 19.53 m., Addr. A. T. & T. Co. Phones Pacific Isles and Japan.
		↓ S.W. BROADCAST BAND ↓
15.340	DJR	**BERLIN, GERMANY,** 19.56 m., Addr. Br'dcast'g House, 8-9am.
15.330	W2XAD	**SCHENECTADY, N. Y.,** 19.56 m., Addr. General Electric Co. Relays WGY 11 am. to 9 pm.
15.310	GSP	**DAVENTRY, ENG.,** 19.6 m., Addr. (See 26.100 mc.) 1.45-3.45 pm.
15.290	LRU	**BUENOS AIRES, ARG.,** 19.62 m., Addr. El Mundo. 6-8 am.

(*Continued on page* 492)

(All Schedules Eastern Standard Time)

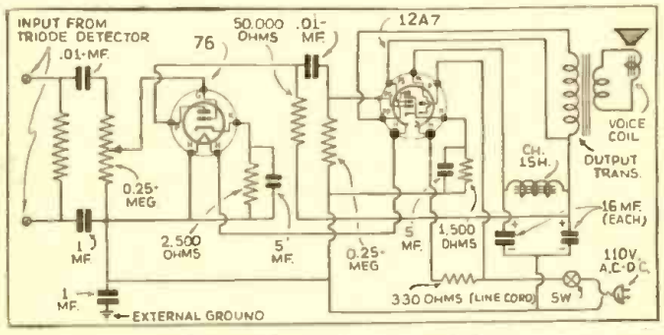
A fee of 25c (stamps, coin or money order) is charged for letters that are answered by mail. This fee includes only hand-drawn schematics. We cannot furnish full-size working drawings or picture layouts. Letters not accompanied by 25c will be answered on this page. Questions involving considerable research will be quoted upon request. Names and addresses should be clearly printed on each letter.

QUESTION BOX

Only 2 Tubes in an A.C.-D.C. Audio Amplifier

I am having trouble making an A.C.-D.C., A.F. amplifier work satisfactorily. The amplifier makes use of a 76 and a 12A7. Please publish a suitable circuit.—Kenneth Perrin, Ashland, Va.

A. A suitable amplifier for A.C.-D.C. operation is shown in the diagram. A 76 tube is used as a first stage and a 12A7 (pentode-rectifier) is used as the output stage and B supply rectifier. Particular attention should be paid to the manner in which connections are made to the 12A7 tube. If the amplifier is constructed according to the data given here, no trouble should be experienced with it. It is essential that an external ground, if used, be not connected directly to the amplifier, but rather through the 1 mf. condenser as shown.

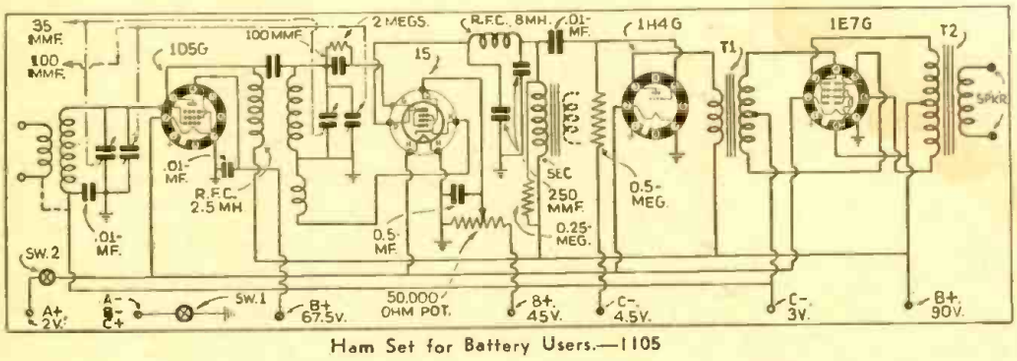


A.C.-D.C. Audio Amplifier.—1104

A Battery-Operated Ham Receiver

I would like to see a diagram for a battery operated "ham" receiver using a 1D5G as R.F., a 15 as electron-coupled detector, a 1H4G for the 1st A.F. and a 1E7G in the output stage. The coupling between the detector and R.F. stage should be by choke and condenser.—C. A. Doane, Jr., Marshfield, Ore.

A. A battery operated receiver following the layout mentioned above is diagrammed. This receiver should give excellent performance on the short waves and has the added virtue of being up-to-date in that it uses modern tubes. The 15 type tube has a separate cathode, it will be noted, to which the regeneration coil is connected. Incidentally, it is important that this coil be hooked-up in reverse fashion, otherwise the detector will not oscillate properly. The 1E7G used in the output stage is actually two pentodes in a single bulb.



Ham Set for Battery Users.—1105

4 Tube Receiver for A.C. Operation

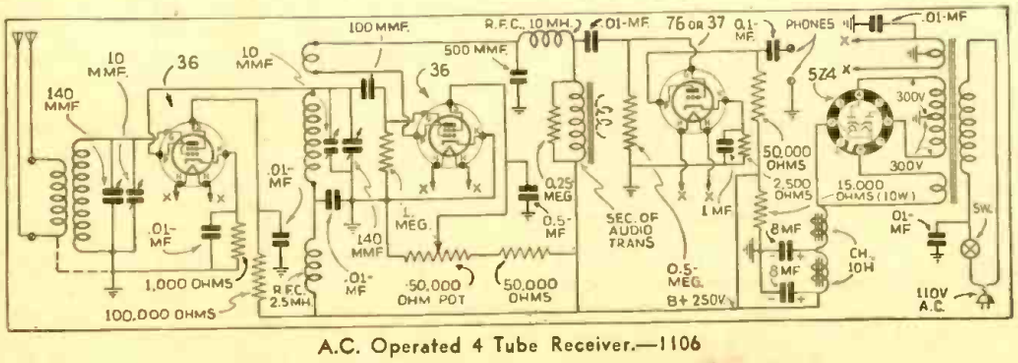
Please publish the diagram for an A.C. operated set using 4 prong plug-in coils, a 5Z4 rectifier and 3 other tubes which should be either 36, 37 or 38 types.—Nick Sforza, Jersey City, N.J.

A. A 4 tube set is diagrammed, making use of a 36 as R.F. amplifier, a 36 as regenerative detector, a 37 as audio, and a 5Z4 as rectifier. This set should give good headphone reception and operates from a 110 Volts A.C. line. More modern tubes may be substituted in the R.F. and detector stages should the constructor so desire. For example, 6C6's can be substituted for the 36's with no changes other than tying their suppressors to the cathodes, and in the case of the R.F. amplifier, replacing the 100,000 ohm screen-grid resistor with one having a value of 300,000 ohms. In addition, a type 76 tube may be substituted for the 37.

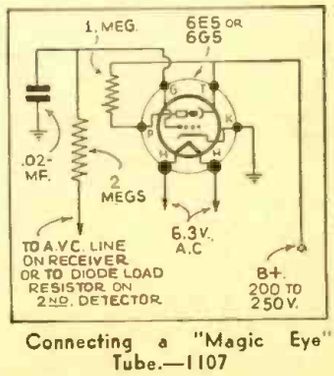
Adding a Magic Eye Tube to a Receiver

I would be pleased if you would publish a diagram showing how to connect a 6E5 cathode ray tuning eye to a receiver.—Robt. Jones, Westernport, Md.

A. The proper method of connecting up a cathode ray tuning eye tube is shown in the diagram. All voltages, of course, can be taken from the same source which supplies the tubes in the receiver. If a plate supply of less than 200 volts is used, the resistor from the target to the plate of the cathode ray tube should be reduced in value to 0.5 meg. The 2 meg. resistor and the .02 mf. condenser in the grid circuit of the tube determine the rapidity of the action of the eye in responding to variations in carrier strength. Increasing the value of the resistor and the condenser will make the eye action more sluggish. Similarly, decreasing the value of these two parts will make the device respond to very rapid impulses and, in fact, if they are made too small, the eye will change for variations in modulation which is undesirable in a receiver. It is necessary that the receiver employ A.V.C. to make use of one of these tubes. A 6G5 tube may be substituted for the 6E5 tube. To determine which tube is proper tune in a strong signal. If the shadow edges overlap when using a 6E5, replace it with the 6G5 type.



A.C. Operated 4 Tube Receiver.—1106



Connecting a "Magic Eye" Tube.—1107

Mc.	Call	
15.280	HI3X	**CIUDAD TRUJILLO, D. R.,** 19.63 m Relays HIX Sun. 7.40-10.40 am. Weekdays 12.10-1.10pm.
15.280	DJQ	**BERLIN, GERMANY,** 19.63 m., Addr. Broadcasting House. 12.05-11 am., 4.50-10.45 pm. Also Sun. 11.10am -12.25 pm.
15.270	W2XE	**NEW YORK CITY,** 19.65 m., Addr. (See 21.520 mc.) 1-6 pm., 8.30-12 m., Sat. and Sun. 2.30-6, 8.30 pm.-12 m.
15.260	GSI	**DAVENTRY, ENG.,** 19.66 m., Addr. (See 26.100 mc.) 12.20-3.45 pm.
15.252	RIM	**TACHKENT, U.S.S.R.,** 19.67 m. Works RKI near 7 am.
15.250	W1XAL	**BOSTON, MASS.,** 19.67 m.. Addr. University Club. Daily 2.15-4 pm., Sun. 10.15 am.-12 n.
15.245	TPA2	**PARIS, FRANCE,** 19.68 m., Addr. 98 bis. Blvd. Haussmann. "Radio Colonial." 6-11 am.
15.230	HS8PJ	**BANGKOK, SIAM,** 19.32 m. Irregularly Mon. 8-10 am.
15.230	OLR5A	**PRAGUE, CZECHOSLOVAKIA,** 19.32 m., Irregular.
15.220	PCJ	**HUIZEN, HOLLAND,** 19.71 m., Addr. N. V. Philips' Radio, Hilversum. Tues. 4-6.30 am., Wed. 8-10.30 am.
15.210	W8XK	**PITTSBURGH, PA.,** 19.72 m., Addr. (See 21.540 mc.) 9 am.-7 pm.
15.200	DJB	**BERLIN, GERMANY,** 19.74 m., Addr. (See 15.280 mc.) 12.05-11 am. Also Sun. 11.10 am. to 12.25 pm.
15.190	ZBW4	**HONGKONG, CHINA,** 19.75 m.,Addr. P. O. Box 200. 11.30 pm. to 1.15 am., 4-10 am. Sat. 9.15 pm.-1 am. Sun. 3-9.30 am.
15.180	GSO	**DAVENTRY, ENG.,** 19.76 m.. Addr. (See 26.100mc.) 3.15-5.30, 5.45-8.55 am, 4-6 pm.
15.165	XEWW	**MEXICO CITY, MEXICO,** 19.78 m. 12 n.-6 pm.
15.160	JZK	**TOKIO, JAPAN,** 19.79 m., 12.30-1.30, 8-9 am.
15.150	YDC	**BANDOENG, JAVA,** 19.8 m., Addr. N. I. R. O. M. 6-7.30 pm. 10.30 pm.-2 am., Sat. 7.30 pm.-2 am., 5.30-10.30 am.
15.140	GSF	**DAVENTRY, ENG.,** 19.82 m., Addr. (See 26.100 mc.) 9.15 am.-12 n.,
15.120	HVJ	**VATICAN CITY,** 19.83 m., 10.30-10.45 am., except Sun., Sat. 10-10.45 am.
15.110	DJL	**BERLIN, GERMANY,** 19.85 m., Addr. (See 15.280 mc.) 12 m-2, 8-9 am., 10.40 am. to 4.30 pm. Sun. also 6-8 am.

S.W. BROADCAST BAND

15.055	WNC	**HIALEAH, FLORIDA,** 19.92m., Addr. A .T. & T. Co. Calls Central America daytime.
15.038	RKI	**MOSCOW, U.S.S.R.,** 19.95 m. Works Tashkent near 7 am. Broadcasts Sun. 12.15-2.30 pm.
14.980	KAY	**MANILA, P. I.,** 20.03 m., Addr. RCA Comm. Works Pacific Islands.
14.970	LZA	**SOPHIA, BULGARIA,** 20.04 m., Addr, Radio Garata. Sun. 12.30-8 am., 10 am.-4.30 pm. Daily 5-6.30 am., 12 n.-2.45 pm.
14.960	PSF	**RIO DE JANEIRO, BRAZIL,** 20.43 m., Works with Buenos Aires daytime.
14.950	HJB	**BOGOTA, COL.,** 20.07 m.. Calls WNC daytime.
14.940	HI1	**CIUDAD TRUJILLO, D. R.,** 20.08 m., Phones WNC daytime.
14.940	HJA3	**BARRANQUILLA, COL.,** 20.08 m. Works WNC daytime.
14.845	OCJ2	**LIMA, PERU,** 20.21 m. Works South American stations daytime.
14.790	ROU	**OMSK, SIBERIA, U.S.S.R.,** 20.28 m. Works Moscow irregularly 7-9 am.
14.730	IQA	**ROME, ITALY,** 20.37 m. Tests irregularly.
14.653	GBL	**RUGBY, ENG.,** 20.47m. Works JVH 1-7am.
14.640	TYF	**PARIS, FRANCE,** 20.49 m. Works Saigon and Cairo 3-7 am, 12 m.-2.30 pm.
14.600	JVH	**NAZAKI, JAPAN,** 20.55 m. Broadcasts irregularly 5-11.30 pm. Works Europe 4-8 am.
14.590	WMN	**LAWRENCEVILLE, N. J.,** 20.56 m., Addr. A. T. & T. Co. Works England morning and afternoon.
14.535	HBJ	**GENEVA, SWITZERLAND,** 20.64 m., Addr. Radio Nations. Broadcasts Sat. 6.45-8 pm.
14.530	LSN	**BUENOS AIRES, ARG.,** 20.65 m., Addr. (See 20.020 mc.) Works N. Y. C. afternoons.
14.500	——	**ASMARA, ERITREA, AFRICA,** 20.69 m. Works Rome and Addis Ababa 6.30-7.30 am
14.500	LSM2	**BUENOS AIRES, ARG.,** 20.69 m., Addr. (See 21.020 mc.) Works RIO and Europe daytime.
14.485	TIR	**CARTAGO, COSTA RICA,** 20.71 m. Works Central America and U. S.A. daytime.
14.485	YSL	**SAN SALVADOR, SALVADOR,** 20.71 m. Irregular.
14.485	HPF	**PANAMA CITY, PANAMA,** 20.71 m. Works WNC daytime.
14.485	TGF	**GUATEMALA CITY, GUATEMALA,** 20.71 m. Works WNC daytime.
14.485	YNA	**NICARAGUA, MANAGUA,** 20.71 m. Works WNC daytime.
14.485	HRL5	**NACAOME, HONDURAS,** 20.71 m. Works WNC daytime.
14.485	HRF	**TEGUCIGALPA, HONDURAS,** 20.71 m. Works WNC daytime.
14.470	WMF	**LAWRENCEVILLE, N. J.,** 20.73 m., Addr. A. T. & T. Co. Works London and Paris daytime.
14.460	DZH	**ZEESEN, GERMANY,** 20.75 m., Addr. (See 15.360 mc.) Irregular.
14.440	GBW	**RUGBY, ENG.,** 20.78 m. Works U. S. A. afternoons.
14.200	EA9AH	**TETUAN, SPANISH MOROCCO,** 21.13 m. Daily except Sun. 2.15-5.7 and 9 pm.
14.164	PI1J	**DORDRECHT, HOLLAND,** 20.52 m., Addr. (See 7.088 mc.) Sat. 12 n.-12.30 pm.
13.990	GBA	**RUGBY, ENG.,** 21.44 m., Works Buenos Aires late afternoon.
13.820	SUZ	**ABOU ZABAL, EGYPT,** 21.71 m. Works with Europe 11 am. to 2 pm.
13.690	KKZ	**BOLINAS, CALIF.,** 21.91 m., Addr. RCA Communications. Irregular.
13.635	SPW	**WARSAW, POLAND,** 22 m., Mon., Wed. Fri. 12.30-1.30 pm., Daily 6-7 pm.
13.585	GBB	**RUGBY, ENG.,** 22.08 m. Works Egypt and Canada afternoon.
13.415	GCJ	**RUGBY, ENG.,** 22.36 m. Works Japan and China early morning.
13.410	YSJ	**SAN SALVADOR, SALVADOR,** 22.37 m. Works WNC daytime.
13.390	WMA	**LAWRENCEVILLE, N. J.,** 22.4 m., Addr. A. T. & T. Co. Works England morning and afternoon.
13.380	IDU	**ASMARA, ERITREA, AFRICA,** 22.42 m. Works Rome daytime.
13.345	YVQ	**MARACAY, VENEZUELA,** 22.48 m. Works WNC daytime.
13.285	CGA3	**DRUMMONDVILLE, QUE., CAN.,** 22.58 m. Works London and ships afternoons.
13.330	IRJ	**ROME, ITALY,** 22.69 m. Works Tokio 8-9 am. irregularly.
13.075	VPD	**SUVA, FIJI ISLANDS,** 22.94 m. Irregularly.
12.840	WOO	**OCEAN GATE, N. J.,** 23.36 m., Addr. A. T. & T. Co. Works with ships irregularly.
12.825	CNR	**RABAT, MOROCCO,** 23.39 m., Addr. Director General Tele. & Teleg. Stations. Works with Paris irregularly.
12.800	IAC	**PISA, ITALY,** 23.45 m. Works Italian ships mornings.
12.780	GBC	**RUGBY, ENG.,** 23.47. Works ships Irregularly.
12.485	HIN	**CIUDAD TRUJILLO, D. R.,** 24 m. "Broadcasting National." 12 n.-2 pm. 6-11 pm. approx.
12.325	DAF	**NORDDEICH, GERMANY,** 24.34 m. Works German ships daytime.
12.300	CB615	**SANTIAGO, CHILE,** 24.39 m., Addr. Louis Desmaras, Casilla, 761. 11 am.-1 pm., 4-8 pm., Sun. 4-10 pm.
12.290	GBU	**RUGBY, ENG.,** 24.41 m. Works N. Y. C. evenings.
12.250	TYB	**PARIS, FRANCE,** 24.49 m. Irregular.
12.235	TFJ	**REYKJAVIK, ICELAND,** 24.52 m. Works Europe mornings. Broadcasts Sun. 7.40-2.30 pm.
12.215	TYA	**PARIS, FRANCE,** 24.56 m. Works French ships in morning and afternoon.
12.150	GBS	**RUGBY, ENG.,** 24.69 m. Works N. Y. C. evenings.
12.130	DZE	**ZEESEN, GERMANY,** 24.73 m., Addr. (See 15.360 mc.) Tests irregular.
12.120	TPZ2	**ALGIERS, ALGERIA,** 24.75 m. Calls Paris 12 m.-6.30 am.
12.060	PDV	**KOOTWIJK, HOLLAND,** 24.88 m. Tests irregularly.
12.000	RNE	**MOSCOW, U.S.S.R.,** 25 m. Daily except Sun. 3-6 pm., Sat., Sun., Tues., Fri., 10.15-10.45 pm., also Sun. 6-11 am., Wed. 6-7 am.
11.991	FZS2	**SAIGON, INDO-CHINA,** 25.02 m. Phones Paris mornings.
11.960	HI2X	**CIUDAD TRUJILLO, D. R.,** 25. 08 m., Addr. La Voz de Hispaniola. Relays HIX Tue. and Fri. 8.10-10.10 pm.
11.955	IUC	**ADDIS ABABA, ETHIOPIA,** 25.09 m, Works IAC around 12 midnight.
11.950	KKQ	**BOLINAS, CALIF.,** 25.1 m. Tests irregularly evenings.
11.940	FTA	**STE. ASSISE, FRANCE,** 25.13 m. Works Morocco mornings and Argentina late afternoon.

S.W. BROADCAST BAND

11.910	CB1190	**VALDIVA, CHILE,** 25.2 m., P. O. Box 642. Relays CB69 11 am.-11 pm.
11.900	XEWI	**MEXICO CITY, MEXICO,** 25.21 m., Addr. P. O. Box 2874. Tues. and Thurs. 7.30 pm.-12 m., Fri. 9 pm.-12 m. Sunday 12.30-2 pm.
11.895	HP5I	**AGUADULCE, PANAMA,** 25.22 m. Addr. La Voz del Interior. 7.30-9.30 pm.
11.880	TPA3	**PARIS, FRANCE,** 25.23 m., Addr. (See 15.245 mc.) 2-5 am., 12.15-6 pm.
11.870	W8XK	**PITTSBURGH, PA.,** 25.26 m., Addr. (See 21.540 mc.) 7-10 pm.
11.860	YDB	**SOERABAJA, JAVA,** 25.29 m., Addr. N. I. R. O. M. Sat. 7.30 pm. to 2.30 am., daily 10.30 pm. to 2 am.
11.860	GSE	**DAVENTRY, ENG.,** 25.29 m., Addr. (See 26.100 mc.) Irregular.
11.855	DJP	**BERLIN, GERMANY,** 25.31 m., Addr. (See 15.280 mc.) Irregular 11.35 am. to 4, 7-10.45 pm.
11.840	KZRM	**MANILA, P. I.,** 25.35 m. Addr. Erlanger & Gallinger, Box 283. 9 pm.-10 am. Irregular.
11.840	CSW	**LISBON, PORT.,** 25.35 m. Nat'l Broad. Stat. 11.30 am.-1.30 pm. irreg.
11.840	OLR4A	**PRAGUE, CZECHOSLOVAKIA,** 25.35 m. Addr. Czech Shortwave Sta., Praha X11, Fochova 16. Mon. and Thurs., 7-9.10 pm.
11.830	W9XAA	**CHICAGO, ILL.,** 25.36m., Addr. Chicago Federation of Labor. Irregular 7 am.-6 pm.
11.830	W2XE	**NEW YORK CITY,** 25.36 m., Addr. Col. Broad. System. 485 Madison Av., N.Y.C.
11.820	XEBR	**HERMOSILLA, SON., MEX.,** 25.38 m. Addr. Box 68. Relays XEBH. 2-4 pm., 9 pm.-12m.
11.820	GSN	**DAVENTRY, ENG.,** 25.38 m., Addr. (See 26.100 mc.). Irregular.
11.810	2RO	**ROME, ITALY,** 25.4 m., Addr. E.I.A.R., Via Montello 5. Daily 6.43-10.30 am, 11.30 am.-12.20 pm., Sun. 6.43-9 am. 11.30 am.-12.20 pm.
11.805	OZG	**SKAMLEBOAEK, DENMARK,** 25.41 m. Addr. Statsradiofonien. Irregular.
11.800	JZJ	**TOKIO, JAPAN,** 25.42 m., Addr. Broadcasting Co. of Japan, Overseas Division. 8-9 am, 3-4, 4.30-5.30 pm.
11.800	OER3	**VIENNA, AUSTRIA,** 25.42 m. Daily 10 am.-5 pm. Sat. until 5.30 pm.
11.795	DJO	**BERLIN, GERMANY,** 25.43 m., Addr. (See 15.280 mc.). Irregular.
11.795	OAX5B	**ICA, PERU,** 25.43 m., Addr. Radio Universal. 11 am.-12 n, 4-11.15 pm.
11.790	COQF	**MATANZAS, CUBA,** 25.45 m., Addr. Gen. Betancourt 51. Relays CMGF. 2-3, 4-5, 6-11 pm.

(*Continued on page* 494)

(All Schedules Eastern Standard Time)

How To Identify S-W Stations

Keep These Lists for Future Reference

WORLD-WIDE STATION IDENTIFICATION LIST

Part Seven

MC CALL TYPE LOCATION

8.664 COJK B—Camaguey, Cuba. Relays BCB CMJK. Slogan sounds like *"Radio Senife."*

8.59 YNPR B—Managua, Nicaragua. Slogan *"Radioemisora Pilot,"* or *"la voz de Pilot."*

8.505 YNLG B—Managua, Nicaragua. Slogan *"Nicaragua Patria de Dario,"* as station owned by Rueben Dario.

8.38 IAC C—Coltano, Italy. Often calls ships in afternoons, calling *"Pronto Pronto Roma,"* etc.

8.33 HC2CW B—Guayaquil, Ecuador. Slogan *"Ondas del Pacifico,"* opens and closes with musical selection *"Sangre Ecuatoriana."*

8.12 KTP C—Manila, Philippines. Call at opening and end of pbone transmissions, *"This is station KTP, Manila, on a frequency of* 8120 *KC, now—"* Inverted speech used all other times.

7.86 SUX C—Cairo, Egypt. Calls Rome and London in afternoons, *"Hello London, SUX Cairo, calling."* Inverted speech used except at opening and close of transmission.

7.855 KZGF C—Manila, Philippines. Call given in code before most transmissions. Inverted speech ordinarily used. At start of transmission may change back and forth between 6.46, 5.81 and 7.855 mc.

7.854 HC2JSB B—Guayaquil, Ecuador. Slogan *"Ecuador Radio."* Standby signal one deep-toned chime or gong.

7.83 KZGG C—Cebu Island, Philippines. Call given in code before most transmissions. *"Hello Manila, Cebu calling."* Inverted speech always used. Contacts KZGF.

7.797 HBP B—Geneva, Switzerland. Slogan *"Radio Nations."* Call and wavelength announced, and then *"League of Nations Wireless Station."* A different language is used every 15 minutes of the broadcast.

7.68 YBZ C—Menado, Celebes, N.E.I. Call in Dutch at beginning of transmission only *"Hallo Macassar, hier ist Menado."* Inverted speech never used.

7.66. JKJ C—Yoshino, near Kagoshima, Japan. Clear phone transmission heard only at beginning of first transmission on this frequency. Inverted speech always used at other times.

7.61 KWX C—Dixon, California. Identifies in clear speech at beginning and end of transmission. Inverted speech used.

7.565 KWY C—Dixon, California. (See KWX.)

7.56 YNLF B—Managua, Nicaragua. Slogan *"La voz de Nicaragua."*

7.55 TI8WS B—Puntarenas, Costa Rica. Slogan *"Ecos del Pacifico."*

7.54 RKI B-C—Moscow, U.S.S.R. Transmits simultaneously with RAN, on evening program only. See RAN, 9.60 mc. Occasionally phones RIM, 7.63 mc., Tashkent, late a.m.'s using clear speech.

7.47 JVQ C—Nazaki, Japan. Identifies in Japanese at start of phone transmissions. Inverted speech used.

7.39 ZLT2 C—Wellington, New Zealand (See ZLT4 11.05 mc.)

7.38 XECR B—Mexico City, Mexico. Slogan *"The Voice of Mexico."*

7.36 XGV C—Shanghai, China. Call in English at beginning and end of transmission, *"This is station XGV, Shanghai, on a frequency of* 7360 *kc., —."* Inverted speech. This frequency rarely used.

7.315 YNLAT B—Granada, Nicaragua. *"La voz del Mombacha."* Uses call YN2LT when phoning other amateurs.

7.20 YNAM B—Managua, Nicaragua. *"La voz del Pacifico."* Signs off with the Washington Post March.

7.177 CR6AA B—Lobito, Angola. (See CR6AA, 9.66 mc.)

7.10 FO8AA B—Papeete, Tahiti. Slogan *"Radio Club Oceanic."* Comes on with *"La Marseillaise,"* goes off usually with *"Aloha Oe."* Call given at beginning and end of program.

7.00 EA9AH B—Tetuan, Spanish Morocco. Uses slogans *"Viva Franco," "Voice of the Trenches."*

6.98 KZGG C—Cebu, Philippines. (See KZGG, 7.83 mc.)

6.97 HCETC B—Quito, Ecuador. Slogan *"Radio Teatro."*

6.90 HI2D B—Trujillo City, Dominican Republic. Slogan *"la voz de L'Asociacion Catolica."*

6.805 HI7P B—Trujillo City, D. R. *"Emisora del Commercio."*

6.80 PZH B—Paramaribo, Dutch Guiana. Announcements in Dutch and Spanish, occasionally English.

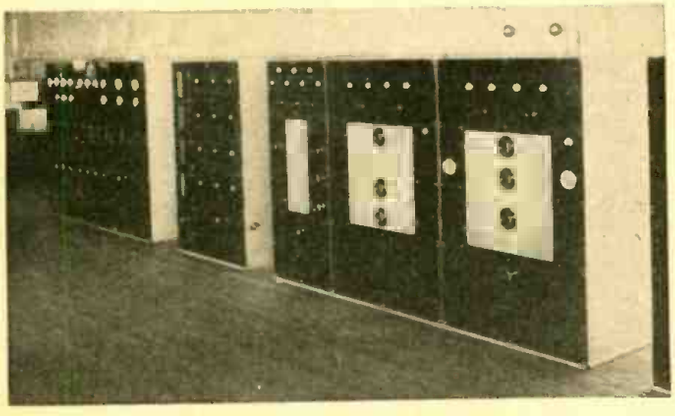
6.775 HIH B—San Pedro de Macoris, D.R. Slogan *"la voz del Higuamo."*

6.75 JVT B—Nazaki, Japan. (See JVN, 10.66 mc.)

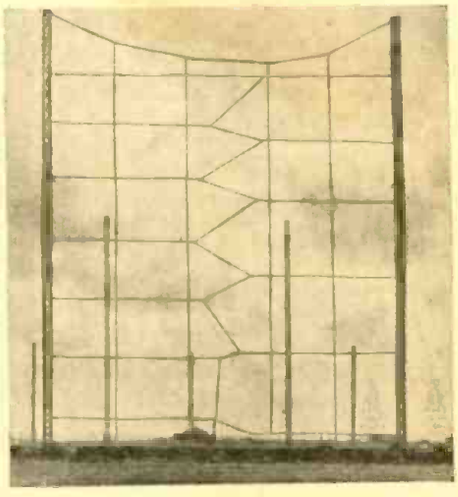
6.73 HI3C B—La Romana, D. R. Slogan *"la voz de la Feria."*

6.72 PMH B—Bandoeng, Java. (See YDC, 15.15 mc.)

New Danish High-Power S-W Station



● Since September 6th, 1937, the old short-wave transmitter (OXY, 6060 kc., 0.5 kw.) has been replaced by a new 6 kw., transmitter. Crystal control of the carrier frequency is used, with separate master oscillator units for each operating frequency. The total number of stages is 8, screen-grid tubes are employed in the low-power stages and two 15 kw., water-cooled triodes in push-pull in the last stage. Lower-power modulation is employed and occurs in the plate circuit of stage No. 6. All the supplies for the transmitter, including 10,000 volts for the last stage, are taken from motor-generators. For the transmissions towards North America and Greenland a directional antenna of the diamond type is employed. The directional antennas for transmissions to South America and East Asia consist of systems of horizontal dipoles. The photograph shows the aerials for 11805 kc. (OZG) and 9520 kc. (OZF) suspended between two 100 meter wood masts. For schedules see world Station List, page 490.



Can YOU Answer These Radio Questions?

1. How does a person in New York City call a radio patrol car? See page 469.
2. Class attention! What modern radio device is used to record brain waves? See page 471.
3. Is the heating effect the only result of short-wave diathermy? See page 472.
4. How can radio waves detect the presence of metallic ore? See page 474.
5. What is the effect of reversed feedback in the audio output circuit? See page 477.
6. What is the number of the new 1½ volt dry-cell radio tube? See page 480.
7. Can you explain how to make a simple output meter, using the new "magic eye" tube? See page 487.
8. Where is station YCP, and what is its time schedule? See page 488.
9. Can you draw a diagram showing how to connect a 6E5 cathode-ray tuning eye to a receiver? See page 491.
10. What is a "folded doublet" and can it be used for transmitting? See page 499.
11. Where is the short-wave broadcast station SPD located? See page 494.
12. How is television used in new adv. sign? See page 525.

Mc.	Call	
11.790	W1XAL	**BOSTON, MASS.,** 25.45 m., Addr. (See 15.250 mc.) Daily 4.45-6.30 pm., Sat. 1.45-5.15, 6-6.30 pm., Sun. 3-6.30 pm.
11.770	DJD	**BERLIN, GERMANY,** 25.49 m., Addr. (See 15.280 mc.) 10.40 am.-4.30 pm., 4.50-11 pm.
11.760	TGWA	**GUATEMALA CITY, GUAT.,** 25.51 m. (See 17.8 mc.) Tues. and Thurs. 8 pm.-12 m.
11.760	OLR4B	**PRAGUE, CZECHOSLOVAKIA,** 25.51 m., Addr. (See 11.875 mc.) Irregular.
11.750	QSD	**DAVENTRY, ENG.,** 25.53 m., Addr. B. B.C., London. 3.15-5.30, 10.30 am.-12 n., 12.20-6.00 pm., 6.20-8.30, 9-11 pm.
11.730	——	**SAIGON, INDO CHINA,** 25.57 m., Addr. Radio Philco. 11pm.-1am., 5.30-9.30am.
11.730	PHI	**HUIZEN, HOLLAND,** 25.57 m., Addr. N. V. Philips' Radio.
11.720	CJRX	**WINNIPEG, CANADA,** 25.6 m., Addr. James Richardson & Sons, Ltd. 4-10pm.
11.718	CR7BH	**LAURENCO MARQUES, PORTUGESE, E. AFRICA,** 25.6 m. Daily 12.05-1, 4.30-6.30, 9.30-11 am., 12.05-4 pm., Sun. 5-7 am., 10 am.-2 pm.
11.715	TPA4	**PARIS, FRANCE,** 25.61 m., (See 15.245 mc.) 6.15-8.15 pm., 10 pm.-1 am.
11.710	SBG	**MOTALA, SWEDEN,** 25.63 m., 1.20-2.05, 8-9 am., 11 am.-1.30 pm.
11.710	XEWB	**GUADALAJARA, MEX.,** 25.63 m., Addr. Juarez 289. Irregular.
11.710	YSM	**SAN SALVADOR, EL SALVADOR,** 25.63 m., Addr. (See 7.894 mc.) Irregular 1.30-2.30 pm.
11.700	HP5A	**PANAMA CITY, Pan.,** 25.65 m. Addr. Radio Teatro, Apartado 954. 10 am.-10 pm.
11.700	CB1170	**SANTIAGO, CHILE,** 25.65 m., Relays CB89 6 pm.-12 m.

S.W. BROADCAST BAND

11.680	KIO	**KAHUKU, HAWAII,** 25.68 m., Addr. RCA Communications. Irregularly.
11.595	VRR4	**STONY HILL, JAMAICA, B. W. I.,** 25.87 m. Works WNC daytime.
11.560	VIZ3	**FISKVILLE, AUSTRALIA,** 25.95 m., Addr. Amalgamated Wireless of Australasia Ltd. Tests irregularly.
11.530	SPD	**WARSAW, POLAND,** 26 m., Addr. 5 Mazowiecka St. Testing daily 6-7 pm.
11.500	XAM	**MERIDA, YUCATAN,** 26.09 m. Irregular 1-7.30 pm.
11.500	PMK	**BANDOENG, JAVA,** 26.09 m. Tests irregularly.
11.450	COCX	**HAVANA, CUBA,** 26.17 m. P. O. Box 32. 6.55 am.-1 am. Sun. till 12 m. Relays CMX.
11.413	CJA4	**DRUMMONDVILLE, QUE., CAN.,** 26.28 m. Tests irregularly.
11.402	HBO	**GENEVA, SWITZERLAND,** 26.31 m., Addr. Radio Nations. Sat. 6.45-8 pm.
11.280	HIN	**CIUDAD TRUJILLO, D. R.,** 26 m., Addr. La Voz del Partido Dominicano. Irregular.
11.060	ZLT4	**WELLINGTON, NEW ZEALAND,** 27.15 m. Works Australia and England early morning.
11.040	CSW	**LISBON, PORTUGAL,** 27.17 m., Addr. Nat. Broadcasting Sta. 1.30-5 pm.
11.000	PLP	**BANDOENG, JAVA,** 27.27 m. Relays YDB. 5.30-10.30 or 11 am. Sat. until 11.30 am.
10.970	OCI	**LIMA, PERU,** 27.35 m. Works Bogota, Col. evenings.
10.840	KWV	**DIXON, CALIF.,** 27.68 m., Addr. A. T. & T. Co. Works with Hawaii evenings.
10.770	GBP	**RUGBY, ENGLAND,** 27.85 m. Works Australia early morning.
10.740	JVM	**NAZAKI, JAPAN,** 27.93 m. Works U.S.A. 2-7 am.
10.675	WNB	**LAWRENCEVILLE, N. J.,** 28.1 m., Addr. A. T. & T. Co. Works with Bermuda irregularly.
10.670	CEC	**SANTIAGO, CHILE,** 28.12 m. Daily 7-7.15 pm.
10.660	JVN	**NAZAKI, JAPAN,** 28.14 m. Broadcasts daily 2-8 am. Works Europe irregularly at other times.
10.650	WOK	**LAWRENCEVILLE, N. J.,** 28.44 m., Addr. A. T. & T. Co. Works S. A. nights.
10.635	JIB	**TAIHOKU, TAIWAN,** 28.48 m. Works Japan around 6.25 am. Broadcasts, relaying JFAK 9-10.25 am. 1-2.30 am. Sun. to 10.15 am.
10.620	VLK	**SYDNEY, AUSTRALIA,** 28.51 m., Addr. Amalgamated Wireless of Australasia Ltd. Works England 1-6 am.
10.430	YBG	**MEDAN, SUMATRA,** 28.76 m. 5.30-6.30 am., 7.30-8.30 pm.
10.420	XGW	**SHANGHAI, CHINA,** 28.79 m. Works Japan 12 m.-3 am.
10.410	PDK	**KOOTWIJK, HOLLAND,** 28.8 m. Works Java 7.30-9.40 am.
10.410	KES	**BOLINAS, CALIF.,** 28.8 m., Addr. RCA Communications. Irregular.
10.370	JVO	**NAZAKI, JAPAN,** 28.93 m. Broadcasts around 5 am.
10.370	EHZ	**TENERIFFE, CANARY ISLANDS,** 28.93 m., Relays EAJ43 2.15-3.15, 6.15-8.55 pm. Relays Salamanca, Spain 8.55-10 pm.
10.350	LSX	**BUENOS AIRES, ARG.,** 28.98 m., Addr. Transradio International. Broadcasts 5-6 pm. Mon. and Fri. Tests irregularly at other times.
10.330	ORK	**RUYSSELEDE, BELGIUM,** 29.04 m. 2.30-4 pm.
10.300	LSL2	**BUENOS AIRES, ARG.,** 29.13 m., Addr. Cia. Internacional de Radio. Works Europe evenings.
10.290	DZC	**ZEESEN, GERMANY,** 29.16 m., Addr. (See 15.360 mc.) Irregular.
10.260	PMN	**BANDOENG, JAVA,** 29.24 m., Relays YDB 5.30-10.30 or 11 am., Sat. to 11.30 am.
10.250	LSK3	**BUENOS AIRES, ARG.,** 29.27 m., Addr. (See 10.310 mc.) Works Europe and U.S.A. afternoons and evenings.
10.230	CED	**ANTOFAGASTAN, CHILE,** 29.33 m. Tests 7-9.30 pm.
10.220	PSH	**RIO DE JANIERO, BRAZIL,** 29.35 m. Irregular.
10.170	RIO	**BAKOU, U.S.S.R.,** 29.15 m. Works Moscow 10 pm.-5 am.
10.140	OPM	**LEOPOLDVILLE, BELGIAN CONGO,** 29.59 m. Works Belgium around 3 am. and from 1-4 pm.
10.080	RIO	**TIFLIS, U.S.S.R.,** 29.76 m. Works Moscow early morning.
10.070	EDM-EHY	**MADRID, SPAIN,** 29.79 m. Works S. A. evenings.
10.065	JZB-TDB	**SHINKYO, MANCHUKUO,** 29.81 m. Works Tokio 6.30-7 am.
10.055	ZFB	**HAMILTON, BERMUDA,** 29.84 m. Works N. Y. C. irregular.
10.055	SUV	**ABOU ZABAL, EGYPT,** 29.84 m. Works Europe 1-6 pm.
10.042	DZB	**ZEESEN, GERMANY,** 29.87 m., Addr. Reichspostzenstralamt. Irregular.
9.990	KAZ	**MANILA, P. I.,** 30.03 m., Addr. RCA Communications. Works Java early morning.
9.950	COCU	**HAVANA, CUBA,** 30.15 m., Addr. (See 6.590 mc., COCU). Relays CMCU 7 am.-12 m.
9.950	GCU	**RUGBY, ENGLAND,** 30.15 m. Works N. Y. C. night time.
9.930	HKB	**BOGOTA, COL.,** 30.21 m. Works Rio evenings.
9.930	CSW	**LISBON, PORTUGAL,** 30.31 m., Addr. Nat. Broad. Station. 5-7 pm.
9.925	JDY	**DAIREN, MANCHUKUO,** 30.23 m. Relays JQAK daily 6.50-8 am.
9.890	LSN	**BUENOS AIRES, ARG.,** 30.33 m., Addr. (See 10.300 mc.) Works N. Y. C. evenings
9.870	WON	**LAWRENCEVILLE, N. J.,** 30.4 m., Addr. A. T. & T. Co. Works England nights.
9.860	EAQ	**MADRID, SPAIN,** 30.43 m., Addr. Post Office Box 951. Daily 5.15-7.30 pm., Sat. also 12 n.-2 pm.
9.830	IRM	**ROME, ITALY,** 30.52 m. Works Egypt afternoons.
9.800	XGOX	**NANKING, CHINA,** 30.61 m., Relays XGOA 6-10 am.
9.800	LSI	**BUENOS AIRES, ARG.,** 30.61 m., Addr. See 10.350 mc.) Tests irregularly.
9.790	GCW	**RUGBY, ENGLAND,** 30.64 m. Works N. Y. C. evenings.
9.775	COCM	**HAVANA, CUBA,** 30.69 m. Addr. Transradio Columbia, P. O. Box 33. 7 am.-12 m. Relays CMCM.
9.760	VLJ-VLZ2	**SYDNEY, AUSTRALIA,** 30.74 m., Addr. Amalgamated Wireless of Australasia Ltd. Works Java and New Zealand early morning.
9.750	WOF	**LAWRENCEVILLE, N. J.,** 30.77 m., Addr. A. T. & T. Co. Works London and Paris night time.
9.740	COCQ	**HAVANA, CUBA,** 30.78 m. Addr. 25 No. 445, Vedado, Havana. 6.55 am.-1 am. Sun. till 12 m.
9.710	GCA	**RUGBY, ENGLAND,** 30.89 m. Works S. A. evenings.
9.700	FZF6	**FORT de FRANCE, MARTINIQUE,** 30.9 m., Addr. P. O. Box 136. 11.30 am.-12.30 pm., 6.15-7.50 pm.
9.685	TGWA	**GUATEMALA CITY, GUAT.,** 30.96 m. Irregular.
9.675	DZA	**ZEESEN, GERMANY,** 31.01 m., Addr. (See 10.042 mc.) Irregular.
9.670	TI4NRH	**HEREDIA, COSTA RICA,** 31.02 m., Addr. Amando C. Marin, Apartado 40. 8.30-10 pm., 11.30 pm.-12 m.
9.660	LRX	**BUENOS AIRES, ARG.,** 31.06 m., Addr. El Mundo. 8.30 am.-10.30 pm.
9.650	CT1AA	**LISBON, PORTUGAL,** 31.09 m., Addr. Radio Colonial. Tues., Thurs. and Sat. 4.30-7 pm.
9.650	DGU	**NAUEN, GERMANY,** 31.09 m., Addr. (See 20.020 mc.) Works Egypt afternoons.
9.645	HH3W	**PORT-AU-PRINCE, HAITI,** 31.1 m., Addr. P. O. Box A117. 1-2, 7-8 pm.
9.645	YNLF	**MANAGUA, NICARAGUA,** 31.1 m. 8-9 am., 12.30-2.30, 6.30-10 pm.
9.640	CXA8	**COLONIA, URUGUAY,** 31.1 m., Addr. Belgrano 1841, Buenos Aires, Argentina. Relays LR3, Buenos Aires 6 am.-11 pm.
9.635	2RO	**ROME, ITALY,** 31.13 m., Addr. (See 11.810 mc.) Daily 12.30-5.30, 6-7.45 pm.
9.630	HJ7ABD	**BUCARAMANGA, COL.,** 31.14 m. 10 am.-12 n., 4-11 pm.
9.625	——	**TAIHOKU, TAIWAN,** 31.16 m., Relays JFAK irreg. 8-10.25 am., 1-2.30 am., Sun. 8-10.15 am.
9.620	HJ1ABP	**CARTAGENA, COL.,** 31.19 m., Addr. P. O. Box 37. 11 am.-1 pm., 5-11 pm. Sun. 10 am.-1 pm., 3-6 pm.
9.615	——	**KLIPHEUVAL, SOUTH AFRICA,** 31.19 m., Addr. P. O. Box 4559, Johannesburg. Relays Johannesburg and Cape Town Daily, exc. Sat. 11:45 pm.-12:40 am., Daily exc. Sun. 9-11:40 am., Sun 8-10:15 am.
9.615	HP5J	**PANAMA CITY, PANAMA,** 31.22 m. Addr. Apartado 867. 12 n. to 1.30 pm., 6-10.30 pm.
9.610	JZI	**TOKIO, JAPAN,** 31.23 m., Addr. (See 11.800. JZJ) 3-4 pm.

S.W. BROADCAST BAND

9.600	RAN	**MOSCOW, U.S.S.R.,** 31.25 m. Daily 7-9.15 pm.
9.595	HBL	**GENEVA, SWITZERLAND,** 31.27 m., Addr. Radio Nations. Sat. 5.30-6.30 pm.
9.590	PCJ	**HUIZEN, HOLLAND,** 31.28 m., Addr. (See 15.220 mc.) Sun. 2-3, 7-9 pm. Tues. 1-3.30, 7-9.30 pm. Wed. 1-3.30, 8-10.30 pm., Thurs. 9-11 pm.
9.590	VK6ME	**PERTH, W. AUSTRALIA,** 31.38 m., Addr. Amalgamated Wireless of Australasia, Ltd. 6-8 am. exc. Sun.
9.590	VK2ME	**SYDNEY, AUSTRALIA,** 31.38 m., Addr. Amalgamated Wireless of Australasia, Ltd., 47 York St., Sun. 1-3 am., 5-11 am.
9.590	W3XAU	**PHILADELPHIA, PA.,** 31.28 m. Relays WCAU Sun. 12 n.-2 pm., 3-7 pm., Mon. 12 n.-8 pm., Tues. 12 n.-1 pm., 3.30-7 pm., Wed. 12 n.-1 pm. 3.30-8 pm. Thurs.-Sat., 12n-8 pm.

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(All Schedules Eastern Standard Time)

Short Wave League

HONORARY MEMBERS

Dr. Lee de Forest — Manfred von Ardenne
D. E. Replogle — E. T. Somerset
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Hugo Gernsback, Executive Secretary

Mr. Li Chi-Chiang of Quebec, 42nd Scout Trophy winner, at his listening post. The Trophy stands atop the receiver.

WHEN TO LISTEN IN

by
M. Harvey Gernsback

All Schedules in Eastern Standard Time

POLAND. A new short wave station in Warsaw is now on the air. It is SPD, operating on 11.535 mc. and employing a directional antenna toward North America. The transmitter has a power of 2 kw. Special programs are broadcast for North America daily from 6-7 p.m., and on Sundays from 6-8 p.m. Both of these transmissions are radiated simultaneously on SPW 13.635 mc., 10 kw., also using a directional antenna for North America. The station has notified us that verification requests should be addressed to Polskie Radio, 5 Mazowiecka, Warsaw.

SOUTH AFRICA. South Africa can now be added to the list of easy catches for short-wave listeners. A new station at Klipheuval, South Africa is operated on 9.62 mc. relaying the programs of the Cape Town and Johannesburg broadcast stations. The power of this station is about 2 kw. according to information received from South Africa. At present the station operates daily except Saturday, 11:45 p.m.-12:40 a.m., daily except Sunday, 9-11:40 p.m., and on Sunday from 8-10:15 a.m. At other hours the old Johannesburg station on 6.097 mc. takes the place of this station. The first transmission period from 11:45 p.m.-12:40 a.m., is being heard very well in the United States. The program material consists of setting-up exercises interspersed with news bulletins. At midnight the Johannesburg "Big Ben" can be heard striking 7 a.m. Within the next month or two there will be greatly increased activity among the South African short-wave broadcasters. We hope to have further details next month.

GUATEMALA. TGWA at Guatemala City has just put a new transmitter on the air operating on three new frequencies in place of its old frequency. The new frequencies are: 17.8, 11.76, and 9.685 mc. At present the schedule of operation is not very regular but the station is supposed to broadcast a program to North American listeners on Tuesdays and Thursdays from 8-10 p.m., on 11.76 or 9.685 mc. The station employs considerable power and has a number of directional antennas. It has been putting very good signals into the Eastern part of the United States. Incidentally, the designer and chief engineer of the Guatemala stations is C. H. W. Nason, whom old readers of *Short Wave Craft* may recall as a frequent contributor to the magazine in years gone by.

URUGUAY. CXA8 at Colonia, Uruguay, is being heard daily relaying the programs of one of the broadcast stations in Buenos Aires, Argentina, which lies across the river Plata from Uruguay. This station generally relays programs of LR3 from 6 a.m. to 11 p.m. daily on a frequency of 9.64 mc. Reports should be addressed to Belgrano 1841, Buenos Aires, Argentina. This station operates but 20 kc. away from LRU, Buenos Aires so it is necessary to do some careful tuning in order not to confuse the two.

GERMANY. Station DJL, 15.11 mc. seems to be using a directional antenna towards North America every day during the African program from 10:40 a.m.-4:30 p.m., as it is being heard very well in the United States. DJC, 6.02 mc. is now on every evening from 4:50-10:45 p.m. on the North America program in conjunction with DJD, 11.77 and DJB 15.2 mc.

MOSCOW. Last month saw a great deal of activity on the part of the Russian stations because of the fact that it was the twentieth anniversary of the Red revolution and many gala programs were arranged. At the present time the English programs on RAN, 9.6 mc. broadcast daily from 7-9:15 p.m., are also broadcast on RKI, 7.52 mc.

HOLLAND. PCJ also had an anniversary last month, for it was in November 1927 that PCJ first came on the air. Ten years is a long time in any field but especially in short-wave broadcasting. To commemorate this tenth anniversary the station has just completed a new 60 kw. transmitter and a novel beam antenna system (which is described elsewhere in this issue). Holland is being heard with renewed vigor all over the world. A greatly enlarged schedule for PCJ is projected. Details are still lacking, however.

CANADA. A new short-wave broadcaster is CJCX, the Sydney, Nova Scotia station on 6.01 mc. It relays programs of CJCB, generally from 7 a.m. to 1 p.m., and from 4-8 p.m.

BOSTON. W1XAL, the educational station of the World Wide Broadcasting Foundation is presenting some programs of unusual interest this year. For example on Tuesday evenings from 8-8:30 p.m., one of a series of programs sponsored by Harvard University is broadcast. This series deals with sound. Other educational programs are broadcast regularly by the station, many originating at Harvard University. Listeners desiring further information should write to the station at the University Club, Boston, Mass. W1XAL operates on 15.25, 11.79 and 6.04 mc. Consult the Station List for schedules of operation.

PITTSBURGH. W8XK has been hard at work erecting a series of new beam antennas for use in directing programs to South America and Europe. At the same time modernization of the transmitters has been undertaken. When alterations are completed power will be 28 kw. on 6.14 mc., 24 kw. on 11.5 mc., 8 kw. on 15.21 mc. and 6 kw. on 21.54 mc. The new antennas operate on all frequencies except 21.54. The changes should be completed by December 1st, 1937.

BRAZIL. PRA8 of the Radio Club de Pernambuco, Recife, Brazil, is now operating daily on 6.01 mc., according to information received from a listener in Rio.

(*Continued on page* 513)

Additions to Station List

Mc.	Call	Location
24.600	W9XJL	SUPERIOR, WISCONSIN
17.800	TGWA	GUATEMALA CITY, GUAT.
11.910	CB1190	VALDIVA, CHILE
11.780	TGWA	GUATEMALA CITY, GUAT.
11.700	CB1170	SANTIAGO, CHILE
11.530	SPD	WARSAW, POLAND
9.800	XGOX	NANKING, CHINA
9.685	TGWA	GUATEMALA CITY, GUAT.
9.640	CXA8	COLONIA, URUGUAY
9.620	.....	KLIPHEUVAL, SOUTH AFRICA
9.580	OAX5C	ICA, PERU
6.530	.....	TANANARIVE, MADAGASCAR
7.520	RKI	MOSCOW, U.S.S.R.
6.490	HI1L	SANTIAGO De Los CABALLEROS, D. R.
6.220	.....	SAIGON, INDO-CHINA
6.110	GSL	DAVENTRY, ENGLAND
6.050	GSA	DAVENTRY, ENGLAND
6.010	.....	TANANARIVE, MADAGASCAR
6.010	CJCX	SYDNEY, NOVA SCOTIA

Mc.	Call	
9.580	GSC	**DAVENTRY, ENGLAND,** 31.32 m., Addr. B. B. C., Portland Pl., London, W. 1, 6.20-8.30, 9-11 pm.
9.580	VK3LR	**MELBOURNE, AUSTRALIA,** 31.32 m. Addr. Box 1686, G. P. O. Daily 3.30-8.30 am. (Sat. till 9 am.) Sun. 3-7.30 am. Daily exc. Sat. 9.45 pm.-2 am.
9.580	OAX5C	**ICA, PERU,** 31.32 m. 6-10 pm.
9.570	KZRM	**MANILA, P. I.,** 31.35 m., addr. Erlanger & Galinger. Box 283. 4.30-5.30 pm., 9 pm.-10 am.
9.570	W1XK	**SPRINGFIELD, MASS.,** 31.35 m., Addr. Westinghouse Electric & Mfg. Co. Relays WBZ 7 am. to 1 am. Sun. 8 am. to 1 am. OAX5C.
9.560	DJA	**BERLIN, GERMANY,** 31.38 m., Addr. Broadcasting House. 12.05-11 am., 4.50-10.45 pm.
9.550	OLR3A	**PRAGUE, CZECHOSLOVAKIA,** 31.41 m. See 11.840 mc. Daily 2.30-4.30 pm. Irreg. 7-9-10 pm.
9.550	XEFT	**VERA CRUZ, MEX.,** 31.41 m, 11.30 am.-4 pm., 7 pm.-12 m.
9.550	YDB	**SOERABAJA, JAVA,** 31.41 m., Addr. N.I. R.O.M. Daily exc. Sat. 6-7.30 pm., 5.30 to 10.30 or 11 pm. Sat. 5.30-11.30 am.
9.540	DJN	**BERLIN, GERMANY,** 31.45 m., Addr. (See 9.560 mc.) 12.05-11 am., 4.50-10.45 pm.
9.540	VPD2	**SUVA, FIJI ISLANDS,** 31.45 m., Addr. Amalgamated Wireless of Australasia, Ltd. 5.30-7 am.
9.535	HB9D	**ZURICH, SWITZERLAND,** 31.46 m., Addr. Radio Club of Zurich, Post Box Zurich 2. Sun. 9-11 am., Thur. 1-3 pm.
9.530	W2XAF	**SCHENECTADY, N. Y.,** 31.48 m., Addr. General Electric Co. 4 pm.-1 am.
9.530	———	**TANANARIVE, MADAGASCAR,** 31.48 m., Addr. Le Directeur des PTT, Radio Tananarive, Administration PTT. 12.30-12.45, 3.30-4.30, 10-11 am.
9.525	ZBW3	**HONGKONG, CHINA,** 31.49 m., Addr. P. O. Box 200. 11.30 pm. to 1.15 am., 4-10 am. Sun. 3-9.30 am.
9.526	LKJ1	**JELOY, NORWAY,** 31.49 m. 5-8 am.
9.520	HJ4ABH	**ARMENIA, COLOMBIA,** 31.51 m. 8-11 am., 6-10 pm.
9.520	OZF	**SKAMLEBOAEK, DENMARK,** 31.51 m., Addr. Statsradiofonien, Copenhagen. 2-6.40 P.M.
9.520	YSH	**SAN SALVADOR, EL SALVADOR** 31.51 m., Addr. (See 7.894 mc.) Irregular 6-10 pm.
9.520	XEDQ	**GUADALAJARA, GAL., MEXICO,** 31.51 m. Irregular 7.30 pm. to 12.30 am.
9.510	VK3ME	**MELBOURNE, AUSTRALIA,** 31.55 m., Addr. Amalgamated Wireless of Australasia, 167 Queen St. Daily except Sun. 4-7 am.
9.510	GSB	**DAVENTRY, ENGLAND,** 31.55 m., Addr. (See 9.580 mc.—GSC) 3.15-5.30 am., 12.20-6 pm., 6.20-8.30, 9-11 pm.
9.510	HS8PJ	**BANGKOK, SIAM,** 31.55 m. Thursday, 8-10 am.
9.505	HJ1ABE	**CARTAGENA, COLOMBIA,** 31.57 m. Addr. P. O. Box 31. 5-10.30 pm.
9.500	XEWW	**MEXICO CITY, MEX.,** 31.58 m. Addr. Apart. 2516. Relays XEW. 6 pm.-12 m.
9.500	HJU	**BUENAVENTURA, COLOMBIA,** 31.58 m., Addr. National Railways. Mon., Wed. and Fri. 8-11 pm.
9.500	PRF5	**RIO DE JANIERO, BRAZ.,** 31.58 m. Irregularly 4.45 to 5.45 pm.
9.478	EAR	**MADRID, SPAIN,** 31.65 m., Addr. (See 9.860 mc.) 7.30-9.30 pm.

4 S.W. BROADCAST BAND 4

9.460	ICK	**TRIPOLI, N. AFRICA,** 31.71 m. Works Rome, 5.30-7 am.
9.450	TGWA	**GUATEMALA CITY, GUATEMALA,** 31.75 m., Addr. Ministre de Fomento. Daily 12 n. to 2 pm., 8 pm. to 12 m. Sat. 9 pm. to 5 am. (Sun.)
9.440	HC2RA	**GUAYAQUIL, ECUDAOR,** 31.78 m. Irregularly till 10.40 pm.
9.428	COCH	**HAVANA, CUBA,** 31.8 m., Addr. 2 B St., Vedado. 7 am.-1 am.
9.415	PLV	**BANDOENG, JAVA,** 31.87 m. Works Holland around 9.45 am. Broadcasts 5.30-9.30 am., 6-6.30 pm.
9.350	COBC	**HAVANA, CUBA,** 32.09 m. Addr. P.O. Box 132. Relays CMBC. 6.55 am.-12.30 am.
9.330	CGA4	**DRUMMONDVILLE, CANADA,** 32.15 m. Works England irregularly.
9.330	OAX4J	**LIMA, PERU,** 32.15 m., Addr. Box 1166, "Radio Universal." 12 n.-3 pm., 5 pm.-1 am.
9.300	YNGU	**MANAGUA, NICARAGUA,** 32.26 m. 12 n.-2 pm., 6-7 pm.
9.280	GCB	**RUGBY, ENGLAND,** 32.33 m. Works Canada and Egypt evenings and afternoons.
9.200	COBX	**HAVANA, CUBA,** 32.59 m., Addr. San Miguel 146. Relays CMBX 7 am.-12 m.
9.170	WNA	**LAWRENCEVILLE, N. J.,** 32.72 m. Works England evenings.
9.160	YVR	**MARACAY, VENEZUELA,** 32.79 m. Works with Europe afternoons.
9.125	HAT4	**BUDAPEST, HUNGARY,** 32.88 m., Addr. "Radiolabor," Gyali-ut, 22. Sun. and Wed. 7-8 pm., Sat. 6-7 pm.
9.060	TFK	**REYKJAVIK, ICELAND,** 33.11 m. Works London afternoons.
9.030	COBZ	**HAVANA, CUBA,** 33.2 m., Radio Salas. Addr. P. O. Box 866, 7:45 am-12.10 am. Irreg. 12.30-2 am. Relays CMBZ
9.020	GCS	**RUGBY, ENGLAND,** 33.26 m. Works N. Y. C. evenings.
9.010	KEJ	**BOLINAS, CAL.,** 33.3 m. Relays NBC and CBS programs in evening irregularly.
8.957	VWY	**KIRKEE, INDIA,** 33.43 m. Works with England in morning.
8.950	TPZ	**ALGIERS, ALGERIA,** 33.48 m. Works Paris afternoons.
8.830	HCJB	**QUITO, ECUADOR,** 33.95 m. 8.30-10.30 pm. except Monday.
8.775	PNI	**MAKASSER, CELEBES, N. I.,** 34.19 m. Works Java around 4 am.
8.765	DAF	**NORDDEICH, GERMANY,** 34.23 m. Works German ships irregularly.
8.760	GCQ	**RUGBY, ENGLAND,** 34.25 m. Works Africa afternoons.
8.750	FZE8	**DJIBOUTI, FR. SOMALILAND, AFRICA,** 34.29 m. Works Paris around 2.30 am.
8.730	GCI	**RUGBY, ENGLAND,** 34.36 m. Works India 8 am.
8.720	VPD3	**SUVA, FIJI ISLES,** 34 m., Addr. (See 9.540 mc., VPD2). 5.30-7 am.
8.700	HKV	**BOGOTA, COLOMBIA,** 34.46 m. Tues. and Fri. 7-7.20 pm.
8.680	GBC	**RUGBY, ENGLAND,** 34.56 m. Works ships irregularly.
8.665	COJK	**CAMAGUEY, CUBA,** 34.62 m., Addr. Finlay No. 3 Altos. 5.30-6.30, 8-11 pm., daily except Sat. and Sun.
8.580	YNLG	**MANAGUA, NICARAGUA,** 34.92 m. 7.30-9.30 pm.
8.560	WOO	**OCEAN GATE, N. J.,** 35.05 m. Works ships irregularly.
8.400	HC2CW	**GUAYAQUIL, ECUADOR,** 35.71 m. 11.30 am.-12.30 pm., 8-11 pm.
8.380	IAC	**PISA, ITALY,** 35.8 m. Works Italian ships irregularly.
8.190	XEME	**MERIDA, YUCATAN,** 36.63 m., Addr. Calle 59, No. 517, "La Voz de Yucatan desde Merida." 10 am.-12n., 6 pm.-12 m.
8.185	PSK	**RIO DE JANEIRO, BRAZIL,** 36.65 m. Irregularly.
8.038	CNR	**RABAT, MOROCCO,** 37.33 m. Sun. 2.30-5 pm.
7.975	HC2TC	**QUITO, ECUADOR,** 37.62 m. Thurs. and Sun. at 8 pm.
7.901	LSL	**HURLINGHAM, ARGENTINA,** 37.97 m. Works Brazil at night.
7.894	YSD	**SAN SALVADOR, EL SALVADOR,** 37.99 m., Addr. Dir. Genl. Tel. & Tel. Irregular 7-11 pm.
7.860	SUX	**ABOU ZABAL, EGYPT,** 38.17 m. Works with Europe, 4-6 pm.
7.854	HC2JSB	**GUAYAQUIL, ECUADOR,** 38.2 m. Evenings.
7.797	HBP	**GENEVA, SWITZERLAND,** 38.48 m., Addr. Radio-Nations. Sat. 5.30-6.30 pm.
7.715	KEE	**BOLINAS, CAL.,** 38.89 m. Relays NBC and CBS programs in evening irregularly.
7.628	RIM	**TACHKENT, U.S.S.R.,** 39.34 m. Works with Moscow in early morning.
7.610	KWX	**DIXON, CAL.,** 39.42 m. Works with Hawaii, Philippines, Java and Japan, nights.
7.560	TI9WS	**PUNTA ARENAS, COSTA RICA,** 39.74 m., Addr. "Ecos Del Pacifico", P. O. Box 75. 6 pm.-12 m.
7.520	KKH	**KAHUKU, HAWAII,** 39.87 m. Works with Dixon and broadcasts irregularly nights.
7.520	RKI	**MOSCOW, U. S. S. R.,** 39.87 m., Relays RAN 7-9.15 pm.
7.510	JVP	**NAZAKI, JAPAN,** 39.95 m. Irregular.
7.500	RKI	**MOSCOW, U.S.S.R.,** 40 m. Works with RIM early am.
7.380	ZLT2	**WELLINGTON, N. Z.,** 40.6 m. Works with Sydney, 3-7 am.
7.380	XECR	**MEXICO CITY, MEX.,** 40.65 m., Addr, Foreign Office. Sunday 6-7 pm.
7.220	HKE	**BOGOTA, COL., S. A.,** 41.55 m. Tues. and Sat. 8-9 pm. Mon. and Thurs. 6.30-7 pm.
7.200	YNAM	**MANAGUA, NICARAGUA,** 41.67 m. Daily at 9 pm.
7.100	FO8AA	**PAPEETE, TAHITI,** 42.25 m., Addr. Radio Club Papeete. Tues. and Fri. 11 pm.-12 m.
7.088	PI1J	**DORDRECHT, HOLLAND,** 42.3 m., Addr. Dr. M. Hellingman, Technical College. Sat. 11.10-11.50 am.
6.998	PZH	**PARAMIRABO, DUTCH GUIANA,** 42.88 m., Addr. P. O. Box 18. Daily 6.06-8.36 am., Sun. 9.36-11.36 am., Daily 5.36-8.36 pm.
6.977	XBA	**TACUBAYA, D. F., MEX.,** 43 m. 9.30 am.-1 pm., 7-8.30 pm.
6.976	HCETC	**QUITO, ECUADOR,** 43m., Addr. Teatro Bolivar. Thurs. till 9.30 pm.
6.905	GDS	**RUGBY, ENG.,** 43.45 m. Works N.Y.C. evenings irregularly.
6.860	KEL	**BOLINAS, CALIF.,** 43.70 m. Tests irregularly. 11 am.-12 n., 6-9 pm.
6.850	XGOX	**NANKING, CHINA,** 43.8 m Daily 6.40-8.40 am., Sun. 4.40-6.05 am.
6.800	HI7P	**CIUDAD TRUJILLO, DOM. REP.,** 44.12 m., Addr. Emisoria Diaria de Commercio. Daily exc. Sat. and Sun. 12.40-1.40, 6.40-8.40 pm. Sat. 12.40-1.40 pm. Sun. 10.40 am.-11.40 am.
6.770	HIH	**SAN PEDRO DE MACORIS, DOM. REP.,** 44.26 m. 12.10-1.40 pm., 7.30-9 pm. Sun. 3-4 am., 4.15-6 pm., 4.40-7.40 pm.
6.775	WOA	**LAWRENCEVILLE, N. J.,** 44.41 m., Addr. A. T. & T. Co. Works England evenings.
6.750	JVT	**NAZAKI, JAPAN,** 44.44 m., Addr. Kokusai-Denwa Kaisha, Ltd., Tokio. Irregular.
6.730	HI3C	**LA ROMANA, DOM. REP.,** 44.58 m., Addr. "La Voz de la Feria." 12.30-2 pm., 5-6 pm.
6.720	PMH	**BANDOENG, JAVA,** 44.64 m. Relays NIROM programs. 5.30-9 am.
6.710	TIEP	**SAN JOSE, COSTA RICA,** 44.71 m., Addr. Apartado 257, La Voz del Tropico. Daily 7-10 pm.
6.672	YVQ	**MARACAY, VENEZUELA,** 44.95 m. Sat. 8-9 pm.
6.670	HC2RL	**GUAYAQUIL, ECUADOR, S. A.,** 44.95 m., Addr. P. O. Box 759. Sun. 5.45-7.45 pm., Tues. 9.15-11.15 pm.
6.660	IAC	**PISA, ITALY,** 45.11 m. Works ships irregularly.
6.630	HI1T	**CIUDAD TRUJILLO, D. R.,** 45.25 m., Addr. "La Voz de la RCA Victor," Apartado 1105. Daily exc. Sun. 12.10-1.40 pm., 5.40-8.40 pm.; also Sat. 10.40 pm.-12.40 am.

(*Continued on page* 500)

(All Schedules Eastern Standard Time)

Here is a front view of the very professional looking Desk-Type Transmitter.

A Desk-Type 10-80 Meter Transmitter

(Part 2—Conclusion)

By George W. Shuart, W2AMN

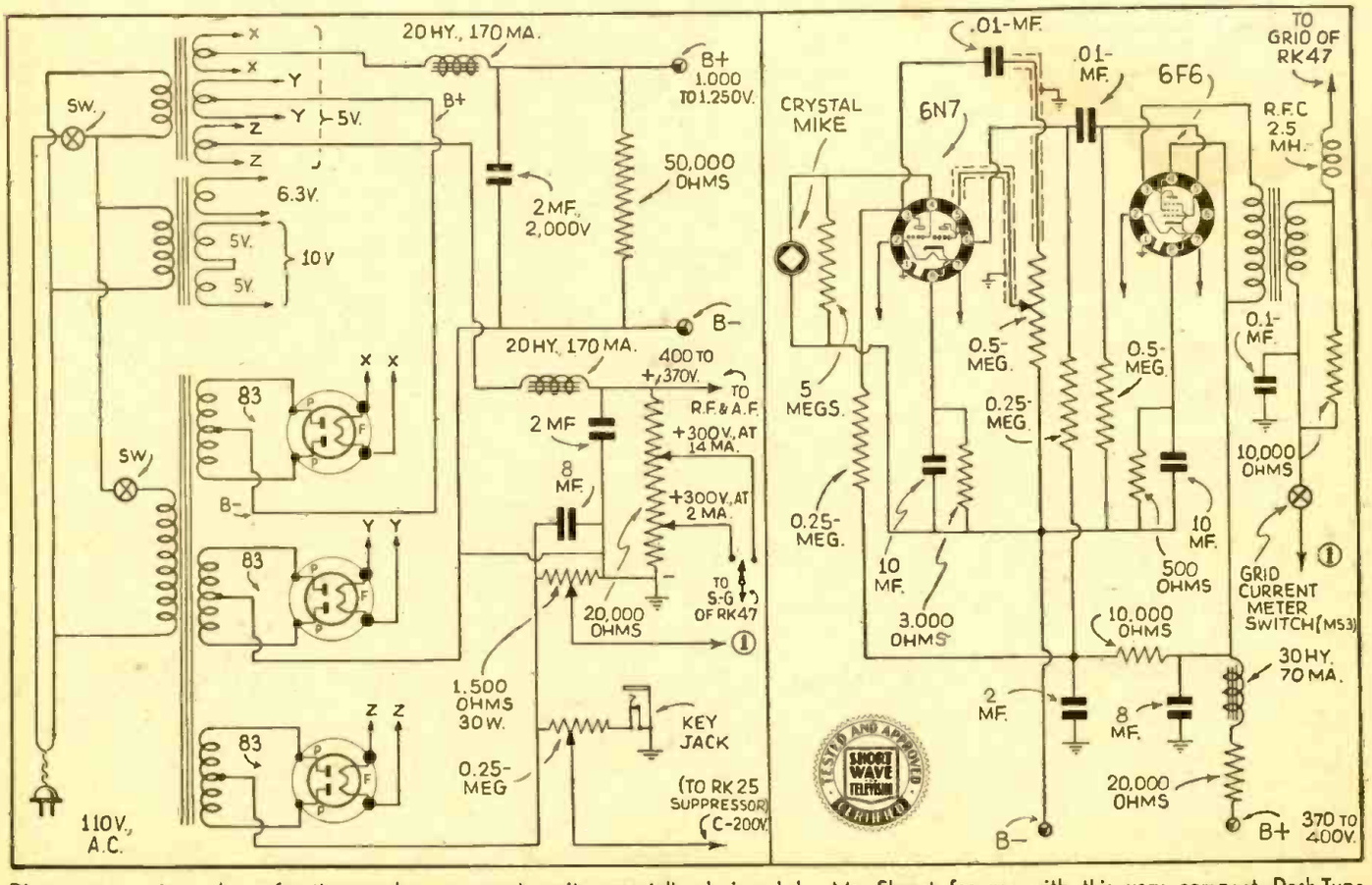
In this concluding half of the article on the Desk-Type Transmitter, Mr. Shuart describes in detail the unique power-supply and the speech amplifier.

● LAST MONTH we described the radio frequency portion of the *Desk-Type Transmitter*. This transmitter is enclosed in a single cabinet measuring only 19 x 10½ x 13 inches. All equipment is enclosed in the cabinet with only the microphone and the key remaining on the outside. This makes a complete station, consisting of only two small cabinets, the other, of course, being the receiver.

The remaining parts of the transmitter which will be described in this article are the power-supply and the low-power audio unit used for grid-modulating the RK-47 final amplifier. It is no easy task—selecting the parts to go into the small space allowed for the power-supply and modulator in this type of transmitter. If it were not for the Kenyon triple winding transformer it would not have been possible to confine the transmitter to such small quarters. This transformer has three windings which are center-tapped and supply slightly over 500 volts each from an 83 rectifier. One of these is used to supply the plate and screen voltages for the 41 oscillator and the RK-25 buffer, screen voltage for the final amplifier, grid bias for the final stage and keying voltage for the suppressor grid of the RK-25. This meant that the output of this winding had to be divided into two parts, one supplying the *positive* voltage for the plates and screens and the other supplying the necessary *negative* voltage for bias and keying purposes. Fixed bias is used on the final amplifier in order to permit keying the suppressor of the buffer-doubler tube. This method of keying is unquestionably the most convenient, in as much as it results in *clickless keying* and permits *break-in* on any band, with a moderately selective receiver.

The key circuit is so arranged that when the key is *up*, the full negative voltage is applied to the suppressor, cutting off excitation to the final amplifier. When the key is pressed down the proper bias is applied to the suppressor, allowing just the proper excitation of the final amplifier. This is accomplished by placing a potentiometer across the bias portion of the power-supply. The center arm goes to the suppressor, permitting easy adjustment of excitation. The key is connected in series with the potentiometer at the grounded end. Because the RK-25 has an output many times that required for the final amplifier and, too, because the excitation must be carefully adjusted for grid-modulation, this variable suppressor voltage arrangement is absolutely

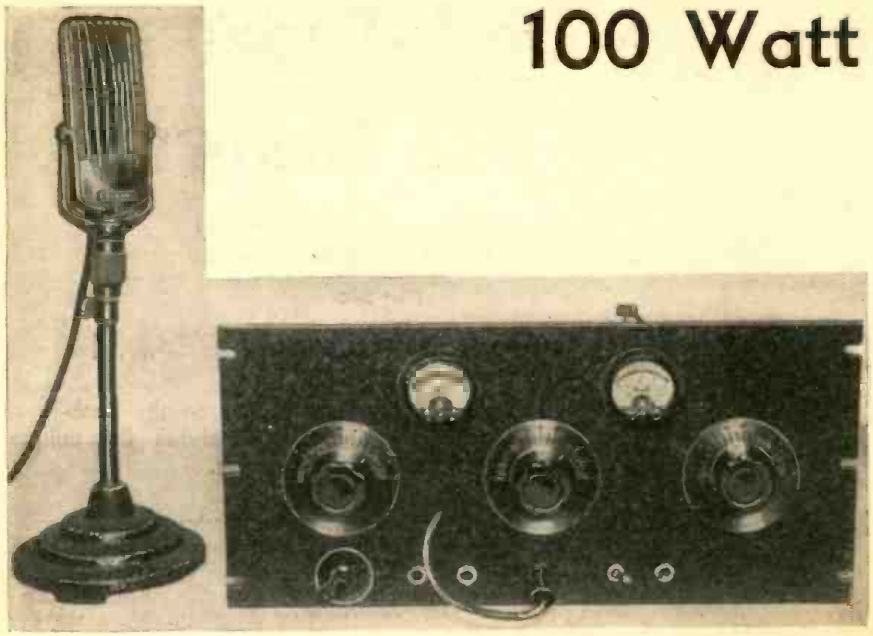
(*Continued on page* 506)



Diagrams are given above for the novel power-supply unit, especially designed by Mr. Shuart for use with this very compact Desk-Type Transmitter, and also the low-power audio amplifier.

100 Watt QRM Dodger

By Art Gregor



100-watt, 5-meter transmitter with the Velotron microphone.

● THE hard and loud cry for frequency stability in 5 meter transmitters has not gone unheeded. This is evidenced by the great number of crystal-controlled transmitters now in operation and also by the great number of really stabilized M.O.P.A.'s.

The conventional crystal-control transmitter for 5-meter operation offers a terrific disadvantage in that the frequency cannot be varied, or else in order to use a variable crystal such as are now available, the transmitter must be more complicated. It would seem to us that with the average *good* 5-meter receiver, which has a band width of from 20 to 40 kc., the stabilized M.O.P.A. offers the best solution to the QRM problem. If, however, all transmitters were crystal controlled the problem would not be so great because the receiver could be more selective and besides the transmitters would not take up so much space. But, unfortunately, it seems that this result will be a long time coming.

The M.O.P.A. shown in the photograph is nothing more than the original 6L6 M.O.P.A. described by the writer in the Sept., 1936, issue, to which has been added a pair of RK37's in order to boost the power to around 100 watts. The stability of the 6L6 M.O.P.A. is well known to the 5 meter gang, and of course, its stability is not changed in the least by the addition of the higher powered push-pull amplifier. The RK37's were selected because of their fairly modest *driving power* requirements. The single 6L6 provides sufficient driving power for this stage for class "C" operation with up to 150 watts input.

The oscillator tuning circuit is tuned to 10 meters and the circuit is relatively high C. The QRM proposition is simply overcome here in the oscillator portion of the transmitter. A very small capacitor is connected in parallel with the tank condenser in a sort of band-spread arrangement.

While the photograph shows this condenser to be mounted with its control on the panel, the ideal arrangement is to employ a long flexible shaft where the transmitter is not mounted directly on the operating desk. The dial which controls this band-spread condenser can be calibrated directly in the 5 meter band. It is possible to shift several hundred kc. by merely adjusting this small condenser.

The entire transmitter should be adjusted to a frequency exactly in the center of the small band over which we desire to QSY. It will then be found that retuning the other stages is not necessary when a slight adjustment is made in the oscillator circuit. This variable control proved to be one of the greatest assets to any 5 meter rig we had ever employed, because you can readily adjust the frequency to avoid QRM during a QSO.

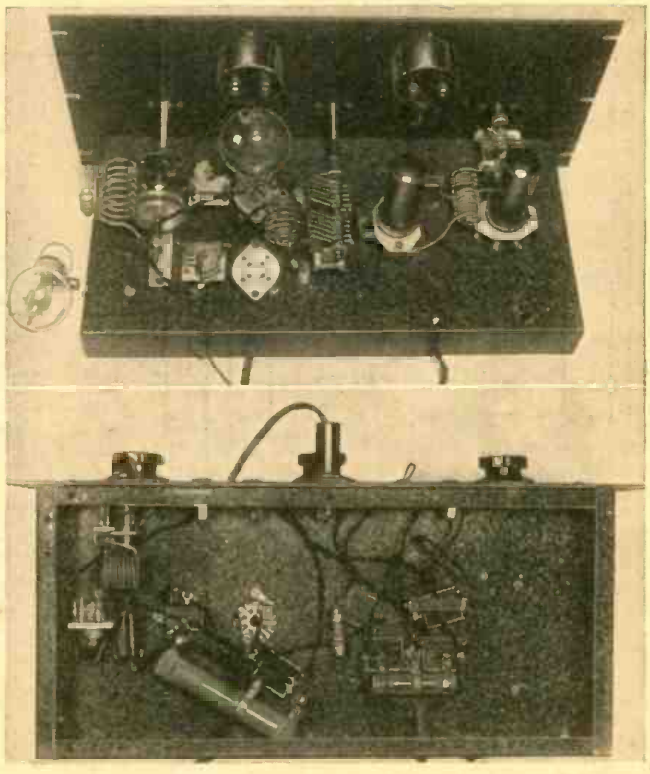
In order to improve efficiency, in the final amplifier circuit a Bud neutralizing condenser of the disc type was used for tuning. The average condenser of the multi-plate type which would serve with this transmitter contains entirely too much metal and framework. This disc type condenser works out very well, besides being economical.

The entire transmitter is mounted on an 8¾"x19" standard relay rack panel. The chassis is only 2" deep by 17" long and 8" wide. This makes an exceptionally compact arrangement and it can be placed in the relay rack along with the other transmitters employed for the lower frequencies. By use of plug cables it only becomes necessary to plug the 5 meter transmitter into the power-supply and modulator units used for other bands, thus allowing quick change-over with a minimum of apparatus.

While we call this a 100 watt transmitter, it is possible to run the input up to 200 watts with the final amplifying tubes running moderately cool, and showing no signs of overloading. The output under these conditions is at least 150 watts and needless to say represents a real husky signal.

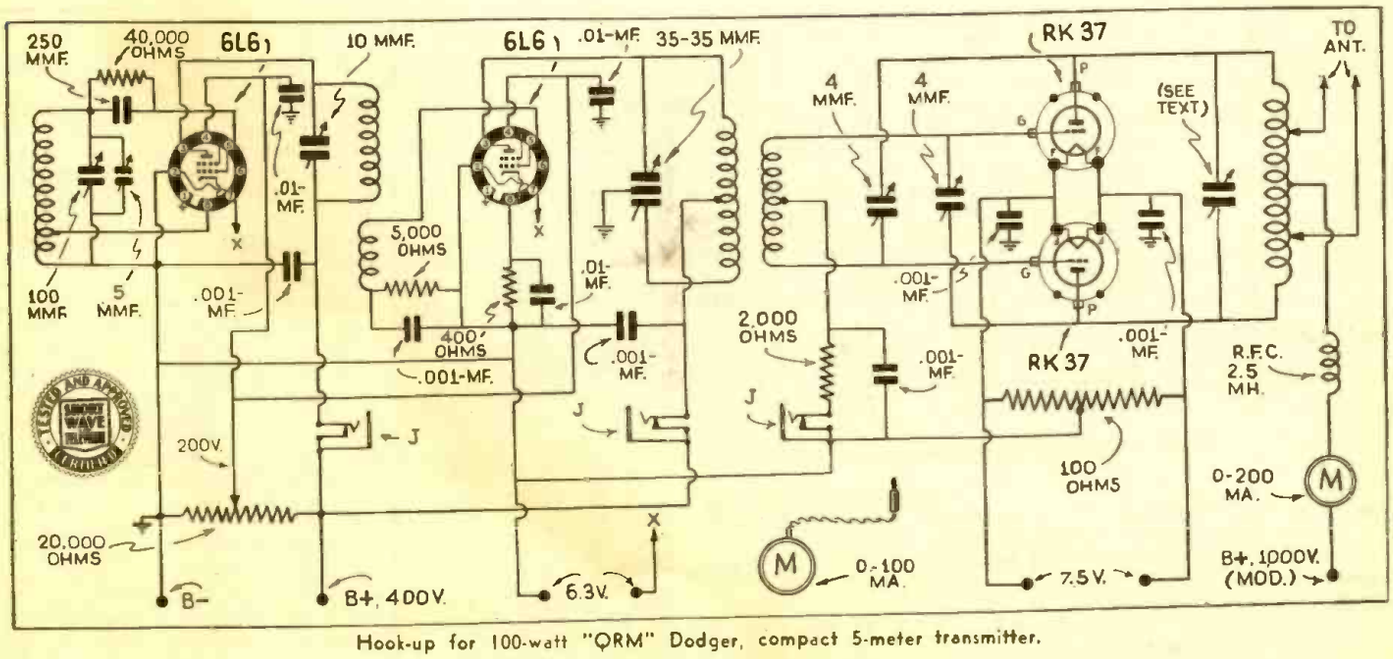
Results with this transmitter are more than gratifying; its ability to break through, due no doubt to the 100 to 150 watt output, together with the *adjustable-frequency* feature, make it an ideal transmitter for the coming 5 meter DX season. No information is given or suggested regarding the antenna. Sufficient data has already been published on various types of 5 meter antennas, and no doubt the location and certain limitations due to surrounding buildings, etc., would dictate the use of an antenna other than the one we suggested, so we leave the selection to the readers.

Any of the various co-axial cables recently introduced, together with a half-wave antenna or a beam should make this transmitter almost unbeatable. 100 watts with a good beam antenna will really go places on 5 meters.



Rear and bottom views of the 100 watt M.O.P.A. Note in the left-hand corner of the bottom view, the oscillator tuning circuit; the large condenser is in the tank circuit, while the smaller one with its knob on the panel is the vernier which is employed for shifting frequency in order to dodge QRM. The dial should be directly calibrated in the 5-meter band.

—A Compact 5-Meter Transmitter



Hook-up for 100-watt "QRM" Dodger, compact 5-meter transmitter.

Besides putting out a real "hefty" signal, this 100-watt 5-meter M.O.P.A. is designed to overcome the terrific QRM problem. By use of a calibrated vernier oscillator control, it is possible to shift frequently over a considerable range even by remote control. The stability of the signal is excellent. While not as good as crystal, it is good enough to permit the use of any type of superheterodyne receiver, regardless of its selectivity characteristics.

Parts List—100 Watt Transmitter

CORNELL-DUBILIER
- 1—250 mmf. mica condenser.
- 3—.01 mf. mica condenser, 500 V.
- 6—.001 mf. mica condenser, 1,000 V.

I.R.C.
- 1—40,000 ohm resistor.
- 1—5,000 ohm 10 watt resistor.
- 1—400 ohm 10 watt resistor.
- 1—2,000 ohm 10 watt resistor.
- 1—20,000 ohm voltage divider—35 watts.
- 1—100 ohm center tap filament resistor.

HAMMARLUND
- 1—100 mmf. variable condenser (H.F.).
- 1—15 mmf. variable condenser (H.F.) (remove all but one rotor and two stator plate for band-spread frequency control).
- 1—35 mmf. condenser 1 rotor and 1 stator plate. Others removed.
- 1—split stator, 35 mmf, condenser, MCD35-X.
- 1—2.1 mh. R.F. choke.
- 2—4 mmf. neutralizing conds.

BUD
- 1—No. 892 disc type neutralizing condenser used for tuning filament amplifier plate circuit.

TRIPLETT
- 1—0-200 ma. meter, small bakelite case.
- 1—0-100 ma. meter, small bakelite case.

RAYTHEON
- 2—6L6 tubes.
- 2—RK-37 tubes.

PAR-METAL
- 1—8¾"x19" panel.
- 1—2"x17"x8" sub-base.

Coil Data for 100-Watt Transmitter

	Turns	Length Winding	Diameter	Wire
*Osc. grid	7	1 "	¾"	No. 12

(Cont. on page 513)

A FOLDED DOUBLET FOR TRANSMITTING

● THE antenna shown herewith is in use at the writer's station. I thought that it might be of interest to amateurs who desire the directive advantages of an "array" without having the required space. To the best of my knowledge this antenna has not been described in any publication.

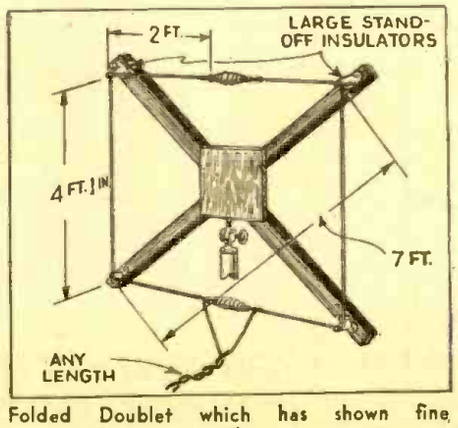
It is suitable for either 5, 10 or 20 meter operation and even on 20 meters takes up a space only eight feet square.

At this station it is being used for 10 meter operation, and, at present, is installed inside in the attic. The first experiments were highly gratifying as a matter of fact the first contact made with this antenna was K6MVV in Hawaii, a distance of about 5,000 miles!

At the time this contact was made the antenna was directed broadside W.S.W. We received a report of QSA. R6-7 on this contact with 60 watts input. We next swung the antenna south and worked K4EPO receiving an R8 report in Porto Rico. Tests were made with several other outdoor antennas, namely a half-way vertical and three half-waves horizontal. In all cases and in every direction this simple *loop antenna* provided as good or better reports than could be obtained with any outdoor antenna.

We also tried it for *reception* on 10 meters and found that in many cases an R6 signal could be brought up to R8 by swinging the antenna *broadside* to the incoming signal.

The constructional details are simple; we merely cut (*Continued on page* 513)



Folded Doublet which has shown fine results.

Call	Mc.	
6.625	PRADO	RIOBAMBA, ECUADOR, 45.28 m. Thurs. 9-11.45 pm.
6.590	COCU	HAVANA, CUBA, 45.52 m., Addr. Estrada Palma 25, Vibora, Havana. Relays CMCU 7 am.-12 m.
6.568	HI4D	CIUDAD TRUJILLO, D. R., 45.74 m. Except Sun. 11.55 am.-1.40 pm.
6.550	XBC	VERA CRUZ, MEX., 45.8 m. 8.15-9 am.
6.550	TIRCC	SAN JOSE, COSTA RICA, 45.8 m., Addr Radioemisora Catolica Costarricense. Sun. 11 am.-2 pm., 6-7, 8-9 pm. Daily 12 n.-2 pm., 6-7 pm., Thurs. 6-11 pm..
6.545	YV6RB	BOLIVAR, VENEZUELA, 45.84 m., Addr. "Ecos de Orinoco." 6-10.30 pm.
6.530	YN1GG	MANAGUA, NICARAGUA, 45.94 m., Addr. "La Voz de los Lagos." 8-9 pm,
6.520	YV4RB	VALENCIA, VENEZUELA, 46.01 m. 11 am.-2 pm., 5-10 pm.
6.500	HIL	CIUDAD TRUJILLO, D. R., 46.15 m., Addr. Apartado 623. 12.10-1.40 pm,, 5.40-7.40 pm.
6.500	TIOW	PUERTO LIMON, COSTA RICA, 46.15 m., Addr. Ondas del Caribe. Daily 12 n.-1.30 pm.
6.490	H I1L	SANTIAGO DE LOS CABALLEROS, D. R., 46.2 m., 6-9 pm.
6.477	HI4V	SAN FRANCISCO de MACORIS, D. R., 46.32 m. 11.40 am.-1.40 pm., 5.10-9.40 pm.
6.470	YNLAT	GRANADA, NICARAGUA, 46.36 m., Addr. Leonidas Tenoria. "La Voz del Mombacho." Irregular.
6.450	HI6A	CIUDAD TRUJILLO, D. R., 46.51 m. 8.40-10 40 am., 2.40-4.10 pm. Sat. 9.40-10.40 pm. Sun. 2.40-4.40 pm.
6.420	HI1S	SANTIAGO, D. R., 46.73 m. 11.40 am. -1.40 pm.. 5.40-7.40, 9.40-11.40 pm.
6.410	TIPG	SAN JOSE, COSTA RICA, 46.8 m., Addr. Apartado 225, "La Voz de la Victor." 12 n.-2 pm., 6-11.30 pm.
6.400	YV5RH	CARACAS, VENEZUELA, 46.88 m. 7-11 pm.
6.396	COX4S	MARIANAO, CUBA, 46.9 m., Addr. Jefe del Cuerpo de Senales de la Republica de Cuba, Ciudad Militar, Marianao. Tests daytime and evenings.
6.380	YV5RF	CARACAS, VENEZUELA, 47.02 m., Addr. Box 983. 6-10.30 pm.
6.360	HRP1	SAN PEDRO SULA, HONDURAS, 47.19 m. 7.30-9.30 pm.
6.360	YV1RH	MARACAIBO, VENEZUELA, 47.19 m., Addr. "Ondas Del Lago," Apartado de Correos 261. 6-7.30 am., 11 am.-2 pm., 5-11 pm.
6.350	HRY	TEGUCIGALPA, HONDURAS, 47.24 m. 6.30-8.30 pm.
6.340	HI1X	CIUDAD TRUJILLO, D. R., 47.32 m. Sun. 7.40-10.40 am., daily 12.10-1.10 pm., Tues. and Fri. 8.10-10.10 pm.
6.330	COCW	HAVANA, CUBA, 47.39 m. Addr. LaVoz de las Antillas, P. O. Box 130. 6.55 am.- 1 am. Sun. 10 am.-10 pm.
6.316	HIZ	CIUDAD TRUJILLO, D. R., 47.5 m. Daily except Sat. and Sun. 11.10 am.-2.25 pm., 5.10-8.40 pm. Sat. 5.10-11.10 pm. Sun. 11.40 am.-1.40 pm.
6.310	TGI	GUATEMALA CITY, GUAT., 47.55 m., Addr. Secretaria de Fomento. Relays TGI 11 pm.-2 am.
6.300	YV4RQ	MARACAY, VENEZUELA, 47.62 m. 8-10.30 pm.
6.280	COHB	SANCTI SPIRITUS, CUBA, 47.77 m., Addr. P. O. Box 85. 9-11.30 am.,12.30-1.30. 4-7, 8-11 pm.
6.280	HIG	CIUDAD TRUJILLO, D. R., 47.77 m. 7.10-8.40 am.. 12.40-2.10, 8.10-9.40 pm.
6.270	YV5RP	CARACAS, VENEZUELA, 47.79 m.. Addr. "La Voz de la Philco." Irregular,
6.243	HIN	CIUDAD TRUJILLO, D. R., 48 m., Addr. "La Voz del Partido Dominicano." 12 m.-2 pm., 7.30-9.30 pm., irregularly.
6.235	HRO	LA CEIBA, HONDURAS, 48.12 m., Addr. "La Voz de Atlantida." 8-11 pm.; Sat. 8 pm.-1 am.; Sun. 4-6 pm.
6.230	YV1RG	VALERA, VENEZUELA, 48.15 m. 6-9.30 pm.
6.230	OAX4G	LIMA, PERU, 48.15 m.. Addr. Apartado 1242. Daily 7-10.30 pm.
6.220	———	SAIGON, INDO-CHINA, 48.2 m., Addr. Radio Philco. 4.30 or 5.30-9.30 am.
6.210	YV5RI	CORO, VENEZUELA, 48.31 m., Addr. Roger Leyba, care A. Urbina y Cia. Irregular.

S.W. BROADCAST BAND

6.190	HI6Q	CIUDAD TRUJILLO, D. R., 48.47 m. 11.45 am.-1 pm.. 4.45-6.45 pm.
6.165	HI1A	SANTIAGO, D. R., 48.5 m., Addr. P. O. Box423. 11.40am.-1. 40 pm.; 7.40-9. 40 pm.: Wed. 6-10.30 pm.
6.171	XEXA	MEXICO CITY, MEX., 48.61 m., Addr. Dept. of Education. 7-11 pm.
6.160	YV5RD	CARACAS, VENEZUELA, 48.7 m. 11 am.-2 pm., 4-10.40 pm.
6.160	VPB	COLOMBO, CEYLON, 48.7 m. Daily exc. Thurs. and Fri., 6.30 am.-12.30 pm.; Sun. 7-11.30 am.
6.150	CSL	LISBON, PORTUGAL, 48.78 m. Irregular. 7-8.30 am., 2-7 pm.
6.150	CJRO	WINNIPEG, MAN., CANADA, 48.78 m., Addr. (See 11.720 mc.) 4-10 pm.
6.147	ZEB	BULAWAYO, RHODESIA, S. AFRICA, 48.8 m. Sun. 3.30-5 am.; Mon., Wed. and Fri., 1.15-3.15 pm.; Tues. 11 am.-12 n.; Thurs. 10 am.-12 n.
6.147	COKQ	SANTIAGO, CUBA, 48.8 m., Addr. Box 137. 9-10 am., 11.30 am.-1.30 pm., 3-4.30 pm., 10-11 pm., 12 m.-2 am.
6,145	HJ4ABU	PEREIRA, COL., 48.8 m. 9.30 am.-12 m., 6.30-10 pm.
6.140	W6XK	PITTSBURGH, PA., 48.86 m., Addr. Westinghouse Electric & Mfg. Co. Relays KDKA 10 pm.-1 am.
6.137	CR7AA	LAURENCO MARQUES, PORT. E. 48.87 m. Daily 12.05-1, 4.30-6.30, 9.30-11 am., 12.05-4 pm., Sun. 5-7 am., 10 am.- 2 pm.
6.135	HJ1ABB	BARRANQUILLA, COL., 48.9 m., Addr. P. O. Box 715. 11.30 am.-1 pm., 4.30-10 pm.
6.135	HI5N	SANTIAGO, D. R., 48.9 m. 6.40-9.10 pm
6.130	TGXA	GUATEMALA CITY, GUAT., 48.94 m., Addr. Giornal Liberal Progressista. Irregularly.
6.130	VP3BG	GEORGETOWN, BRIT. GUIANA. 48.94 m. From 5 pm. on.
6.130	COCD	HAVANA, CUBA, 48.94 m., Addr. Calle G y 25, Vedado. Relays CMCD 10 am-10 pm.
6.130	VE6HX	HALIFAX, N. S., CAN., 48.94 m., Addr P. O. Box 998. Mon.-Fri. 9 am.-1 pm., 5-11 pm. Fri.; 1-3 pm., Sat.; Sun. 9 am.-1 pm., 2-11 pm. Relays CHNS.
6.130	ZQE	KUALA LUMPUR, FED. MALAY ST., 48.94 m. Sun., Tue. and Fri. 6.40-8.40 am.
6.130	LKL	JELOY, NORWAY, 48.94 m. 11 am.-6 pm.
6.125	CXA4	MONTEVIDEO, URUGUAY, 48.98 m., Addr. Radio Electrico de Montevideo., Mercedes 823. 10 am.-12 n., 2-8 pm.
6.125	OAX1A	CHICLAYO, PERU, 48.98 m., Addr. La Voz de Chivlayo, Casilla No. 9. 8-11 pm.
6.122	OAX4P	HUANCAYO, PERU, 49 m. La Voz del Centro del Peru. 8 pm. on.
6.122	HP5A	PANAMA CITY, PAN., 49. m. Addr. Box 58. 12 n-1 pm.. 8-10 pm.
6.122	HJ3ABX	BOGOTA, COL., 49 m., Addr. La Voz de Col., Apartado 2665. 12 n.-2 pm., 5.30-11 pm.; Sun. 6-11 pm.
6.120	W2XE	NEW YORK CITY, 49.02 m., Addr. Col. B'cast. System, 485 Madison Ave. Irregular.
6.120	XEUZ	MEXICO CITY, MEX., 49.02 m., Addr. 5 de Mayo 21. Relays XEFO 1-3 am.
6.115	OLR2C	PRAGUE, CZECHOSLOVAKIA, 49.05 m. (See 11.875 mc.)
6.110	XEPW	MEXICO CITY, MEX., 49.1 m., Addr. La Voz de Aguila Azteca desde Mex., Apartado 8403. Relays XEJW 11 pm.-1 am.
6.110	VUC	CALCUTTA, INDIA, 49.1 m. Daily 3-5.30 am., 9.30 am.-12 m.; Sun 7.30 am.-12 m.
6.110	GSL	DAVENTRY, ENGLAND, 49.1 m., Addr. (See 26.1 mc.) Irregular 6.20-8.30, 9-11 pm.
6.110	YUA	BELGRADE, JUGOSLAVIA, 49.18 m., 12.45-2.30, 4-8 am., 1-6 pm.
6.105	HJ4ABB	MANIZALES, COL., 49.14 m., Addr. P. O. Box 175. Mon.-Fri 12.15-1 pm.; Tue. and Fri. 7.30-10 pm.; Sun 2.30-5 pm.
6.100	W3XAL	BOUND BROOK, N. J., 49.18 m., Addr. Natl. Broad. Co. 9.15 pm.-1 am.
6.100	W9XF	CHICAGO, ILL., 49.18 m., Addr. N.B.C. 8 am.-9.10 pm.. 1.05-2 am.
6.100	HJ4ABE	MEDELLIN, COL., 49.18 m. 11 am.-12 m.. 6-10.30 pm.
6.097	ZTJ	JOHANNESBURG, S. AFRICA, 49.2 m., Addr. African Broad. Co. Mon.-Sat. 11.45 am.-4 pm.; Sun. 12.30-3 pm.
6.095	JZH	TOKIO, JAPAN, 49.22 m., Addr. (See 11.800 mc., JZJ.) Irregular.
6.092	OAX4Z	LIMA, PERU 49.25 m. Radio National 7-11 pm.
6.090	HJ4ABC	IBAGUE, COL., 49.26 m. 7 pm.-12 m.
6.090	CRCX	TORONTO, CAN., 49.26 m., Addr. Can. Broadcasting Corp. Daily 5.30-11.30 pm.; Sun. 5-11.30 pm.
6.090	XEBF	JALAPA, MEXICO, 49.26 m., Addr. Insurgentes 34. Testing.
6.090	ZBW2	HONGKONG, CHINA, 49.26 m., Addr. P. O. Box 200. Irregular.
6.085	HJ5ABD	CALI, COLOMBIA, 49.3 m., Addr. La Voz de Valle. 12m.-1.30 pm., 5.10-9.40 pm.
6.083	VQ7LO	NAIROBI, KENYA, AFRICA, 49.31 m., Addr. Cable and Wireless, Ltd. Mon.-Fri. 5.30-6 am., 11.15 am.-2.15 pm., also Tues. and Thurs. 8.15-9.15 am.; Sat. 11.15 am.-3.15 pm.; Sun. 10.45 am.-1.45 pm.
6.080	ZHJ	PENANG, FED. MALAY STATES, 49.34 m. 6.40-8.40 am., except Sun., also Sat. 11 pm.-1 am.
6.080	CP5	LAPAZ, BOLIVA, 49.34 m. 7-10.30 pm.
6.080	W9XAA	CHICAGO,ILL., 49.34 m., Addr. Chicago Fed. of Labor. Relays WCFL irregular
6.079	DJM	BERLIN, GERMANY, 49.34 m., Addr. Broadcasting House. Irregular.
6.070	VP3MR	GEORGETOWN, BRI.GUIANA, 49.42 m. Sun. 7.45-10.15 am ; Daily 4.45-8.45pm.
6.070	HJ3ABF	BOGOTA, COL., 49.42 m. 7-11.15 pm.
6.070	CFRX	TORONTO, CAN., 49.42 m. Relays CFRB 6.30 am-11 pm. Sun. 9.30 am.-11 p. m.
6.070	YV1RE	MARACAIBO, VEN., 49.42 m. 6-11pm.
6.070	VE9CS	VANCOUVER, B. C., CAN., 49.42 m. Sun. 1.45-9 pm., 10.30 pm.-1am.; Tues. 6-7.30 pm., 11.30 pm.-1.30 am. Daily 6-7.30 pm.
6.065	HJ4ABL	MANIZALES, COL., 49.46 m. Daily 11 am.-12 m., 5.30-7.30 pm.; Sat. 5.30-10.30 pm.
6.065	SBG	MOTALA, SWEDEN, 49.46 m. Relays Stockholm 1.30-5 pm.
6.060	W8XAL	CINCINNATI, OHIO, 49.6 m., Addr. Crosley Radio Corp. Relays WLW 6.30 am.-8 pm., 11 pm.-2 am.
6.060	W3XAU	PHILADELPHIA, PA., 49.5 m. Relays WCAU 8-11 pm.
6.050	HP5F	COLON, PAN., 49.59 m., Addr. Carlton Hotel. 11.45am.-1.15 pm., 7.45-10 pm.
6.050	GSA	DAVENTRY, ENGLAND, 49.59 m., Addr. (See 26.1 mc.) Irregular 6.20-8.30, 9-11 pm.
6.045	HI9B	SANTIAGO, D. R., 49.63 m. Irregular 6-11 pm.
6.042	HJ1ABQ	BARRANQUILLA, COL., 49.65 m., Addr. Emisora Atlantico. 11 am.-11 pm.; Sun. 11 am.-8 pm.
6.040	W4XB	MIAMI BEACH, FLA., 49.65 m. Relays WIOD 12m.-2 pm., 5.30-6 pm., 10 pm.-12 m.
6.040	W1XAL	BOSTON, MASS., 49.65 m., Addr. University Club Exc. Sat. 7-9 pm.
6.040	YDA	TANDJONGPRIOK, JAVA, 49.65 m., Addr. N.I.R.O.M., Batavia. 10.30 pm.-2 am.; Sat. 7.30 pm.,-2 am.

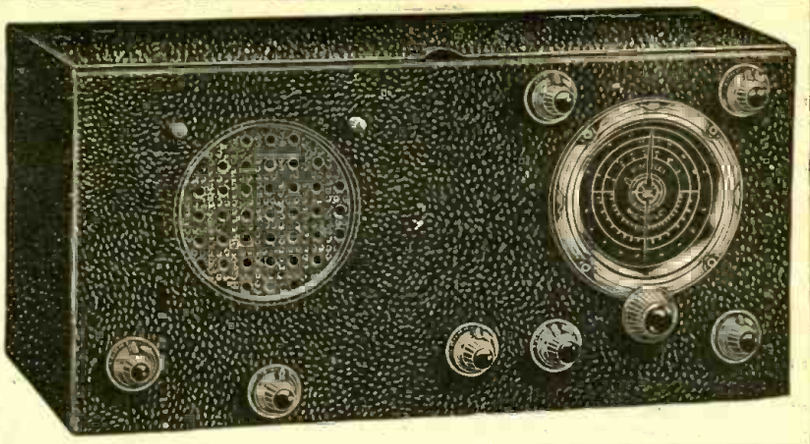
(Continued on page 515)

(All Schedules Eastern Standard Time)

DOERLE MODEL D-38

A. C. 17½ x 8½ x 8½

8 Tubes **4½ to 3000 Meters**

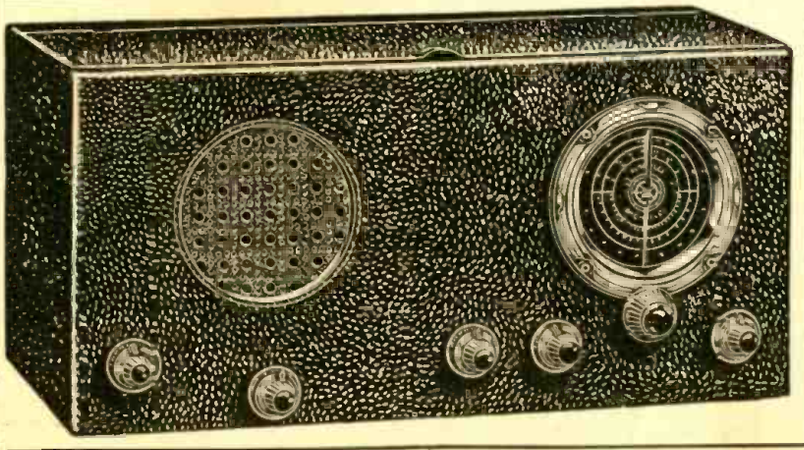


The last word in short wave receivers. Before you buy send for circular D-38, an eight-page booklet containing schematic and picture diagrams, instructions, and sketches.

Read this booklet and compare with the other models you have in mind. Then send your order to the concern who in your opinion is giving you the best for your money.

Complete, with all coils, and tubes, no extras **$32.50**

Kit, factory assembled, but unwired, less tubes, with all coils..... **$22.50**



DOERLE MODEL D-5

5 Tubes 9½ to 2000 Meters

Really a Junior of Model D-38. Intended primarily for the amateur or listener not interested in the five meter band.

Uses tuned radio frequency as does Model D-38 and the highly popular 6L6 as audio output beam power tube.

Again we request you to write for our catalog which describes this model in detail.

Available in amateur model which is shipped with special amateur bandspread coils or short wave listener model for which general coverage is supplied.

Complete with all coils and tubes, ready to use, no extras..... **$22.50**

Kit, factory assembled, but unwired, less tubes, with all coils..... **$19.50**

7C 5-Tube

Short Wave Receiver 8¼ to 625 meters

Bigger and More Powerful Than Ever

A Giant in Performance

Our Model 7C, A Midget in Size—A Giant in Performance. One of our most popular short wave receivers.

Our files contain many letters from satisfied listeners from all over the world which testify to the popularity of this set, and their lists of DX stations received on the loudspeaker is amazing.

Uses a 6K7 radio-frequency stage, a 6F7, twin 2 in 1 tube, as regenerative detector and first audio, one 6C5, one 12A7, twin 2 in 1 tube, and one K92A.

Earphone pack has been incorporated to permit the use of phone when loudspeaker operation is not desired. Operates from regular house current.

Size: 10x7½x7½.

Complete with all coils, 9½ to 600 meters, and all tubes, ready to use, nothing else to buy.....$16.50

In Kit form, but factory assembled, including all coils and tubes, but unwired.....$12.95

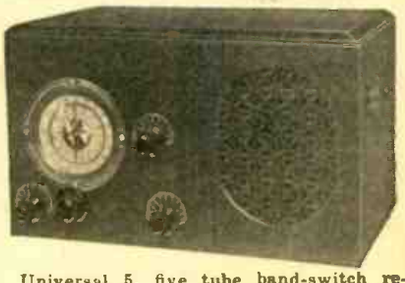
*Available in battery model upon special order at same price.

**Also available in ham model with special tuning circuit to provide additional bandspread at $1.00 additional.

BS-5 Six tube Bandswitch Receiver, no plug-in-coils, select the band by a simple flip of the switch. Loudspeaker Operation.
12 to 600 meters, automatic headphone jack also included. Complete, ready to use, including tubes, factory wired and laboratory tested, $18.50.
Complete kit, factory assembled, ready to wire, including tubes and cabinet, $16.50.

Universal 5

Bandswitch 5-Tube Receiver



Universal 5, five tube band-switch receiver. No plug-in coils are used 14 to 600 meters. By a simple flip of the switch bandspread tuning was incorporated. Full-sized dynamic speaker.

Uses the efficient time-tested electron-coupled regenerative method of detection. Operates on any 110 volt house lighting current.

Complete ready to use, nothing else to buy, laboratory tested.....$16.50

Not sold in kit form.

3 Tube Electric Model, complete, tested and ready to use, with 5 plug-in coils, 12 to 600 meters, at $6.50.

Kit form, factory assembled, but unwired, with coils, less tubes, $3.50. Available in battery model at same prices, if specified.

HF-35

TRANSMITTER IN KIT FORM

$21.95

Write for Complete Information

HF-20

SHORT WAVE TRANSMITTER

Uses 3 type 2A5 crystal control so as to deliver a good 20 watt output.

In kit form, including triplet meter, coils for one band, less tubes, crystals and crystal holder.....$11.95

Tubes, extra.....$1.75

Crystal for 80 and 160 meters $1.45

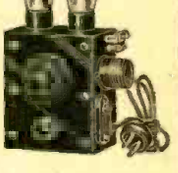
Crystal holder.....$1.00

40 meter crystal.....$2.75

Coils for additional band (per set).....$1.00

Detailed information available in our catalog.

2-Tube Electric Set



Smallest receiver on the market. No fuss or feathers. Just essential and necessary parts make this an ideal receiver for the beginner, also an excellent gift for the shut-in.

Complete with 5 coils, 2 tubes, wired and tested, 12 to 600 meters, which includes the broadcast band $4.00

In kit form, factory assembled with coils, but less tubes and unwired.....$2.50

Available for battery operation at the same price, if specified.

Information for old customers of Eilen Radio Laboratories, Guy Stokely Radio Corporation, and Centrallion Engineering Company. These three concerns have been purchased by the new owner whose name appears at the bottom of this advertisement. We solicit your continued patronage.

WRITE FOR NEW 1938 CATALOG OF SHORT WAVE APPARATUS

Enclose Stamp to Cover Mailing

OSCAR B. KUSTERMAN 68 BARCLAY ST. NEW YORK CITY | **1938 FREE CATALOGUE** SEND STAMP TO COVER MAILING

Short Wave

The Forty-Fifth Trophy

Presented to SHORT WAVE SCOUT FREDERICK LANAWAY

49 Granville Avenue, Edmonton,
London, N. 9, England

For his contribution toward the advancement of the art of Radio

by

SHORT WAVE and TELEVISION

Honorable mention John Szlucha, Owega, N.Y.

46 Stations verified—Europe, including Iceland.

● A Britisher, Fred Lanaway, of London, England, wins the trophy award for the Europe contest this month. This is the first time that the trophy has been awarded to a trans-Atlantic Short Wave Scout.

Mr. Lanaway submitted a list of 48 European stations, all but two of which came within the rules of the contest. All reception was on a 2-tube receiver, designed and built by the winner. The aerial system was an end-fed Hertz having a length of 42 feet, 9 inches. All reception was by headphones.

The listening period was from August 1 to 30, 1936.

Our congratulations, Mr. Lanaway. We trust the trophy meets with your approval.

List of Stations

PCJ, 15,220 kc., Radio Hilversum, Hilversum, Nederland.
OER2, 6,072 kc., Kurzwellensender Der Osterr. Osterreich.
PHI, 17,775 kc., Philips' Radio, PHOHI Studios, Eindhoven, Holland.
LKJ1, 9,530 kc., Ministere Du Commerce, Oslo, Norvege.
CT1AA, 9,650 kc., Radio Colonial, Lisbon, Portugal.
TFJ, 12,235 kc., Icelandic State Broadcasting Service, Reykjovik, Iceland.
HVJ, 15,120 kc., Laudetur Jesus Christus. Citto Del Vaticano.
PCJ, 9,590 kc., Philips' Radio, Eindhoven, Holland.
PRAHA, 15,230 kc., Radio Journal, Prague, Czechoslovakia.
12RO, 25.4 mtrs., Ente Italiano Audizioni Radiofoniche, Rome, Italy.
OER2, 11,801 kc., Kurzwellensender Der Osterr. Vienna, Osterreich.
HVJ, 5,969 kc., Laudetur Jesus Christus, Citta Del Vaticano, Vatican City.
RKI, 15,145 kc., Radio Centre, Moscow, U.S.S.R.
RNE, 12,000 kc., (Same as above).
RAN, 9,520 kc., (Same as above).
TPA2, 15,245 kc., Paris, France.
TPA3, 11,880 kc., Paris, France.
TPA4, 11,715 kc., Paris, France.
DJE, 17,760 kc., Der Deutsche Kurzwellensender Berlin-Tempelhof, Germany.
DJR, 15,340 kc., (as above).
DJN, 9,540 kc., (as above).
DZE, 12,130 kc., (as above).
DJL, 15,110 kc., (as above).
DZC, 10,290 kc., (as above).
DJA, 9,560 kc., (as above).

(*Continued on page* 514)

South America Contest Closes December 24th

Beginning next month, the original type of contest will be run again. That is to say, there will be no restriction on the geographical location of the stations to be entered in any one contest. Each contest will be *worldwide*. Stations heard and verified during any thirty-day period, regardless of their location, will be acceptable provided that at least 50% of the stations submitted are from countries other than the one in which the contestant resides. The first of these contests will close on January 24, 1938.

Contest Rules

The purpose of this contest is to advance the art of radio by "logging" as many short-wave phone stations, amateur stations excluded.

A notarized affidavit must be sent with the veri cards and, of course, all of the veris will have to be for the continent assigned for each particular contest. The trophy winner in the next contest will be published in the February issue.

By midnight, Dec. 24th, all entries for the South American contest must therefore be in the hands of the Editors, together with the veris and the notarized oath that the contestant personally listened to all of the stations listed.

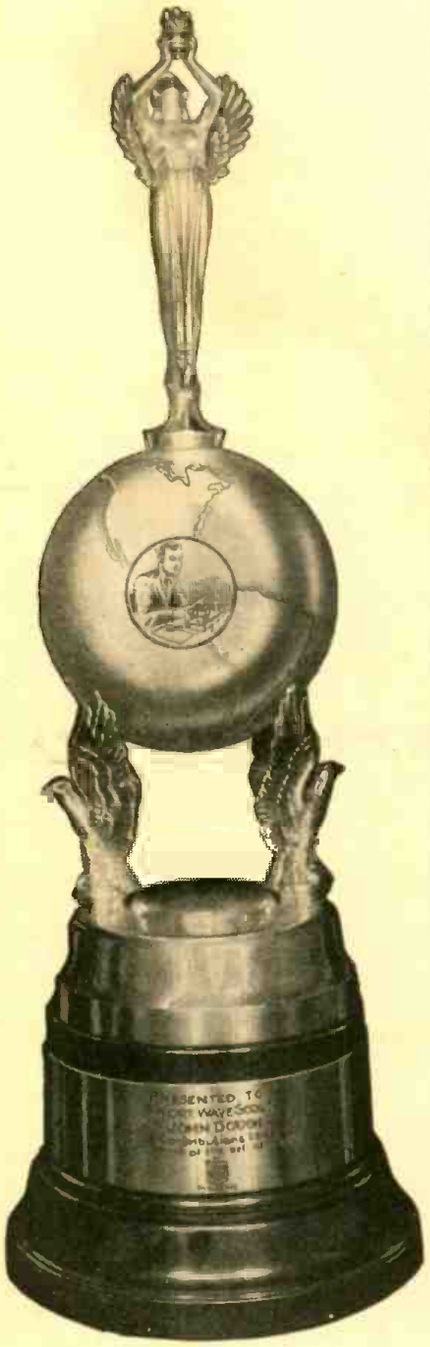
In the event of a tie between two or more contestants, each listing the same number of stations, the judges will award a similar trophy to each contestant so tying.

Bear in mind that the veri cards should be absolute verifications, and not simply an acknowledgment that you notified a station that you heard them. Several stations do not verify, but simply send an acknowledgment card. Note that in either contest that only experimental, phone, or broadcast stations should be entered in your list. No *amateur* transmitters or *commercial code* stations can be entered. The contest for the March issue will close in New York City, Dec. 24th.

The judges in each contest will be the Editors of *Short Wave & Television* and the opinion of the judges will be final.

Send veri cards with your letter and oath certificate all in one package. Use a single line for each station and list them in a regular order, such as: frequency, schedule (all time should be reduced to E.S.T., which is five hours behind G.M.T.), name of station, city, country; musical identification signal if any.

Scouts



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 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. It will enhance any home, and will be admired by everyone who sees it.

The trophy will be awarded every month to that SHORT WAVE SCOUT who has logged the greatest number of short-wave stations in each contest as explained elsewhere. The winner will be announced in the following issue of SHORT WAVE & TELEVISION. The winner's name will be hand engraved on the trophy.

The New ACT-20 Transmitter

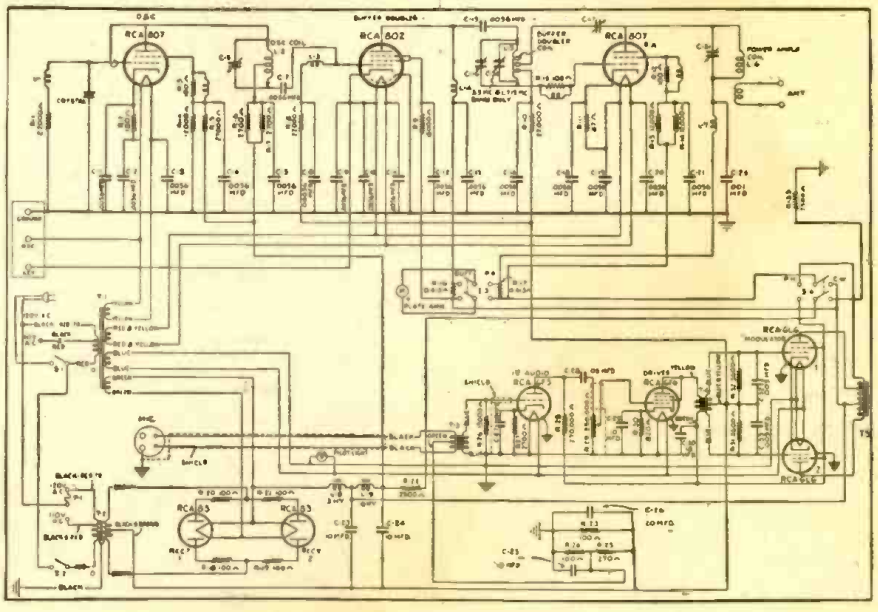


Diagram of ACT-20 Transmitter.

● ONE of the most compact, and extremely modern, amateur type transmitters so far designed is the ACT-20.

The set measures 24⅝" long, 11½" high, 12½" deep, and weighs 64 lbs. The rated power output is 20 watts C.W. or 16 watts on phone. A double-button carbon microphone is suggested for use with it.

The R.F. system has been designed to make possible rapid changes of both frequency bands and frequencies within any band with a minimum of adjustment. This is accomplished by arranging the oscillator and buffer-doubler stage circuits so that coils and crystals of adjacent frequencies can be interchanged without the necessity of returning the plate circuits each time. The final amplifier stage is tuned in a conventional manner.

The completely crystal-controlled oscillator employs an 807 beam-power tube in a standard circuit. Special consideration has been given to the design of the tuned plate circuit. Tuning is accomplished by a small capacitor mounted on the chassis. This capacitor may be adjusted for a crystal frequency in the 1.715, 3.5 and 7.0 megacycle bands, and for several frequencies in a band, so that when its capacitance is less than that required for any other crystal, the oscillator will perform satisfactorily with all crystals without retuning. This means that any frequency may be used in any of these three bands by plugging in the proper crystal and coil and without further oscillator tuning. When a 14 m.c. crystal is used, individual tuning adjustments are necessary.

The buffer-doubler stage consists of an 802 R.F. pentode employing special plate tuning, similar to that described for the oscillator, except that in the 1.715 and 3.5 mc. bands, an additional tuning capacitor is mounted in each coil form. These capacitors make it possible to operate on any frequency in these bands and in one other band, without retuning the buffer stage. This means that by adjusting both chassis and coil capacitors to an oscillator frequency or harmonic, no retuning will be necessary when shifting bands.

The final amplifier employs an 807 beam power tube as a Class C amplifier. The tuning capacitor for this stage is mounted on the front panel, providing the single-control tuning feature of the ACT-20. The final amplifier is neutralized for maximum stability; this is accomplished by means of a specially designed adjustable condenser mounted on the chassis. A meter and selector switch are provided on the front panel, so that buffer-doubler or final amplifier plate current can be observed. The final amplifier is capable of delivering an average power output of 20 watts to the antenna. Coils are available for the entire 5 band range of the transmitter (1.715 to 30 mc.). The transmitter may be keyed in the buffer-doubler or final amplifier stage with the oscillator running continuously, or the oscillator may be keyed simultaneously with the other two stages. Keying of the oscillator alone is not recommended.

The modulator section of the ACT-20 single-chassis transmitter consists of an 6F5 high-gain speech-amplifier stage, a 6F6 audio-driver stage and a push-pull 6L6 beam-power modulator stage. The audio-amplifier gain control is readily accessible on the front panel.

A "Phone-C.W." switch connects the modulation transformer into the power-amplifier plate circuit for phone operation, and automatically provides the correct voltages for the 807 as a plate-modulated amplifier. In the C.W. position the switch disconnects the plate voltage from the speech amplifier, screen-voltage from the modulator and audio-amplifier and substitutes a bleeder resistor, which prevents the high voltage from rising to a value in excess of safe filter capacitor ratings for the key-up position.

The 6F5, high-gain speech amplifier, has a transformer input circuit for coupling to a double-button carbon microphone by means of a four-prong tube socket. Voltage for the microphone is supplied automatically when the plug is inserted in the socket. Other types of microphones or inputs may be used, provided they have an impedance of 500 to 600 ohms and have a level of about -35db.

The antenna coupling system consists of an integral coupling coil on each final-amplifier coil unit, and is so arranged that either a grounded system or transmission-line feed may be used. The most desirable type of radiator will depend on local conditions and frequencies used.

This article has been prepared from data supplied by the courtesy of the RCA Manufacturing Co.

Law Enforcement and Short Wave Radio

By Gerald Morris

(*Continued from page 469*)

it has been stolen. In numerous cases the cars are able to apprehend thieves before they have had time to dispose of, or even throw away, the money or goods they have stolen.

Many cities instead of using one-way short-wave communications have installed two-way systems using waves of the order of 10 meters, by means of which the cars are able to get into instant touch with headquarters, without having to find a telephone. This is a distinct advantage as it saves time in the event that an automobile containing criminals has left a location before the arrival of the police. We have conducted experiments along the lines of two-way communication in New York City and plans for installing it have been discussed to determine the efficiency of the available equipment and the practicability of same in a city of 312 square miles of land, 587 miles of waterfront and 6000 miles of streets.

Police have also investigated the possible use of television and facsimile equipment, and while some very interesting possibilities are apparent, I believe that for the time being New York will adhere to the eight state teletype system, which has given such satisfactory service over a period of years, and the police radio telegraph network in the midwest from the Gulf of Mexico to the Great Lakes, which was brought about through the Associated Police Communications Officers.

In closing, let me add that if any credit is given to the radio system in New York City, it should go to the splendid cooperation of every patrolman in the City, to our Police Commissioner, Lewis J. Valentine, who is not only our Police Commissioner but also our inspiration, and to Mayor LaGuardia, who has always given the Police Department his splendid support.

Human Ills Cured By New Short-Wave Technique

(*Continued from page 472*)

current passes through a coil composed of several turns of heavily insulated wire cable. A powerful magnetic field is thus set up in the vicinity of the coil and any part of the body subjected to this field will be acted upon accordingly. *(Photos courtesy of Lepel High Frequency Laboratories.)*

PCJ, Holland's, New Revolving Beam Antenna

(*Continued from page 472*)

of the track) on an iron pivot partly-sunk into a huge concrete block. In this way masts, carriers and bridge form one entity, able to turn on the iron pivot, and the aerials suspended from the masts can thus be directed in a few moments to any desired part of the world.

It is obvious that in this way it will be possible to direct the beam very precisely; in fact, it has been calculated that the power radiated by the beam will have the same effect as the radiation of a dipole aerial, operating with a power of 2,000 kilowatts!

For the time being, this experimental aerial-system will only be used on the 31-meter band, that is for countries situated to the South and Southwest of Holland, such as Africa and South and Central America, and when this experiment proves successful, other wave-bands will be equipped with an identical system of masts.

A Desk-Type 10-80 Meter Transmitter

(*Continued from page* 497)

necessary for proper operation. Fixed screen voltage is used on the 47 final amplifier. This includes two taps on the voltage divider and a single-pole, double-throw switch in order that the voltage will be approximately 300 either on phone or CW. These taps are adjusted when the transmitter is in operation with the aid of a voltmeter.

The grid bias tap on the voltage divider which supplies bias to the RK-47 is adjusted for optimum performance for both phone and CW. This value is easily determined; that which gives best results for phone will work satisfactorily for CW. Due to the higher value of current the bias will be higher when the transmitter is used for CW operation.

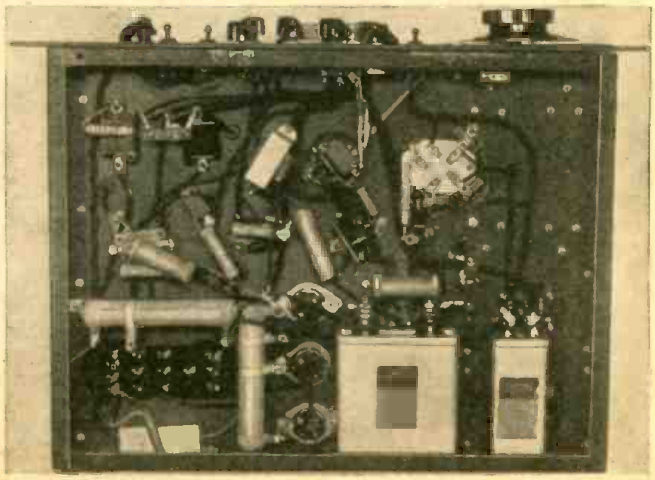
Audio Amplifier

The audio end of the transmitter is rather simple and the only "flea in the ointment" is getting it to behave. Much trouble may be experienced if a few precautions are not taken in the arrangement and construction of this unit. Metal tubes are used in the audio amplifier because of the excellent shielding thus permitted. These tubes are located right alongside of the final amplifier and any R.F. which might get into a tube less effectively shielded, would cause considerable trouble. The under view of the transmitter shows that the resistors and condensers associated with the amplifier are grouped together as far as possible. They are then further shielded by a metal baffle which surrounds the two sockets and the resistors and condensers. This shield is not shown as it was removed to permit a clear view of the arrangement. This shield is just as deep as the chassis and when the *rig* is mounted in the cabinet the entire under portion of the A.F. circuit is completely shielded. The tubes used are a 6N7 and a 6F6. The first is used as two stages of resistance-coupled amplification. This is in turn resistance coupled to the 6F6. There is more than enough gain to provide complete modulation of the 47. The output transformer is especially designed to couple a 6F6 to the grid of a grid-modulated amplifier. The output or secondary of the transformer is shunted with a 10,000 ohm resistor to improve operation. This amplifier is designed to work with a crystal microphone and, with such, will provide very good quality.

The plate voltages for the audio section are taken from the same supply as the oscillator and buffer. The same filament winding is also used. One might think that serious feed-back would be encountered; however if the circuit arrangement is followed as described no trouble will occur. Even heater by-passing condensers were not required, but if R.F. should get into the audio through this part of the circuit, they can be easily installed. The *gain-control* for the audio circuit, as well as the microphone jack, have their leads shielded. It would be better probably to use one of the new metal microphone connectors, this would provide more perfect shielding since the jack cannot be completely shielded without considerable difficulty.

High Voltage Supply

The high-voltage supply is conventional in all respects, except for the transformer which was discussed before. The filter in each supply contains a single choke and a two microfarad condenser. The photos here shown and the others reproduced with last month's article provide the constructional details. Careful examination of the inside view reveals that the two filter chokes are mounted one above the other, there not being sufficient space to mount both on the chassis. The line up of the controls as seen in the front view is as follows.—The two knobs at the top left are, left to right, the oscillator and buffer-doubler band-switching controls; the lower two at the left are for tuning the above two stages in the same order. The center knob below the meter is the meter-switch, and the right-hand dial is the final amplifier tuning control. Along the bottom we have from left to right—primary switch of plate transformer, filament primaries, buffer cathode switch, excitation control, phone-CW screen switch for final, A.F. gain, final filament center-tap switch,



Bottom view of transmitter.

microphone jack and finally the key jack.

A word as to performance—125 watts on CW is capable of working almost anything under favorable conditions; tests of the transmitter resulted in many DX contacts. On phone of course the power is only around 25 to 30 watts and many pleasant QSO's can be had when the bands are not too crowded. 75 meter phone seems to be the best bet for low-power short-haul QSO's.

Parts List Xmitter

KENYON

1—175 ma. 3-winding plate transformer
1—5 volt 3-winding filament transformer
1—5 volt-5 volt-6.3 volt filament transformer
2—170 ma. 20 henry filter chokes
1—6F6 to amplifier grid, modulation transformer
1—midget choke 30 henry 70 ma.

CORNELL-DUBILIER

3—.01 mf. mica condensers
2—10 mf. low voltage electrolytics
1—.1 mf. bypass condenser
2—8 mf. electrolytic condensers
1—2 mf. electrolytic condenser
1—2 mf. 2000 volt filter condenser
1—2 mf. 1000 volt filter condenser

I.R.C. (Resistors)

1—5 meg. ½ watt resistor
2—¼ meg. ½ watt resistors
1—½ meg. ½ watt resistor
1—3000 ohm ½ watt resistor
1—500 ohm 1 watt resistor
1—½ meg. potentiometer
1—¼ meg. potentiometer
1—20,000 ohm resistor, 2-sliders. 50 watt
1—1,500 ohm resistor, 1-slider. 50 watt
1—10,000 ohm resistor. 10 watt
1—10,000 ohm resistor. 1 watt
1—20,000 ohm resistor. 20 watt
1—50,000 ohm resistor. 50 watt

RAYTHEON

1—6F6 tube
1—6N7 tube
3—83 tubes

ASTATIC

1—Crystal Microphone (D-104)

World-Wide S-W Review

(Continued from page 476)

This unit, which can also be used in the adjustment of amateur transmitting rigs by adjusting the transmitter tuned circuits for maximum signal strength in a receiver as indicated visually on the meter, can be made in a few minutes from parts found in most amateurs' junk boxes.

The circuit is shown in the accompanying sketch. The calibration in R units can be accomplished in the way described in an item in this department in a recent issue of *Short Wave and Television.*

13-Tube Superhet Has Touch Tuning

(Continued from page 485)

tures, this superhet has continuous band coverage from 13.7 to 570 meters; "beam-power" push-pull output tubes with a rated output of 20 watts; R.F. pre-selection; high fidelity switch control; automatic audio compensation; a 12-inch super-dynamic speaker and separate bass-treble control. The receiver is encased in a tastefully designed modern console cabinet 41¼" high, 24" wide and 14¼" deep. (No. 670.)

This article has been prepared from data supplied by the courtesy of the Wholesale Radio Service Co., Inc.

Portable Superhet 4

(*Continued from page 483*)

question for patent reasons; it would call for room which an essentially portable design simply could not afford, and, further, for an extra 4 or 5 coils. Consequently, we designed the job for first detector input, assuring the receiver of a desirable input sensitivity by wiring the circuit here for grid-leak bias. The conversion is excellent with the 1D7G mixer, resulting in a high first tube efficiency, and both 1A6 and 1C6 replacements will work out almost as satisfactorily. Grid leak detection may seem a little out of the ordinary at this point, and straight grid bias, effected by returning the L1 circuit to minus three volts of C battery rather than direct to ground may appeal to some—and perbaps most—builders.

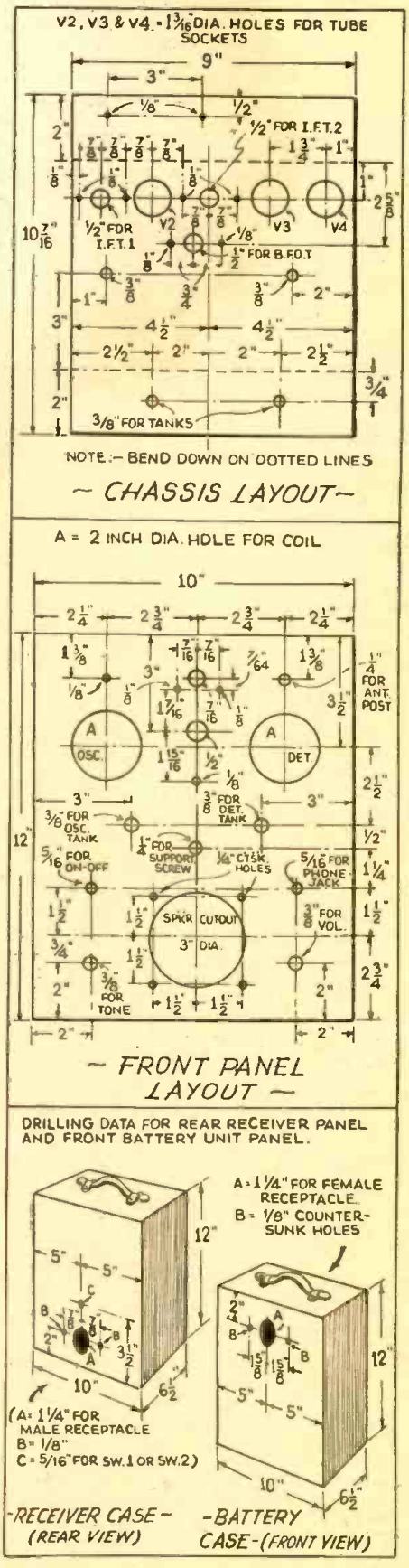
We have, note, employed audio control of volume; the alternative and equally satisfactory method is to replace the 0.5 meg. control potentiometer with a fixed resistor of similar value, and return the C minus lead for both the input and I.F. circuits to a .05 meg. potentiometer variable tap, the new pot. bridged across a 22.5 volt C battery.

Both first detector and front-end oscillator stages are *tank-tuned* by separately and manually adjustable .00014 mf. max. variable capacities; these condensers permit precise tracking throughout any given coil range, spot high frequency limits for narrow amateur, broadcast or other working bands, and afford fairly wide frequency coverage with each set of coils—reducing the number of such sets as will be required for all-wave tuning. *Band-spreading*, if effected through the use of a separate two-gang condenser of .00005 mf. maximum capacity per section; here we simultaneously tune both detector and oscillator stage circuits, with the amount of band-spreading being determined for an individual set of coils by connecting the spreader stators down on coil windings. The lower the stator leads tap down on the windings, the greater will be the band-spreading effect. As the tapping is done within the coil form, which is to say from winding to one form prong, the spreading may be nicely related to a desirable station separation and spreader dial coverage suitable to individual coil-set requirements. Thus the tap may be fairly low for 20 meter band spread—over the complete dial scale—or tapped down very little or not at all for 160 meter spread.

The single I.F. stage, with its screen-grid tube and *iron-core* input and output intermediate transformers, provides ample gain and selectivity. The frequency is 465 kc.—a very practical value—(if necessarily a compromise one) for good signal and image selectivity in an *all-wave* receiver.

Second detector-beat oscillator circuit: As we show it in the main diagram, this circuit departs somewhat from the conventional in its use of a pentagrid tube as a demodulator, beat note triode, and, of course, mixer. The signal circuit is grid-leak biased, and the output portion acts somewhat as a *first* A.F. amplifier, the sensitivity of the tube being nothing if not excellent, so long as certain precautions are taken in properly relating screen supply and plate voltages.

In the under chassis photograph no second detector plate audio choke is shown; it was added later to replace a plate resistor, which may be employed if the screen voltage is reduced in proper proportion to plate voltage. The choke, or rather plate impedance, if used, may be the secondary of any small (preferably push-pull) audio transformer. In this case the screen may tie directly to



The drawings above show details of the chassis and other parts used in constructing the Portable Superhet-4.

45 or 67.5 volts B; where the plate resistor is used, it will be perhaps advisable to try out various values, not only for this plate resistor itself but for the second resistor which will be necessary between screen and B plus. Generally, 250,000 ohms as a plate resistor and 2 megs. for the screen drop from 135 volts B plus will work out satisfactorily.

The two mixer elements are used as grid and plate for the BFO (beat freq. oscillator) circuit. Here we follow conventional mixer procedure, the usual 50,000 ohm grid resistor connecting between the No. 1 grid to ground, the usual .0001 mf. grid condenser connecting between the No. 1 grid and the BFO coil grid lead, the plate lead for the coil connecting to the No. 2 grid or oscillator plate element. The second detector and BF oscillator circuits are electronically coupled within the tube, and the locally generated and tuned signals of course beat to provide the required audio note for CW reception and *beacon* spotting of weak broadcasters.

Choice of Output Tube: There is considerable choice as to selection of an *output* tube. For ourselves, we tried out the new 1G5G, found its 300 milliwatt output at least acceptable, liked its low drain (both plate and filament) and kept it in service. A 1F4 would have similarly low drain characteristics and would deliver 340 milliwatts at 135 volts plate supply (Filament drain 0.12 ampere, plate and screen total drain 10.6 ma.). A 1D4 would, with 180 volts B supply, afford 750 milliwatts output, and a type 33 as much as 1400 milliwatts at 180 volts B and 700 milliwatts at 135 volts B—but both tubes call for 0.26 filament ampere, with the '33 plate and screen drain as high as 27 ma. Frankly, if higher output is imperative, it would seem advisable to employ the newer type 1E7G, which we all know to be a push-pull pentode (a single tube with two sets of elements), filament drain 0.24 ampere, plate voltage 135, C voltage minus 4.5, output 1 watt, etc.—an ideal tube but one which naturally will require something in the way of preamplification of the A.F. signal.

Construction Details

It is no secret that special cases of heavy stock—that is, built to order and to precise layout specifications—would be relatively expensive when compared to the cost of available standards suitable for portable service. The particular cases we have used are available as such standards to West Coast builders, through local jobbing sources or direct from the manufacturer. But it is highly improbable that Eastern and Mid-Western manufacturers and distributors handle items of exactly similar dimension.

We must, of course, refer constructional details to the lab. model; but in giving layout data, we will do so with this comment: acquire cases as near the specified dimensions as possible, but don't go to the expense of having special boxes made if available jobs don't hit specifications exactly; instead, secure them of simply reasonably similar size and take such differences as may exist into consideration when following your own layout.

We do, in any event, suggest the use of the two independent units; this permits easy battery replacement, prevents shorting of battery leads to receiver chassis during transportation, affords plenty of necessary space for antenna wire, extra coils, headphones, tools and replacement parts storage—and on the whole makes possible a very sensible, practical design with portability very definitely featured.

The first thing to do is to arrange the various batteries (135 volts of B, 3 volts of A, and the required voltage of C) compactly within the one can and so that as much reserve space as possible may be had. Once

this is done, a wooden partition may be fitted in just above these batteries, and the removable front panel then stamped or circle-cutter drilled to permit installation of the female receptacle for cable connection. The receptacle may now be wired to the batteries—the leads being left long enough so that the panel may be removed sufficiently well away from the cabinet to afford access to the items stored within.

The next job is to drill and stamp or cut the receiver unit *front panel* to layout specifications (our layout data will be satisfactory if your own box is at least as high, wide and deep as that used with our lab. model), then the *back panel* for the single opening for male cable receptacle installation.

Install the latter receptacle. Then acquire two shield cans (coil type, with removable base) of three inch diameter. Cut back their depth to 2¾ inches, open the round cut-out in the base to 2½ inch diameter, and solder the bases to the front panel so that they center properly around the two holes in that panel which we use for coil insertion. Solder them securely, by the way. Now stamp or cut holes in the back of the cans for installation of the retainer ring mounted coil sockets, install the sockets (five prong), place the cans over the bases already soldered to the front panel, and securely solder the cans to these bases. If all this is carefully done, a very rigid coil shield construction will result, sized properly for easy change of the knob-handled coils; and if lab. model parts specifications are followed and the retainer-ring mounted sockets are employed, there will be ample insurance against socket breakage with repeated coil insertion and removal, as the resilient concentric rings will take up the strain of the pulling out and pushing in of the forms.

The speaker may now be mounted on the front panel, preferably with a small wood baffle between it and the metal to prevent tinny reproduction. Next, volume and audio controls may be installed, along with the antenna and ground posts, the phone jack, and the three-pole single-throw jack switch.

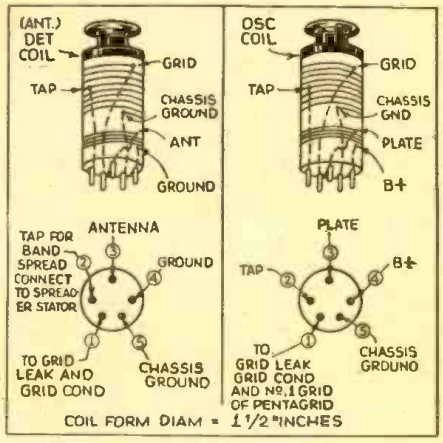
The chassis must now be drilled and stamped; that used with the lab. model shows cutaway corners, as we had a very close fit to worry about; but specifications relate to a pan which should not require any such remaking for proper installation in a box no smaller, in any event, than that which we ourselves have employed.

The band-spreading two-section variable condenser is mounted as shown, and see that it is positioned between the coil cans with the chassis assembled together with the front panel; its shaft should extend forward just far enough to permit insertion into the dial hub. (The dial should have been panel mounted, so that this extension may be at once determined.) The two *tank* condensers are now hung from the chassis top and in such position that their threaded mounting bushings extend out far enough to permit the securing of the nuts with front panel and small dial plates in place—yet not out so far that the nut which holds the condensers more or less in proper stator-rotor alignment will protrude beyond the front edge of the front chassis drop. I.F. transformers, sockets and other small items are now installed, and the chassis and front panel securely bolted together by means of the tank condenser bearing nuts, a single sturdy nut and bolt assembly positioned between the two tanks, and angle supports if such are deemed advisable by the individual builder.

Octal sockets, we might note, will serve throughout the line-up if 1-G type tubes are to be used; if, on the other hand, the 1A6, 1A4, 1A6, 33 or 1F4 or 1D4 older tubes are to be employed, socket requirements call for, respectively, a 6 prong job, a four, another six, and a five. A small universal output transformer by the way, such as that one which may be secured separately from the manufacturer of the speaker and for use with this particular reproducer, will permit use of any of the several suitable output tubes except the 1E7G.

A five or six point screw terminal assembly should be installed against the rear chassis rear drop, elevated somewhat from this wall, of course, with hollow sleeves or spacers; this assembly will afford convenient termination for circuit element connection to points of common power supply.

The RF 1D7G or 1A6 is mounted below the chassis, horizontally, and in such position that the possibility of and the effects of a sagging filament will be considerably lessened. The socket for this tube is placed at the input I.F. transformer end of the chassis, so that the lead from the plate to the transformer may be kept short. Naturally, the tank tuning condenser near this point and the coil shield assembly above the condenser will be related to the oscillator stage, as the tube No. 1 and 2 grid terminals will be conveniently located for connection to these R.F. items.



Coil Connection Data.

Wiring

It is not exactly necessary to give many wiring details. If the parts have been placed as indicated, and if the circuit diagram with or without such changes as the alternative circuit drawings suggest or permit is carefully followed, proper wiring will more or less take care of itself. Just keep all leads as *short* as possible, bring returns for each stage to one convenient point, and solder your connections securely. Use one screw terminal assembly lug as a tie point for B plus, one for B screen (45 or 67.5 volts), one for power tube C minus, one for I.F. stage C minus (or both I.F. and R.F. C minus if the first mixer tube signal section is to be conventionally biased), one for A plus and one for B minus, A minus, C plus collectively; cable-tie the various terminals of the assembly to the on-off switch, actually connecting only those circuits here which are to be broken by the switch, of course, and then bring cable leads from this switch to the main cable male receptacle on the back panel—making sure the wiring is such as to permit removal of that panel for access to inside parts. Diagrams indicate how the coil sockets should be wired and the coils themselves wound and terminated. Be sure that the No. 7 terminals of the 1D5G and 1G5G (or the 1E7G, if that tube is used), connect to A plus. The second detector grid lead, we might advise in winding up this brief discussion of wiring, should come up through the chassis to the tube cap from the grid leak-grid condenser combination, which should be mounted on a tie point

conveniently near the green lead at the bottom of the output I.F. transformer.

The BFO transformer should have a *feedback* winding, and if the particular unit which we have used in the lab. model (we acquired it not knowing that it was a single coil affair, tapped for electron-coupled circuits) is to be employed, this separate winding, consisting of about 100 turns of fairly fine wire, *scramble wound* (i.e. helter-skelter) and closely coupled to the other, must be added. It would, it seems, be better policy to avoid this extra work, which may in the end involve considerable experiment before proper oscillation and a beat note are effected, and simply acquire and use any small BFO transformer which features *tickler* feedback construction.

Adjustment and Operation

With the construction and wiring completed, and one set of coils built and plugged into place in the shield can assemblies, check *continuity* carefully, being particularly sure that all cable connections are as they should be. Then plug in the cable to connect the two units, turn the control switch on, and check for proper voltage readings at various points. Now line up the I.F. to exactly 465 kc. and adjust the *front end* tanks (which should track pretty well) until a signal is heard. Turn on the BFO switch (we might note that this switch may well be placed on the back panel, as it will be used infrequently, or that it might replace the power switch on the front panel, with the latter removed to the back) and adjust the BFO trimmer until a beat note results. The receiver should operate satisfactorily, and it should be now only necessary to build more coils for other bands and then experiment a little with the band-spread *tapping* until a proper spreading over the scale of the main control is effected. We have purposely omitted tap turns specification for the simple reason that most builders will have their own ideas as to how much spread will be desirable at particular frequencies.

In closing, may we advise that if the builder does not contemplate much use of the BFO feature—if he does not particularly care about the reception of CW, to be more explicit—he might just as well omit the refinement and substitute for the second 1A6 or 1D7G any triode, pentode, or diode-triode or diode-pentode, which will be satisfactory as a second detector. But these points should be clearly kept in mind where second detector and—we might add—audio changes are in any way contemplated:

1. First, a triode second detector, grid-leak biased, and coupled to any single section audio pentode with an ordinary midget A.F. transformer, will afford very sensitive rectification and excellent output.

2. Second, a pentode second detector, such as a 1B4, will be similarly sensitive, whether connected as a grid (grid-leak bias) or plate (straight grid bias) rectifier; but here a 250,000 ohm plate resistor and a 2 meg. screen to B plus resistor are recommended—the coupling from detector to output tube being the conventional network similar to that made necessary where the 1A6 is used.

3. A type '33 output tube will give excellent volume for speaker operation but will drain heavily on A and B batteries, will call for relatively high bias and drive, and may make necessary another tube as first audio and regardless of the type of second detector employed.

4. Where high output (1 watt) is required with economy of operation, the 1E7G recommends itself, but here again there may be difficulty in driving this tube to full output without using a first audio tube (1H4G or equivalent).

5. The most sensible set-ups, all things considered, would seem to be—first, the arrangement we have used in the lab. model (where the beat oscillator feature is required); second, a triode detector, (grid-leak biased and transformer coupled to a 1F4 or 1G5G output tube) arrangement where fair output is desired and no beat note provision is imperative; and third, a diode-triode detector and first AF, (1H6G), 1H4G second AF and driver, and transformer coupled 1E7G set-up where 1 watt output and AVC control are in order and there is no objection to 5 tubes and increased drain on both A and B batteries.

PARTS FOR PORTABLE SUPERHET 4

SOCKETS, ETC.*

Two 5 prong steatite sockets, with adapters and rings.
One 8 prong steatite socket, with adapter, for V1 or one 6 prong if 1A6 or 1C6, used in V1 position.
Three 8 prong, chassis type moulded sockets, or one 4 prong and two 6 prong if older type tubes used instead of G.
Three tube shield bases

BRUSH

One pair crystal headphones

RHEOSTATS, ETC.*

One 2 ohm rheostat—R8
One open circuit phone jack
One three-pole single-throw jack switch (SW1)
One SPST switch (SW2) for BFO circuit
One 7 prong cable plug with 5-foot cable and male mounting receptacle
One 7 prong receptacle (female)
One .5 meg. potent. (R5) and one 15000 ohm tone potent. (R7)

LOUD SPEAKER*

One midget loud-speaker
One midget universal output transformer for above speaker

NAME PLATES*

Four knobs
One osc. cond. plate
One det. cond. plate
One volume plate
One tone control plate

HAMMARLUND

Two type HF-140 micro condensers (C1 and C2)
One type HFD-50 two-gang micro cond. (C3-C4)
One ICT-1 465 KC input I.F. trans—IFT1
One ICT-2 465 KC output I.F. trans—IFT2
One matching "tickler-type" BFO trans.—BFOT
Two CF-5 coil forms for each set of coils to be built
Two CS-3 coil shield, rebuilt to text specifications

NATIONAL

One type BM-1 dial

BINDING POSTS*

Two binding posts, one insulated for antenna connection

AEROVOX

Three type 284 .25 mf.—C11, C12, C19
Six type 284 .05 mf.—C9, C6, C7, C10, C18, C15
Four type 1467 .00025 mf. mica—C5, C15, C16, C17
Two type 1467 .0001 mf. mica—C8, C13

I.R.C.

One 1000 ohms, R3—two 50,000 ohms R6, R2—two 1 meg. Rr, R4—all above resistors half-watt, midget type, bakelite cased

MISC.:

Two cabinets, as near layout specification as possible; one chassis to fit; Two 2.5 mh. R.F. chokes (RFC 1 and 2) and one 16 mh. choke—RFC3
One Midget Push-pull transformer (secondary used only)

BATTERIES*

Three B batteries, two "A" batteries, one C battery as required

RAYTHEON

One set tubes, as required

*Most Radio mail order houses can supply these items if properly identified as to title of article, issue (month) of *Short Wave & Television* and year.

COIL WINDING DATA

COVERAGE (Approx.)	L1	L2	L3	L4	Notes
10-20 meters	3	4	4	5	A
16-39	5	7	6	5	B
35-70	8	17	15	8	C
70-160	10	40	30	10	D
150-260	15	85	70	15	E
260-550	15	120	100	20	F

Coil form, (Hammarlund CF-5 type) diameter is 1¼ in. diameter.

A: one inch L2 and L3 winding space, other windings close wound. Pri. and tickler (L1 and L4) about one quarter inch from L2 and L3.

B: one and one-fourth inch of L2 and L3 winding space, other data as for A.

C: close-wound, all windings, spaced apart as above for A and B. A variable padder of .006 mf. max. capacity may facilitate tracking at low frequency end of tuning range. This padder should be connected between the L3 inductance (lower end) and ground.

D: ditto as for C, with .005 mmf. approx. padder suggested for osc. circuit, where accurate tracking is more or less imperative.

E: ditto, with or without approx. .002 mf. padder.
F: ditto, without approx. .0004 mf. padder for osc.
Note: all windings may be of No. 24 D.S.C. copper wire.

Note: coverage is approximate only; minor departures from these specifications may be necessary, especially if no padders are used for osc. circuits. Padders may be installed within coil forms.

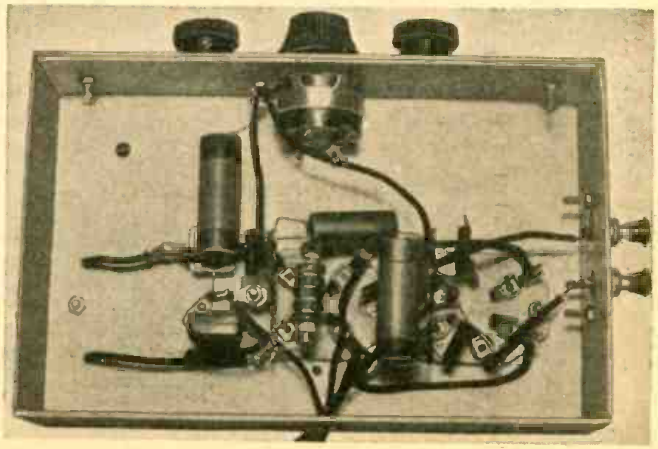
Note: the amount of band-spread for each coil will depend upon the placement of the C3 and C4 stator taps. Careful tapping will permit not only good spreading but will enable the det. osc. alignment to retain accuracy to close limits at least over the spreader dial tuning range.

How Loud is a Lion's Roar?

● THE roar of a lion is majestic indeed! It is 100,000,000 times more powerful than what is required for the human ear to hear it. Engineers tucked away in sound-proof rooms, in the huge Philco plant, have discovered many strange things about our sense of hearing. They have found that the range from the faintest to the loudest sounds perceptible to the human ear is from one to three trillion power units. The force at work in the faintest sound heard by the normal ear is so small that it would have to be multiplied by two and one-half billion times to equal the force required to merely raise a pound weight. One of the scientific staff at this plant explained it this way: "If the lips of an average speaker are held within a half inch of the ear of a person of normal hearing, the acoustic power the ear receives is ten billion times greater than needed for mere perception of sound."

A 2-Tube Receiver for the Beginner

(*Continued from page* 481)



Bottom view of the 2-tube beginner's receiver, using the new 1.5 volt tubes.

Short Wave Scouts

(*Continued from page* 502)

DZH, 14,460 kc., Der Deut. Kurzwel, Berlin.
DJB, 15,200 kc., (as above).
DJQ, 15,280 kc. (as above).
DZB, 10,042 kc. (as above).
DJD, 11,770 kc., (as above).
DJC, 6,020 kc., (as above).
DJH, 9.840 kc., (as above).
DFB, 17,520 kc., Nauen, Germany.
DAF, 13,100 kc., Norddeich-Radio, Germany.
DGH, 10,440 kc., Nauen, Germany.
DOAH, 12.325 kc., "S.S. Bremen."
HBP, 7,797 kc., Radio Nations, Geneva, Switzerland.
HBF, 18,450 kc., (as above).
HBL, 9,595 kc., (as above).
HBO, 11,402 kc. (as above).
HBJ, 14,535 kc., (as above).
ORK, 10,330 kc., Radio Ruysselede, West Flanders, Belgium.
HAS3, 15,370 kc., Station of the Royal Hungarian Post, Budapest, Hungary.
HAT4, 9,125 kc., (as above).
PHI, 11,730 kc., Philips' Radio PHOHI Studios, Hilversum, Holland.
SM5SX, 11,705 kc., Royal Technical University, Stockholm, Sweden.

Let's Listen In With Joe Miller

(*Continued from page* 489)

Other DX on 10 meters is SP1HH, Poland, HA4A, Hungary, ON4FE, Belgium, all heard here, and SM5OI, Sweden, OK3VA, Czecho-Slovakia, all heard in L.F. end of 10 meter band.

Max Bass, W2, reports hearing LA1F, Norway, SM7QC, Sweden, on 20 meters.

Other DX here on 20 meters: CT2AB, 14.36, Azores, 3:45 p.m., ZBAL, 14.05, Malta, at 4:35 p.m., and OX2QY, Greenland.

Regarding OX2QY, many readers are wondering where to write for QSL's. Address reports to W2QY, who is radio "op," and when he returns he will QSL all reports.

OX2QY operates on 14,368, and is located at Reindeer Point, near Etah, Greenland, and the antenna used is a 35 foot high rhombic, accounting for OX2QY's excellent R9 signal. Occasionally 12.46 is used for hookups with NBC. Thanks to George Pasquale, W8OQU, for much of this FB dope.

TELEVISION IN 1869

A contemporary of Jules Verne, the well-known European artist A. Robida, in the year 1869 published the drawing which is reproduced herewith. The television scene shows a ballet from the opera "Faust."

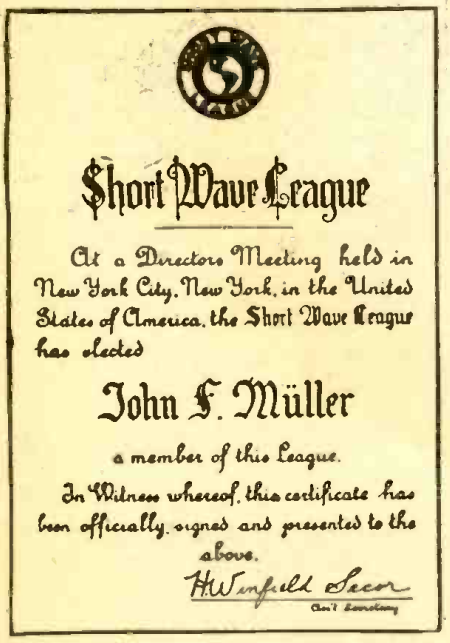
Articles Wanted

● The Editors are looking for good construction articles on "Ham" and "Fan" sets, including receivers and allied apparatus. Our readers are anxious to know about new circuits which you may have devised. Just because the set may only have 2, 3 or 4 tubes, there is no reason why you should think it unimportant.

Be sure to write the Editors and give them a brief description of your particular circuit; if they are interested, they will inform you promptly, so that you can prepare an article and take photos of the set. Otherwise, the set can be sent to the Editors and they will photograph it.

Short Wave League

(*Continued from page 495*)



This is the handsome certificate that is presented FREE to all members of the SHORT WAVE LEAGUE. The full size is 7¼"x9½". (See page 524.)

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.

A Folded Doublet for Transmitting

(*Continued from page 499*)

a doublet to a half-wave on the desired frequency and bend it back against itself as shown in the diagram. For example, on 10 meters each leg is 8 ft. 3" long. The feeders used at this station consist of a length of RCA cable that was originally used for a doublet receiving antenna. I believe that the diagram will be easily understood.

Harold B. Rhodes, W2IKW.

100 Watt QRM Dodger—A Compact 5-Meter Transmitter

(*Continued from page 499*)

Coil Data for 100-Watt Transmitter

	Turns	Length Winding	Diameter	Wire
Osc. plate	4	½"	½"	No. 12
Buffer } Plate }	6	1¼"	1 "	No. 12
†Amp. grid	11	⅝"	1½"	No. 12
Amp. plate	7	1 "	2 "	No. 12

*Tapped ¾ turn from B—.
†Mounted inside of amplifier grid coil.

Book Reviews

RADIO ENGINEERING, by Frederick E. Terman, Sc.D., Second Edition. Cloth bound; size 6½"x9¾"; 814 pages; 475 illustrations; copious index by names and by subjects. Published by McGraw-Hill Book Co., New York City.

One of the finest "tools" to put into the hands of a radio student and the engineer, no matter how advanced he may be, is a good text-book on the subject. So many poorly written books or incomplete treatises have been published on the subject of radio that it is a treat, indeed, to look through this second and enlarged edition of Professor Terman's work.

Some radio text-books have been so full of mathematics that the average student, especially those who study at home, could gain but little help from the text, but Professor Terman has the happy faculty of explaining the various subjects so that practically anyone can understand them as here presented.

Vacuum tubes are the backbone of radio today and Prof. Terman covers this subject in a very complete manner, including the fundamental properties of vacuum tubes.

Another very important subject for radio students is the various actions taking place in resonant circuits, and it seems that we can never learn too much about this subject. Vacuum tube amplifiers is another "mile-post" in radio technique and one which must be thoroughly understood by the student as well as the engineer. This class of amplifiers, including power amplifiers and radio transmitters are covered at great length, with graphic diagrams and formulas wherever necessary. Vacuum tube oscillators are discussed in a comprehensive manner, including the various type of circuits such as the Hartley, Colpitts, etc., with diagrams.

Antennas have been covered in a refreshing way by the author, with some new diagrams showing the radiation patterns of various directive forms of aerials, and the *propagation of waves* receives a liberal treatment. Radio receivers are adequately covered, while later chapters deal with the important subjects of Radio Aids to Navigation, Television (including a diagram for a complete Television System), Sound and Sound Equipment, etc.

Formulas for the calculation of inductance and capacity are also given in a special appendix.

An up-to-date radio engineering text-book which should be on every library book-shelf.

THE CAUSES AND ELIMINATION OF RADIO INTERFERENCE, by Joseph Everett Foster. Cloth covers, 4¼" x 7"; 152 pages, illustrated with half-tones and diagrams. Published by C. W. Nelson Co., So. Braintree, Mass.

If there is any one subject in the realm of radio which has been sadly neglected, it is the prevention of interference. Mr. Foster has prepared this very valuable and interesting book intended for radio engineers, dealers, servicemen, and in particular, those having to deal with interference troubles on service lines operated by electrical light and power companies.

A brief resume of the principles of radio are given in the first part of the book and a description of the apparatus for locating noise and circuit faults. Later the writer takes up the subject of radio interference caused by electric light and power lines. One chapter deals with radio interference caused by 2,300 and 4,400 volt distribution feeder primaries. Possible causes of interference such as leaks in transformers, loose fuse plugs, break-down of insulation, etc., are discussed and methods of locating also. The great value of this book lies in the fact that the author describes in elaborate detail typical "hunts" for interference trouble and the final cause of the trouble as discovered by means of a sensitive locating apparatus. Radio interference caused by high voltage transmission feeders has a chapter to itself and this is a very important subject, owing to the possibility of leakage on such high voltage lines. Street lighting circuits as a source of interference, underground cables, etc., are also discussed.

Ham DX Contest

● A DX contest for amateur stations has been arranged by the Radio Club of Venezuela, at Caracas. The first half of the contest, for C.W. only, begins at Midnight, January 14, and continues for four days. The second half, for phone transmission, begins at midnight, January 21, and lasts the same length of time as the first. The operators getting acknowledgments from the greatest distances will be declared the winners. More than 200 Venezuelan amateurs will be on the air almost continuously during this eight-day period, offering a good chance for logging a large number of stations in this country.

World Short-Wave Stations

(*Continued from page* 500)

6.030	HJ4ABP	MEDELLIN, COL., 49.75 m. 8-11 pm.
6.030	HP5B	PANAMA CITY, PAN., 49.75 m., Addr. P.O. Box 910. 12m.-1 pm., 7-10.30 pm.
6.030	VE9CA	CALGARY, ALTA., CAN., 49.75 m. Thur. 9 am.-2 am.; Sun 12 m.-12 m.
6.030	OLR2B	PRAGUE, CZECHOSLOVAKIA, 49.75 m. (See 11.875 mc.)
6.025	HJ1ABJ	SANTA MARTA, COL., 49.79 m. 11.30 am.-2 pm., 5.30-10.30 pm. except Wed.
6.020	DJC	BERLIN, GERMANY, 49.83 m., Addr. (See 6.079 mc.) 10.40 am.-4.30, 4.50-10.45 pm.
6.020	XEUW	VERA CRUZ, MEX., 49.83 m., Addr. Av. Independencia 98. 8 pm.-12.30 am.
6.018	ZHI	SINGAPORE, MALAYA, 49.18 m., Addr. Radio Service Co., 2 Orchard Rd. Mon., Wed. and Thu0 5.40-8.0 am.. Sat. 10.40 pm.-1.10 am.
6.015	HI3U	SANTIAGO DE LOS CABALLEROS D. R., 49.88. m. 7.30-9 am.. 12m.-2 pm., 5-7 pm., 8-9.30pm; Sun. 12.30-2, 5-6 pm.
6.012	HJ3ABH	BOGOTA, COL., 49.91 m., Addr. Apartado 565. 12 n.-2 pm., 6-11 pm.; Sun. 12m.-2 pm., 4-11 pm.
6.010	COCO	HAVANA, CUBA, 49.92 m., Addr. P. O. Box 98. Daily 7.55 am.-12m., Sun. till 11 pm.
6.010	———	TANANARIVE, MADAGASCAR, 49.92 m., Addr. (See 9.53 mc.), 12.30-12.45, 3.30-4.30, 10-11 am.
6.010	CJCX	SYDNEY, NOVA SCOTIA, 49.92 m., Relays CJCB 7 am.-1 pm., 4-8 pm.
6.005	HP5K	COLON, PAN., 49.96 m., Addr. Box 33. 7-9 am., 11.30 am.-1 pm., 6-11 pm.
6.005	CFCX	MONTREAL, CAN., 49.96 m., Can. Marconi Co. Relays CFCF 7.45 am.-1 am.; Sun. 10 am.-12.15 am.
6.005	VE9DN	DRUMMONDVILLE, QUE., CAN., 49.96 m., Addr. Canadian Marconi Co. Sat. 11.30 pm.-2 am.
6.000	CXA2	MONTEVIDEO, URUGUAY, 50 m., Addr. Rio Negro 1631. Relays LS2, Radio Prieto, Buenos Aires. 10.30 am.-10.30 pm.
6.000	ZEA	SALISBURY, RHODESIA, S. AFRICA, 50 m. (See 6.147 mc., ZEB.)
6.000	RV59	MOSCOW, U.S.S.R., 50 m. Irregular. 3-6, 10.15-10.45 pm.
5.990	XEBT	MEXICO CITY, MEX., 50.08 m., Addr. P. O. Box 79-44. 8 am.-1 am.

S.W. BROADCAST BAND

5.970	HJ4ABD	MEDELLIN, COL., 50.26 m.. Addr. La Voz Catia. 8-11.30 pm.
5.968	HVJ	VATICAN CITY, 50.27 m. 2-2.15 pm. daily; Sun. 5-5.30 am.
5.950	HJN	BOGOTA, COL., Radiodifusora Nacional. 50.42 m. 6-11 pm.
5.940	TG2X	GUATEMALA CITY, GUAT., 50.5 m. 4-6, 9-11 pm.; Sun. 2-5 am.
5.930	YV1RL	MARACAIBO, VEN., 50.59 m., Addr. Radio Popular, Jose A. Higuera M, P. O. Box 247. Daily 11.43 am.-1.43 pm., 5.13-10.13 pm.; Sun. 9.13 am.-3.13 pm.
5.925	HH2S	PORT-AU-PRINCE, HAYTI, 50.63 m., Addr. P. O. Box A103. 7-9.45 pm.
5.917	YV4RP	VALENCIA, VEN., 50.71 m. Irregular.
5.900	ZNB	MAFEKING, BRL BECHUANALAND S. AFRICA, 50.84 m., Addr. The Govt. Engineer, P. O. Box 106., Daily 1-2.30 pm., 1.15-2 am.
5.900	TIMS	PUNTARENAS, COSTA RICA, 50.85 m. 6-10 pm.
5.898	YV3RA	BARQUISIMETO, VEN., 50.86 m., Addr. La Voz de Lara, 12 m.-1 pm., 6-10 pm.
5.890	JIC	TAIHOKU, FORMOSA, 50.93 m. Works Tokio 6-9 am.
5.885	HCK	QUITO, ECUADOR, 50.98 m. 8-11 pm.
5.875	HRN	TEGUCIGALPA, HONDURAS, 51.06 m. 1.15-2.16, 8.30-10 pm.; Sun 3.30-5.30, 8.30-9.30 pm.
5.855	HI1J	SAN PEDRO DE MACORIS, D. R., 51.25 m., Addr. Box 204. 12 m.-2 pm., 6.30-9 pm.
5.853	WOB	LAWRENCEVILLE, N. J., 51.26 m., Addr. A. T. & T. Co. Works Bermuda nights.
5.850	YV1RB	MARACAIBO, VEN., 51.28 m., Addr. Apartado 214. 8.45-9.45 am., 11.15 am.-12.15 pm., 4.45-9.45 pm.; Sun. 11.45 am.-12.45 pm.
5.830	TDD	SHINKYO, MANCHUKUO, 51.46 m. Works Tokio 6-9 am.
5.830	TIGPH	SAN JOSE, COSTA RICA, 51.5 m., Addr. Alma Tica, Apartado 800. 11 am.-1 pm., 6-10 pm. Relays TIX 9-10 pm.
5.813	TI2H	SAN JOSE, COSTA RICA, 51.59 m., Addr. Senor Gonzalo Pinto, H.
5.800	YV5RC	CARACAS, VEN., 51.72 m., Addr. Radio Caracas. Sun. 8.30am.-10.30 pm. Daily 7-8 am., 10.30 am.-1.45 pm., 3-45-10.30 pm.
5.790	JVU	NAZAKI, JAPAN, 51.81 m. Irregular.
5.780	OAX4D	LIMA, PERU, 51.9 m., Addr. P. O. Box 853. Mon., Wed. and Sat. 9-11.30 pm.
5.770	YV2RA	SAN CRISTOBAL, VENEZUELA, 51.96 m., Addr. La Voz de Tachira. 11.30 am.-12 n.. 5.30-9 pm., Sun. till 10 pm.
5.758	YNOP	MANAGUA, NICARAGUA, 52.11 m. 8-9.30 pm.
5.740	TGS	GUATEMALA CITY, GUAT., 52.26 m. Wed., Thur. and Sun. 6-9 pm.
5.730	HC1PM	QUITO, ECUADOR, 52.36 m. Irregular 10 pm.-12 m.
5.720	YV2RB	SAN CRISTOBAL, VEN., 52.45 m., Addr. La Voz de Tachira. 6-11.30 pm.
5.500	TI5HH	SAN RAMON, COSTA RICA, 54.55 m. Irregular 3.30-4. 8-11.30 pm.
5.145	PMY	BANDOENG, JAVA, 58.31 m. 5.30-11 am.
5.077	WCN	LAWRENCEVILLE, N. J., 59.7 m. Addr. A. T. & T. Co. Works England late at night irregularly.
5.025	ZFA	HAMILTON, BERMUDA, 59.7 m. Works N. Y. C. irregularly at night.
5.000	TFL	REYKJAVIK, ICELAND, 60 m. Works Europe nightime irregularly.
4.975	GBC	RUGBY, ENG., 60.3 m. Works ships irregularly.
4.836	HJ3ABD	BOGOTA, COL., 62 m., Addr. La Nueva Granada, Box 509. 12 m.-2 pm., 7-11 pm., Sun. 5-9 pm.
4.820	GDW	RUGBY, ENG., 62.24 m. Works N.Y.C. nightime irregularly.
4.810	HJ2ABC	CUCUTA, COL., 62.34 m. La Voz de Cucuta. 8 pm. to 12 m.
4.807	HJ1ABB	BARRANQUILLA, COL., 62.39 m., La Voz de Barranquilla, Addr. P. O. Box 715. 11.30 am. to 1 pm.. 4.30-6 pm.
4.790	VE9BK	VANCOUVER, B. C., CAN., 62.63 m. Addr. Radio Sales Service, Ltd., 780 Beatty St. Except Sun. 11.30-11.45 am., 3-3.15, 8-8.15 pm.
4.752	WOO	OCEAN GATE, N. J., 63.1 m., Addr. A. T.& T. Co. Works ships irregularly.
4.600	HC2ET	GUAYAQUIL, ECUADOR, 65.22 m. Addr. Apartado 249. Wed. and Sat 9.15-11 pm.
4.272	WOO	OCEAN GATE, N. J., 70.22 m., Addr, A. T. & T. Co. Works ships irregularly.
4.250	RV15	KHABAROVSK SIBERIA, U. S. S. R., 70.42 m. 1-10 am.

Daventry To Broadcast In Foreign Languages

● The BBC announces that news broadcasts in foreign languages will be added to the programs short-waved from Daventry.

It has been agreed that these broadcasts must not interfere in any way with the existing Empire service from Daventry. New transmitters are needed and until they are constructed and brought into use, only a limited service will be possible.

RADIO INSTRUCTION

How To Get Crystal Control on 5 Meters

● OF outstanding significance in the development of ultra-high frequency equipment is the transition from self-excited frequency modulated transmitters to the highly stabilized equipment afforded by crystal control. This transition has been taking place for some time, but it was only recently that the many advantages of crystal control at these high frequencies have been fully realized.

It is now a well established fact and has been proven in numerous tests, that greater distances and more reliable communication is possible, with a given amount of power, through the use of very stable radio frequency equipment. This is due largely to two obvious improvements: first, because the concentration of carrier power on a single frequency has the result of increasing the transmitter's effectiveness several times over that of a self-excited modulated oscillator of equal power output, and second, because of the fact that the more sensitive superheterodyne receiver can be employed.

The use of highly stable 5-meter transmitters is not only desirable and worthwhile from the standpoint of increasing the number and reliability of contacts, but also from the standpoint of interference. This

Fig. F. Simple 1-Tube (R.F) 5-meter transmitter, with Bliley crystal frequency control. No. 671.

latter consideration is particularly important in the larger cities where 5-meter activity is comparable to that found in the lower frequency bands.

DEVELOPMENT: Heretofore, the application of crystal control to 5-meter transmitters has been limited by the fact that the necessary frequency multiplying schemes seriously complicated the design and construction. The development of the now well-known HF2 20-meter crystal unit was an important step in the right direction but transmitter simplicity was still wanting. With this in mind, a program of investigation and research was instituted in an attempt to develop a practical 10-meter quartz crystal.

The characteristics of existing types of crystals were unsatisfactory for these high frequencies and the development of a new cut was necessary. After extended research, a new angle was found in which the crystal was thicker, for a given frequency, than other cuts and at the same time possessed the necessary high activity. It will safely carry an RF current of up to 200 mils without danger of fracture and has a drift of 43 cycles/Mc/°C.

This new crystal, complete with holder, is the Bliley HF2 10-meter crystal unit. It is indeed a revolutionary development for it is now possible to have 5-meter crystal control which is really simple—so simple that it can be easily applied to portable and mobile equipment.

TUBES: In applying crystal control to high frequency transmitters, the problem resolved itself not only into the development of the crystal, but, also, to the selection of tubes which had the proper characteristics for efficient crystal performance. With some tubes, especially the higher mu and pentode types, the crystal was effectively shorted by

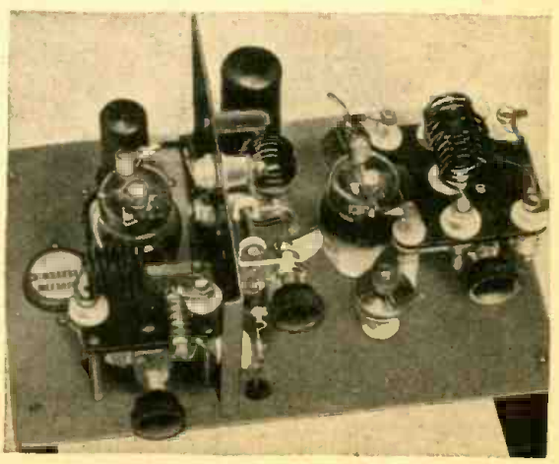


Fig. D. This "prof." looking 18 watt, 5 meter transmitter will interest every "Ham"; it's perfectly stabilized by crystal control.

the high input capacity. Others, having a low feed-back capacity and a large electrode spacing, were equally unsatisfactory. Pentodes, in general, are not to be recommended and best results were obtained with the new high frequency triodes such as the 955, 6J5G, 6E6 and RK34.

The 955 and 6J5G are excellent oscillators, giving 1¾ and 2½ watts output, respectively, on 10-meters. The 6J5G has slightly higher inter-electrode capacities but is preferable to the 955 because of the higher output and lower cost. Either of these tubes will give sufficient output at 10-meters in a simple triode oscillator circuit, to drive an 802, RK23, 807, RK39, or 6L6 tube as a doubler.

The 6E6 and RK34 tubes are particularly interesting since their dual-triode construction makes possible good 5-meter output with a single tube. The 6E6 gives an output of 3 watts on 5-meters from the doubler section, while the RK34 will give an output of 3½ watts.

CIRCUIT CONSIDERATIONS: At these high frequencies, careful consideration must be paid to the design and construction of the transmitter. Low-loss construction must be used throughout, with the parts so arranged as to facilitate short direct leads, and, at the same time, to permit the individual circuits to be shielded and isolated as much as possible. If sub-base or chassis construction is used, all grounds should be tied to a common bus and the bus strapped to one point on the chassis to eliminate the possibility of closed loops and circulating currents in the ground system. Parallel feed should not be used due to the absence of a real good choke at these frequencies. This means that the tuning condenser will be at high voltage and must be insulated from ground. An alternative method, which is often used at the lower frequencies, is to ground one side of the condenser and insert a by-pass condenser in the tank circuit. This arrangement should not be used since the impedance and losses of a mica condenser is considerable at these frequencies and if it is required to carry the circulating tank current, there will be a serious loss in power output.

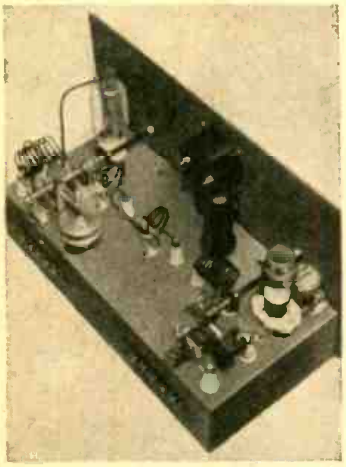


Fig. E. This swell looking 60-watt 5-meter transmitter, was developed by the Bliley engineers and a description of it is given in the accompanying text.

For maximum power output, a high-C tank circuit should be used in the crystal oscillator. This is necessary since the recommended tubes have a low plate impedance, and is advantageous in that the stability will be greatly increased as compared to the use of a low-C tank.

PRACTICAL CIRCUITS: Standard crystal oscillator circuits for use with HF2 10-meter

See the new "Barter and Exchange" Free Ad Department on Page 527

crystal units are shown in Figures A and B. The circuits are conventional but all values indicated should be adhered to as closely as possible as these have been found to give best output and highest stability. The construction and layout of two simple 5-meter crystal controlled transmitters is pictured in

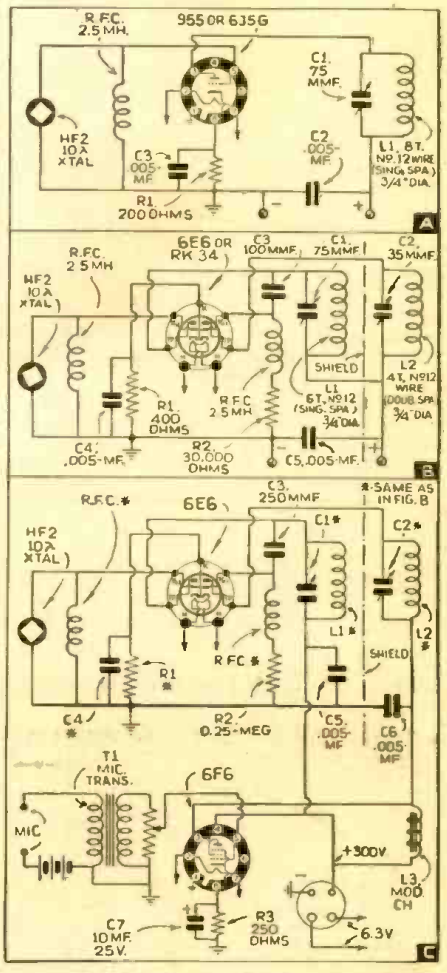


Figure A. 10-Meter Triode Crystal Oscillator

L1—8 Turns No. 12 wire single spaced ¾" dia.
C1—75 mmf. variable condenser.
C2—.005 mf. mica condenser.
C3—.005 mf. mica condenser.
R1—200 ohm carbon resistor.
RFC—2.5 mh. R. F. choke, National or Hammarlund.
Plate Voltage—180V. for the 955, 220V. for the 6J5G.

Figure B. Dual-Triode Oscillator-Doubler For 5-Meters

L1—6 turns No. 12 wire single spaced ¾" dia.
C1—75 mmf. variable condenser.
L2—4 turns No. 12 wire double spaced ¾" dia.
C2—35 mmf. variable condenser.
C3—.0001 mmf. mica condenser.
C4, C5—.005 mf. mica condenser.
RFC—2.5 mh. R. F. choke, National or Hammarlund.
R1—400 ohms.
R2—30,000 ohms.
Plate Voltage—6E6—300, RK34—325.

Figure C. Diagram of Simple but Highly Effective 5-Meter Transmitter

L1, C1, L2, C2. Same as in Figure B.
C4, C5, C6—.005 mf. mica condenser.
C3—.00025 mf. mica condenser.
C7—10 mf.—25 volt electrolytic condenser.
R1—400 ohms.
R2—250,000 ohms.
RFC—2.5 mh. R. F. choke, National or Hammarlund.
R3—250 ohms.
L3—Modulation choke.
T1—Microphone Transformer.

Figures D and E. The transmitter shown in Figure D has an output of 18 watts and because of its compactness is ideal for a mobile or portable rig. An RK34 oscillator doubler is used to drive a second RK34 as a push-

(*Continued on page 528*)

A 4-Band, Three-Tube Superheterodyne Receiver

(*Continued from page 484*)

necessary is to discard the metal front at a few cents expense. This panel shields, is sturdy. If you are using a metal rack it is necessary to look closely to discover that wood is used. The only wood showing is at the ends which are painted black to resemble the metal. The top panel is turned over and painted so as to hide the wood there.

Construction: First, get the piece of plywood 8 by 24 inches. It is ¾ inch thick, five-ply, and is carried in stock by lumber companies in sheets 24 inches wide. It will only be necessary for them to cut off an 8 inch piece from a sheet.

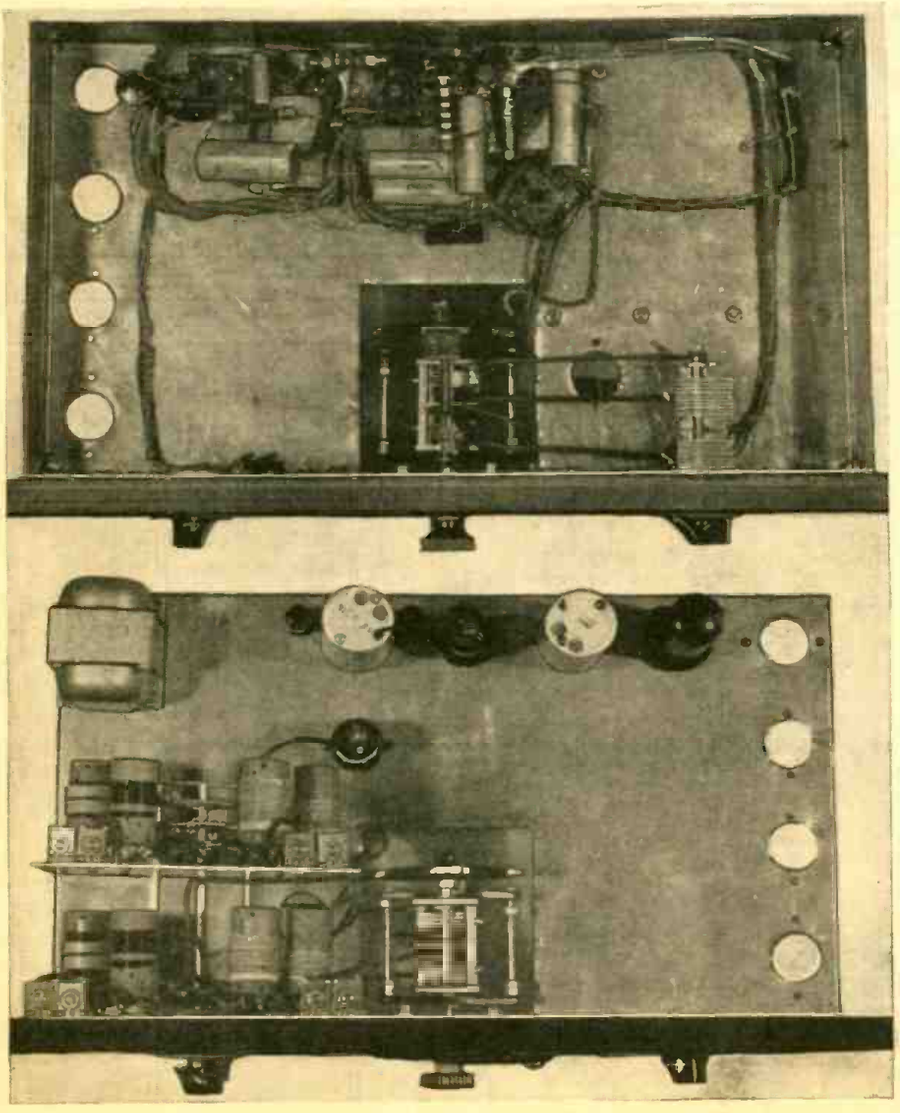
Preparing the front: Get the metal front of number 20 gauge iron and measure and mark places for the control holes. After drilling the holes paint the panel black crackle and lay it away a few hours to dry. Crackle paint that dries in air is relatively inexpensive and you soon can become expert in turning out a beautiful job. I use a brush and flow it on thick (only one coat) after experimenting on a couple of pieces of scrap panel.

Escutcheons: The escutcheons are metal washers 1⅞ inch outside diameter with a quarter-inch rim. They may be purchased at a specialty hardware house. They are then painted white and marking on them is done with India ink. The band-switch has four colors painted on it, one for each band.

The Dial: The dial is one of the features of the set. It is revamped from an old Radiola Semi-Portable superhet. These dials are obtainable for a song from salvage houses, but, if that is impossible, it would not be difficult to construct it. Only one of the conveniences of this dial is the ease of removing the four pointers and inserting new paper scales. These paper scales can be filed away as logs. Thus graphs or records are unnecessary and the proper place to turn the dial for any given station is always in front of you. I use draughtsmen's tracing paper for my dial. The printed 0-100 scale then shows through and a graph can be drawn if desired. A blueprint can then be made of the record for permanence. Each of the four scales is colored to match the color on the band switch, another convenience.

The Band-Spread Selector

I used a Cardwell Type ER 25 AD because its physical dimensions happened to fit neatly into the space formerly occupied by the RCA condenser; the latter's innards



Top and bottom views of receiver.

having been scooped out. A piece of rubber tape over the RCA vernier will prevent slipping that was a characteristic of these dials as soon as they became worn.

The Chassis: Unused holes will be observed in the chassis. This is because it is easier to cut holes in the chassis before assembling and wiring than afterwards and this set is designed to permit of expansion or changing the circuit. The sheet metal man who will build this very simple chassis for you will punch these holes for little added cost. Before the chassis is formed it is simple for him to punch them out—one operation per hole. But if this is not done, then the next best bet is a fly-cutter. If you do not cut these extra holes out first and then should decide later to add to the set you will be obliged to drill a ring of small holes, punch out the center and file for smoothness—a comparatively long laborious operation.

Output: I use an output socket which connects into my wiring system so that the panel may be disconnected for service or changes simply by pulling the plug.

Power-Supply: The power-supply may be any convenient one. I use one built into another panel with a good amplifier and a switch for speaker-phones operation.

Improvements: The first improvement I would suggest would be the addition of another I.F. tube. Next, an electron-coupled separate high frequency oscillator and next a separate beat frequency oscillator and AVC to be cut in and out at will. Then I would add a tuning indicator. Another set of coils and a variable condenser added to each gang will give you band pass tuning without discarding anything.

With this panel I use another containing a frequency meter and transmitter remote control. The transmitting switch automatically cuts the B-lead when transmitting.

The Band-switch: The band switch grounds all coils not in use (except the tickler coils). Thus it was not necessary to shield and it was possible to group the coils conveniently around the switch.

Coils: The coils are wound on convenient one-inch forms purchased for junk from a salvage house. They were formerly used for broadcast inductances. I rewound them. The mounting bracket and terminals on each coil were very handy. Should you not be able to procure these coils for their forms from a salvage house, you can procure like coils new for only 15 cents each.

Coil Data

	First Det.		Osc. Grid	Osc. Tickler
Antenna	L1	L2	L4	L3
160 meters	10	62	50	10
80 meters	8	27	21	10
40 meters	6	12	10	5
20 meters	4	6	5	3

Forms one inch in diameter.

All coils except 40 and 20 meter coils close-wound with No. 28 enamel wire. 40 and 20 meter coils are spaced diameter of the wire and wound with No. 22 D.C.C. wire.

Regeneration winding for 6N7:

60 turns No. 28 D.S.C. wire scramble wound on ½ inch diameter form.

Parts List

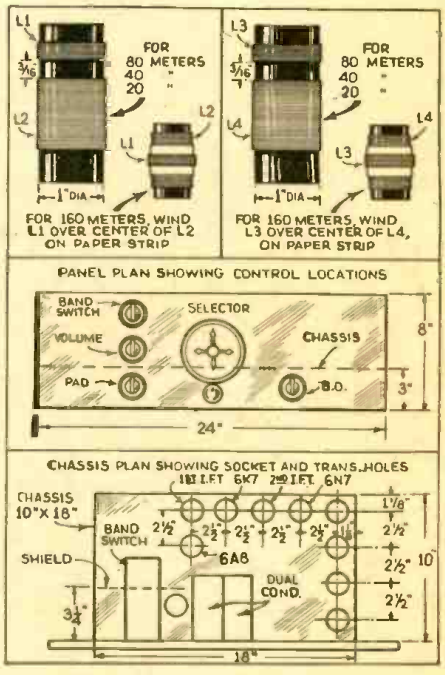
1 piece ¾ inch, 5 ply, plywood 8 by 24 inches
1 piece 20 gauge iron 8 by 24 inches
1 plain chassis, 20 gauge iron 18 by 10 by 3 inches
Shrivel paint for panel
Old dial from Radiola Semi-Portable
4 bar knobs
4 escutcheons
1—4 point, 5-deck band-switch grounding coils not in use (constructed here)

HAMMARLUND

1—140 mmf. per-section dual midget variable condenser (Main tuning) C1, C2.
2—I.F. transformers kc.

BAND-SET CONDS.

1—Type ER 25 AD, 25 mmf. per section midget dual condenser (Band setting) C1A, C2A
8—one inch coil forms



Chassis layout and other details.

SOLAR

8—TPS F100 trimmer condensers, C3
3—SD 0327 .01 mf. condensers
7—SD 0347 .1 mf. condensers
1—SD 0359 .25 mf. condenser
2—MW 1227 .001 mf. mica condensers
1—MW 1239 .005 mf. mica condenser
1—SD 0365 .5 mf. condenser
1—MW 1216 mica condenser .0001 mf.

I.R.C. (Resistors)

6—100,000 ohm, 1 watt resistors
1—400 ohm, 1 watt resistor
2—5,000 ohm resistors, 1 watt
2—250,000 ohm resistors, 1 watt
2—25,000 ohm, 1 watt resistors
1—10 megohm, 1 watt resistor
1—40,000 ohm, 1 watt resistor
2—2,000 ohm potentiometers
2—Radio frequency chokes
3—octal wafer sockets
1—six prong output socket
1—coil for 6N7 regeneration, wound on S-W choke form (see coil table)
1—6.3 V. filament transformer
2—large binding posts. Ant.-Gnd.

R.C.A.

1—6A8 tube
1—6K7 tube
1—6N7 tube

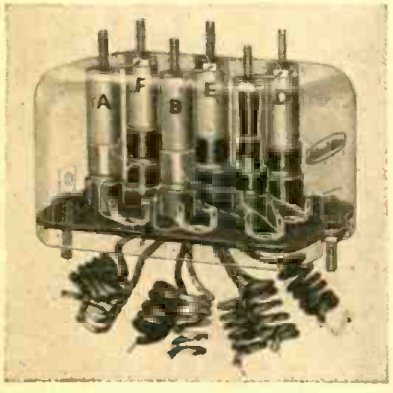
The 6A8 tube acts as combination oscillator and detector. The coupling is electronic and accomplished inside the tube. Each oscillator grid coil is provided with a trimmer, a grid-leak (so that the grid won't be up in the air in which case it would motor-boat) and a *padding* condenser in series with the coil. This latter condenser attends to the tracking of the oscillator variable and the mixer variable condenser. If it were not for this padding condenser in series with each coil, which in effect is also in series with the oscillator variable condenser, the oscillator variable condenser would have to be a special small size in order to track. Or else another panel control would be necessary.

The 6K7 tube provides the single stage of intermediate frequency amplification, which is on a frequency of 465 kc. Standard I.F. transformers of a small size are used. Two tubes in one envelope and with a common cathode are provided by the 6N7. The first tube is used as a regenerative second detector. It helps the *gain* to work this to the *critical point* and it is operated just over the spill-over point to provide the beat note needed for code reception. The second tube inside the 6N7 envelope is a resistance-coupled audio-frequency amplifier. Its output goes to a switch selecting ear-phones or connecting into one stage of push-pull amplification and a twelve-inch dynamic speaker. The tone quality is exceptionally good, but the volume is so adequate that the neighbors requested a police car to call on me and persuade me to use phones in the 'wee-sma hours! Of course, I could cut the volume down on the speaker, but it is a temptation to "turn it loose" when really inspiring music is being received.

The outfit is connected into the switching system of my station and may be used in connection with any of the separate transmitters I have for each band. It is far superior to a 3-tube T.R.F. set-up in many ways. Since the photograph was taken, the outfit has been improved by the addition of all the features that I mentioned which could be added without discarding any parts.

New Multiple Oscillator with Iron Cores

● THERE has recently been developed a very interesting and timely piece of apparatus, a multiple oscillator which is aligned with polyiron cores. The oscillator is all contained in a very compact housing as the picture shows, and it has aroused the keenest interest among engineers who examined it.



This unit is for use in pre-selected tuning systems and by virtue of the polyiron adjusting method, obviates the drift which is attendant upon the use of compression type trimmer condensers. The stability afforded by this method of alignment makes this composite coil invaluable in those systems where drift is a critical factor.

The following ranges are obtained with the the individual coils which cover the broadcast band.

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

This article has been prepared from data supplied by courtesy Aladdin Radio Industries, Inc. No. 674.

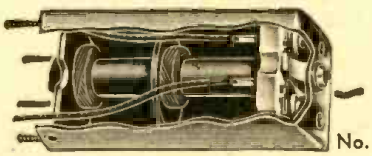
New Xtal Microphone

● THE photo shows a new Turner microphone. This is a high-level crystal device with an output of -55 DB. It is excellently suited to Amateur and also pick-up purposes. It is quite directional—a sound from the rear is cut down tremendously, thus doing away with feedback and facilitating duplex operation. It has a new shock absorbing interior construction which actually floats in the case, greatly reducing mechanical noises and the posibility of damage to the element due to vibration.

New design of Xtal microphone No. 676

This article has been prepared from data supplied by courtesy of The Turner Company.

New I. F. Transf.



No. 675

● A NEW line of standard I.F. double-tuned transformers has recently been placed on the market by the Meissner Mfg. Company. They are known as the Wide-Range line. The unusual feature of these transformers is the wide range that the transformers can be tuned to. A serviceman can with only four standard wide-range transformers tune to any I.F. frequency required, from 121 to 650 kc., without skip. They are available in either air core or iron core. 1500 kc., and 3000 kc. units are also available for the amateur.

This article has been prepared from data supplied by courtesy of Meissner Mfg. Company.

Long-Wave Converter

● TWO metal tubes are used, one providing r.f. amplification of long-wave signals. The other a signal which may be picked up by the receiver at 600-700 kilocycles.

This unit* has a band coverage of 130 to 430 kilocycles (2,306 to 697 meters). Designed for receiving the Government weather reports, ships at sea, airplane and amateur signals in this band.

Regular broadcast reception is not affected when the converter is not in use.

Calibrated airplane dial and *edge-of-instrument* panel installation make easy to tune and install.

**Most Radio mail order houses can supply this item if properly identified as to title of article, issue (month) of SHORT WAVE & TELEVISION and year.*

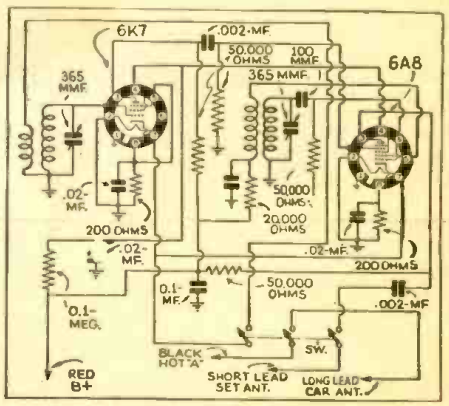


Diagram of Long-Wave Converter

Appearance of the new Long-Wave Converter

New Oil-filled Condensers for Transmitters

● ONE of the Transoil oil-filled transmitting condensers recently developed by Solar, is here illustrated. This line of condensers has been especially designed for transmitting purposes; these condensers are available in a variety of capacities and for various voltage ranges. A catalog listing these items is available on request.

No. 677

This article has been prepared from data supplied by the courtesy of the Solar Mfg. Corp.

Did You Notice

The improved style of type used in this issue of SHORT WAVE & TELEVISION? How do you like it?

Where to Reach Your Nearest Radio Inspector

UNITED STATES RADIO DISTRICTS

District	*Territory*	*Address, Radio Inspector-in-Charge*
No. 1	The States of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.	Customhouse, Boston, Mass.
No. 2	The counties of Albany, Bronx, Columbia, Delaware, Dutchess, Greene, Kings, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Schenectady, Suffolk, Sullivan, Ulster and Westchester of the State of New York; and the counties of Bergen, Essex, Hudson, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Passaic, Somerset, Sussex, Union and Warren of the State of New Jersey.	Federal Building, 641 Washington St., New York, N. Y.
No. 3	The counties of Adams, Berks, Bucks, Carbon, Chester, Cumberland, Dauphin, Delaware, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Perry, Philadelphia, Schuylkill and York of the State of Pennsylvania; and the counties of Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Ocean and Salem of the State of New Jersey; and the county of Newcastle of the State of Delaware.	Room 1200, U. S. Customhouse, Second and Chestnut Sts., Philadelphia, Pa.
No. 4	The State of Maryland; the District of Columbia; the counties of Arlington, Clark, Fairfax, Fauquier, Frederick, Loudoun, Page, Prince William, Rappahannock, Shenandoah and Warren of the State of Virginia; and the counties of Kent and Sussex of the State of Delaware.	Fort McHenry, Baltimore, Md.
No. 5	The State of Virginia except that part lying in District 4, and the State of North Carolina except that part lying in District 6.	402 New Post Office Bldg., Norfolk, Va.
No. 6	The States of Alabama, Georgia, South Carolina, and Tennessee; and the counties of Ashe, Avery, Buncombe, Burke, Caldwell, Cherokee, Clay, Cleveland, Graham, Haywood, Henderson, Jackson, McDowell, Macon, Madison, Mitchell, Polk, Rutherford, Swain, Transylvania, Watauga and Yancey of the State of North Carolina.	411 New Post Office Bldg., Atlanta, Ga.
No. 7	The State of Florida, Puerto Rico, and the Virgin Islands.	P. O. Box 150, Miami, Fla.
No. 8	The States of Arkansas, Louisiana and Mississippi; and the city of Texarkana in the State of Texas.	Customhouse, New Orleans, La.
No. 9	The counties of Arkansas, Brazoria, Brooks, Calhoun, Cameron, Chambers, Fort Bend, Galveston, Goliad, Harris, Hidalgo, Jackson, Jefferson, Jim Wells, Kenedy, Kleberg, Matagorda, Nueces, Refugio, San Patricio, Victoria, Wharton and Willacy of the State of Texas.	209 Prudential Building, Galveston, Tex.
No. 10	The State of Texas except that part lying in District 9 and in the city of Texarkana; and the States of Oklahoma and New Mexico.	464 Federal Building, Dallas, Tex.
No. 11	The State of Arizona; the county of Clarke in the State of Nevada; and the counties of Imperial, Inyo, Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura of the State of California.	1105 Rives-Strong Building, Los Angeles, Calif.
No. 12	The State of California except that part lying in District 11; the State of Nevada except the county of Clarke; the Hawaiian Islands, Guam and American Samoa.	Customhouse, San Francisco, Cal.
No. 13	The State of Oregon; and the State of Idaho except that part lying in District 14.	207 New U. S. Courthouse Bldg., Portland, Ore.
No. 14	The territory of Alaska; the State of Washington; the counties of Benewah, Bonner, Boundary, Clearwater, Idaho, Kootenai, Latah, Lewis, Nez Perce and Shoshone of the State of Idaho; the counties of Beaverhead, Broadwater, Cascade, Deerlodge, Flathead, Gallatin, Glacier, Granite, Jefferson, Lake, Lewis & Clark, Lincoln, Madison, Meagher, Mineral, Missoula, Pondera, Powell, Ravalli, Sanders, Silver Bow, Teton and Toole of the State of Montana.	808 Federal Office Building, Seattle, Wash.
No. 15	The States of Colorado, Utah, and Wyoming; and the State of Montana except that part lying in District 14.	538 Customhouse, Denver, Colo.
No. 16	The States of North Dakota, South Dakota and Minnesota; the counties of Alger, Baraga, Chippewa, Delta, Dickinson, Gogebic, Houghton, Iron, Keweenaw, Luce, Mackinac, Marquette, Menominee, Ontonagon and Schoolcraft of the State of Michigan; and the State of Wisconsin except that part lying in District 18.	927 New P. O. Bldg., St. Paul, Minn.
No. 17	The States of Nebraska, Kansas and Missouri; and the State of Iowa except that part lying in District 18.	410 Federal Building, Kansas City, Mo.
No. 18	The States of Indiana and Illinois; the counties of Allamakee, Buchanan, Cedar, Clayton, Clinton, Delaware, Des Moines, Dubuque, Fayette, Henry, Jackson, Johnson, Jones, Lee, Louisa, Muscatine, Scott, Washington and Winneshiek of the State of Iowa; the counties of Columbia, Crawford, Dane, Dodge, Grant, Green, Iowa, Jefferson, Kenosha, Lafayette, Milwaukee, Ozaukee, Racine, Richland, Rock, Sauk, Walworth, Washington and Waukesha of the State of Wisconsin.	2022 Engineering Building, Chicago, Ill.
No. 19	The State of Michigan except that part lying in District 16; the States of Ohio, Kentucky and West Virginia.	10th Floor, New Federal Bldg., Detroit, Mich.
No. 20	The State of New York except that part lying in District 2, and the State of Pennsylvania except that part lying in District 3.	514 Federal Building, Buffalo, N. Y.
No. 21	The Territory of Hawaii.	Aloha Tower, Honolulu, T. H.

New Cathode Ray Oscilloscope

(*Continued from page* 485)

the cathode ray tube to enlarge the image.

Two different *sweeps*, or comparisons with time, are found on the oscilloscope. The simplest is at the rate of 60 cycles per second and is obtained by applying an A.C. voltage to one set of deflector plates, usually the horizontal.

The second is called a *linear* sweep. This is the so-called *saw-tooth* sweep which rises to a maximum and drops abruptly to zero, over a wide range of frequencies per second.

This article has been prepared from data supplied by courtesy of the Thordarson Electric Co.

OSCILLOSCOPE PARTS LIST

Thordarson Foundation Unit and Accessories
1 Foundation unit T-11K16 consisting of chassis, panel, 913 shield and instruction sheet
1 Etched panel—T-11K17
1 Cover T-11K19 for Foundation Unit
1 2" Lens with retainer ring (Optional) T-11K20

Transformers and Chokes
1 T-9233 Power Transformer
1 T-7430 Choke

Controls

Number	Ohms	Type
R-1	500,000	Potentiometer
R-22	500,000	Potentiometer
R-2	1,000,000	Potentiometer
R-10	100,000	Potentiometer
R-11	100,000	Potentiometer
R-12	50,000	Potentiometer
R-13	25,000	Potentiometer
R-14	3,000,000	Potentiometer
S-1		2-pole, 2-position switch
S-2		2-pole, 3-position switch
S-3		1-pole, 5-position switch

R.C.A. (Tubes)
1 Type 913 Tube
1 Type 1-V Tube
2 Type 6J7 Tubes
1 Type 885 Tube
1 Type 6X5 Tube

I.R.C. (Resistors)

Number	Ohms	Watts
R-3	5,000	1
R-4	5,000	1
R-20	5,000	1
R-5	500,000	1
R-6	500,000	1
R-7	2,000,000	1
R-8	2,000,000	1
R-9	75,000	1
R-15	50,000	1
R-16	750,000	1
R-17	40,000	20
R-18	8,000	1
R-19	800	
R-21	200	1
R-X	5,000	1 (R.)

Aerovox (Condensers)

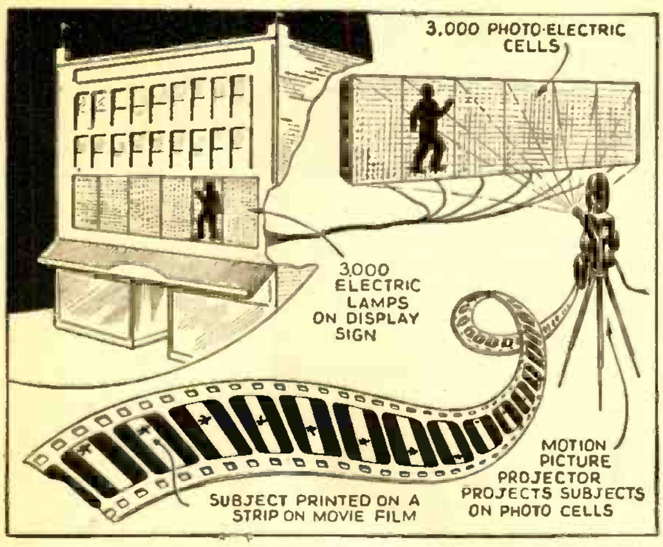
Number	Mf.	Voltage	Type
C-1	.1	400	Aerovox 484
C-4	.1	400	Aerovox 484
C-5	.1	400	Aerovox 484
C-6	.1	400	Aerovox 484
C-18	.1	400	Aerovox 484
C-2	.003	200	Aerovox 284
C-3	.003	200	Aerovox 284
C-7	8	525	Electrolytic (GLS5)
C-8	8	525	Electrolytic (GLS5)
C-9	8	525	Electrolytic (GLS5)
C-10	8	250	Electrolytic (GLS250)
C-11	25	25	(PB25)
C-12	.5	400	(484)
C-13	.5	400	Maximum Tolerance — 10%
C-14	.13	400	Maximum Tolerance — 10%
C-15	.04	400	Maximum Tolerance — 10%
C-16	.007	400	Maximum Tolerance — 10%
C-17	.0014	400	Maximum Tolerance — 10%

Miscellaneous Parts
2 Metal tube grid caps
1 4-prong Socket (for 1-V tube)
1 5-prong Socket (for 885 tube)
4 Octal Sockets (for 2-6J7, 6X5, 913 tubes)
11 1¼" bar knobs
9 5-lug resistor mounting strips
1 2-lug resistor mounting strip
24 ⅛" 6-32 nuts, screws, and lockwashers
1 A.C. line cord and plug
4 Pin jacks
4 Pin jack plugs
3 ¾" Grommets
1 ¼" Grommet

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.

Voltage Analysis

885 bias	3.2 volts
885 plate	29.0 volts
6J7 bias	2.0 volts
6J7 plates	120.0 volts
6J7 screen grids	51.0 volts
Total voltage after choke	420 volts
Voltage at anode of 1-V	480 volts
From "R" of R-10-R-11 to ground	90 volts
From "R" to "L" of R-10	45 volts

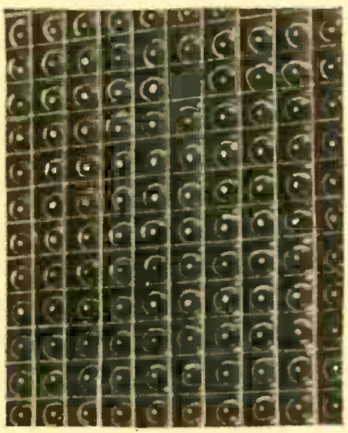


This diagram shows a new television sign in which the pictures from a movie projector are thrown on a bank of photo-electric cells. The fluctuating currents from these cells are in turn passed through a bank of thyratron tube amplifiers, and finally reach the large bank of 3,000 lamps on the sign on the exterior of the building.

Television Technique Provides New Action Sign

● AN invention which probably will revolutionize the present technique of advertising by means of electric signs has recently been tested in England. The sign consists of a large iron frame covered with thousands of incandescent lamps (of about 15 to 25 watts) which resembles the customary large advertising sign to be found atop the buildings of many cities.

However, the number of letters, figures, images which the new sign is able to reproduce is not restricted to a few continuously repeating ones as in the case of the customary signs. The new method of electrical advertising permits the reproduction of an unlimited number of various texts, pictures and most complicated patterns. This all is done with the rapid speed of a motion picture performance, but with an illumination intensity approximately 100 times as powerful as that obtainable direct from a motion picture screen.



A small section of the bank of 3,000 incandescent lamps, on which animated or motion pictures are reproduced by television means.

This amazing trick is done in a very interesting way. Somewhere inside a building one finds a motion picture projector, which throws an image upon a screen. If observed from a short distance one will find that the screen does not consist of a fabric as in motion picture theatres, but rather of 3,000 tiny photo-electric cells, which divide the projected picture or image into 3,000 small "picture elements." This screen is the most important unit of the new advertising device. Every photo-electric cell produces a current in accordance with the illumination power of the "picture element" which is allotted to it.

The current impulses produced by the photo-electric cells are of course quite weak, but by application of a new type of radio amplifier tube (thyratron) the tiny electrical impulses are converted into strong voltage fluctuations which (when sent into an incandescent lamp) will cause the lamp to radiate a more or less brilliant light.

Every electric lamp on the sign has exactly the same position in relation to all the other lamps as its corresponding photo-cell has in relation to all the other photo-cells.

An important advantage of the new advertising sign is its ability to operate without any time delay. This makes it possible to operate the motion picture projector with the normal speed, i.e., 25 different frames are projected per second on the "screen," consisting of photo-electric cells. This speed, presented in another way, means 1500 different little picture frames may be shown per minute. Considering the improvement obtained one will readily realize that the old electric sign, with its slow speed of operation, will in a few years become an historic relic.

The new advertising sign permits the utilization of all the advantages motion-picture projection offers, and in addition to it presents the images to be reproduced with an intensity of illumination which hardly can be obtained with the largest and most powerful motion picture projector available at present. But that is not all—there may come a time where even movie theatres will utilize the new method to present motion pictures, in order to make the old dream of *daylight projection* come true.

It is of interest to note that television technique enables the advertising men to apply its technique, even before widespread television transmission has arrived.

The Editors Want

articles describing in detail television receivers on which short-wave experimenters may pick up the television images being broadcast by the RCA Station, in New York City, on about 5 meters, and also those being broadcast in Los Angeles and Philadelphia. All articles accepted and published will be paid for at regular space rates. Send outline of article and what diagrams available to: The Editor, Short Wave and Television, 99 Hudson St., New York, N. Y.

Uncontrolled Oscillations

(*Continued from page 478*)

What Do You Say, SWL's?

Incidentally, it might interest those SWLs who have cards printed reading, W2SWL or W9SWL, etc., to know that the use of the amateur call district on these cards is in violation of the Radio Act of 1934.

Yours for less SWL QSLs
CHARLES FIEGE, JR., N2DDV, RM1c.,
Mantoloking Road,
Laurelton, N.J.

P.S.: How's about printing this in your *Short Waves and Long Raves* department, Mr. Editor, and see how many SWLs break out their pyrex pens and asbestos paper.

(Well! Here she is—let's hear from the SWLs—Editor.)

A Boost from New Zealand!

(*Continued from page 479*)

I am a regular reader of your magazine and am convinced that there is not a better *short-wave* magazine published. The up-to-date *station list* and the *DXers notes* are a boon to us in New Zealand.

Yours sincerely,
W. D. MCCOMB,
I Merani St., Devonport,
Auckland, New Zealand.

Built 36 "S. W. & T." Sets—All "F.B."!

Editor,

I have been a reader of your "F.B." Magazine for a long time, and I still think that you have a SWELL "Mag."

So far I have built 36 of the sets that were in your Mag. and they all worked "F.B." I have been in the radio game for the past 9½ years and I only wish I could have had "S. W. & T." when I started.

I will be only too glad to exchange cards with any one and especially *foreign* fellows. I will answer all letters to man, woman and child so if you will put this in your "F.B." Mag. I sure will appreciate it.

Now for a little *brick-bat*, I still don't see why you are putting in all that *junk* about Television. The SWLs are not going to pay any attention to it, and I don't think that many hams do either. If you would put more diagrams of swell sets and more data on the things that the SWLs like and less on Television, I think you will have a better Mag.

Now please don't get me wrong, I still get your Mag. and think the following sections are swell: Joe Miller's column; World S-W Station List; Short Wave Kinks and Short Waves and Long Raves.

Will you please put this in your next issue and I hope to hear from some of the "Y.L.'s." Hi!

Hoping that you keep up the good work on *short waves*, I am

DICKSON WITMAN,
41 Peters Place,
Red Bank, N.J.

(Well, Dickson, it seems from some of the other letters received from readers, that they want to learn as much as possible about Television. So we're trying to please everybody. Congrats on building 36 S. W. & T. sets! Glad to know they all worked OK. —Editor.)

He's Interested in Astronomy!

Editor,

I am very much interested in radio, but in addition to this I am interested in *amateur astronomy*. I was able to identify Finsler's comet and have made a chart of the course it followed, and I also have a similar chart of the course of Peltier's comet of 1936. I am very much interested in astronomical phenomena and will be glad to hear from any

BARTER AND EXCHANGE FREE ADS

Space in this department is not sold. It is intended solely for the benefit of our readers, who wish to buy, sell or exchange radios, parts, phonographs, cameras, bicycles, sporting goods, books, magazines, etc. without profit. As we receive no money for these announcements, we cannot accept responsibility for any statements made by the readers.

Use these columns freely. Only one advertisement can be accepted from any reader in any issue. All transactions MUST be above board. Remember you are using the U. S. mail in all these transactions and therefore you are bound by the U. S. Postal Laws. Describe anything you offer accurately and without exaggeration. Treat your fellow men the way you wish to be treated.

We welcome suggestions that will help to make this department interesting and profitable to both buyer and seller.

HAVE YOU STAMPS TO TRADE? Collectors in South America, British Colonies, elsewhere, please write. I have and want commemoratives, airmails, Coronations, etc. Also want quantities recent used U.S. commems. Reply assured to all. Charles Lasky, 162-13 Hillside Ave., Jamaica, New York.

WANTED: USED CANDLER course. Also duo-amplidyne receiver. Will swap $2.89 cartooning course for —what have you? Write Warren Wilson, Glen Ullin, North Dakota.

SWAP: 500 U.S. AND FOREIGN stamps. No German. Several sets. Adhesive mounted on notebook paper. Want: Used 913 C.R. tube or X'tal any Ham freq. Robert W. S. Bue, Rte. 1, Clinton, Wis.

FOR SALE: LABORATORY TYPE slide wire Wheatstone bridge for capacity inductance and resistance measurement. Accurate scale. Low loss bakelite insulation and heavy brass and copper bar connections. Reasonable. Ropert Lepic, 3026 South St. Louis Ave., Chicago, Ill.

FOR SALE: COMPLETE BATTERY operated rig—19-33 receiver—31 T.N.T. transmitter. Including tubes, coils, speaker and 3 B batteries. All mounted in wooden cabinet—18"/14"/10". Weight about 30 lbs. $8.75 plus shipping charges. Will also sell new W. E. telephone handset $3.00 and high speed key $1.25. All for $11.75 plus shipping charges. Barnett Mitchell—W4EZI—Route 4, B.114, Selma, Alabama.

FOR SALE OR SWAP: ONE Radiart Corp. type P6 portable vibrator analyzer, brand new, in factory carton, won in Radio Craft Serviceman's Contest and never used, list price $25; tests all vibrators as well as associated circuit components; will trade for good used servicing or shortwave equipment. What can you offer me? J. A. Ladue, President Hotel, Long Beach, N.Y.

'37 KNIGHT SUPER-GAINER kit, pts. slightly used, 4 metal tubes, 40-80 coils, $10, postpaid. Marv Loftness, Devils Lake, N.D.

WANT GOOD S.W. RECEIVER as Elgin III, R.S.R. Clipper, AC-4 or similar set. Exchange Majestic Electric Razor, Brilliant Camera—7.7 lens, books, 1000 postcards, used and unused. Send lists to Joseph Nagy Jr., 9610 Kennedy Ave., Cleveland, Ohio.

I WILL TRADE CANADIAN stamps for stamps of foreign countries, with any readers outside of the United States and Canada. I guarantee to answer all letters promptly. James W. Newman, 45 Sixth St., New Toronto, Ontario, Canada.

WANTED—GOOD PRESELECTOR also crystal mike and FB7XA complete. N. R. Thornton, Somerville, Ohio.

I HAVE FOR SALE A "MEISSNER 8" tube metal set in kit form all accessories, condensers, resistors, everything to complete it and will sell it for $20.00, costs $40.00, except the horn which I need for another set. Please send money order. Harlan Fulmer, 827—N. 69th St., Wauwatosa, Wis.

SWAP LINOTYPE KEYBOARD and course, miniature candid cameras, etc. Want 220 pistol or 8m m projector. Roscoe Hukill, 1484 W. Broad St., Columbus, Ohio.

WILL SELL SW RECEIVER US-ing 58, 57, 56, 2A5, high quality parts (U.T.C., Aerovox, Centralab, National). Built on a 10"x12" chassis with Isolantite sockets, black crackle panel, stand-by switch, phone jack, and with 8 general coverage and 8 band spread coils. Sell for not less than $25. (coils alone worth $6.) photo on request. G. Black, 12 Lambert Rd., Belmont, Mass.

WILL SWAP: 6E5 TUNING UNIT or bridge, neon tube condenser tester, all types of tubes (receiving), and telephone receivers. For what have you or phonograph pick-up (electric) and motor. Charles Mourmouris, 2121 South Washington Street, Denver, Colorado, U.S.A.

WILL SELL PRACTICALLY NEW Hallicrafter Sky Buddy super complete with tubes $20.00. Will trade 65 copies QST magazine 1924-1931 for what have you. W9TMQ, 3860 Harrison Street or phone SACramento 0828, Chicago, Ill.

WILL SELL OR TRADE SHORT wave equipment, reasonable terms. Call, or write for details. Also wish to correspond with other fellows and exchange experiences. John J. Vilkas, 1515 So. 49th Court, Cicero, Illinois.

I WOULD LIKE TO SELL AN Ellen model 7C receiver 5 tubes with broadcast coils $11.00. A. E. Rodesky, Box 346, Suffern, N.Y.

I HAVE (15,000) FIFTEEN THOU-sand varieties of foreign and domestic stamps, many rare mint copies without hinge marks. I want any two or three tube battery or electric receivers for short wave reception. I have several King George Jubilee Sets mint copy. Albert Hartman, 419-91st Street, Brooklyn, N. Y.

SHORT WAVE LISTENERS IN foreign countries. Let's swap SWL cards. Just send me one of yours and I'll send you one of mine in the next mail. C'mon fellas QRA Chris Davis Jaffe', Algonquin Park, Norfolk, Virginia, U.S.A.

TRADE:—MEISSNER DUAL ALL-Wave Trap, new; magnetic speaker in cabinet, new; M.R.L. No. 2 crystal radio set, long distance reception on crystal, new, selective; old foreign coins, magical apparatus, books, manuscripts, like new; fishing tackle, new and used. Wanted:—Patterson No. 10 Preselector, Stuart Antenna Tuner. Also will trade Scott 12 tube All-Wave receiver, 6 wave bands, and pay cash difference for later model Scott or McMurdo-Silver receiver. Don M. Newbold, 218 Locust St., Akron, Ohio.

WILL SWAP 204A WITH FILA-ment transformer for SW3 or what have you? Wesley R. Bard, W7GDX, Box 1014, Laurel, Mont.

WILL TRADE FOR TRANSMIT-ting equipment electric phono-turntable, heavy duty motor, Webster magnetic pick-up, RCA double button mike, Wilbur Slater, W8RBK, B No. 212, Clarion, Pa.

FOR SALE—SLIDE-FOCUSING, 70-250 power midget microscope with accessories, almost new; 100 mmf. variable condensers, type 30 tubes, audio transformers, other parts. Will sell very cheap. Edward Wooten, Varita Court, Apt. F, Wilson, N.C.

BEST CASH OFFER TAKES COM-plete 5 meter receiver, 5 tubes, separate power supply, dynamic speaker, all well shielded. George Swanson, Box 224, Englewood, N. J.

FOR SALE OR TRADE: 1—3 TUBE receiver, all wave, battery set, Webster phonograph pickup, electric turntable, 5 pair of ice skates. Would like to have automatic record changer. Make an offer. Bill Godden, Emmetsburg, Iowa.

FOR SALE—SCOTT XV. $125 console $10; factory seals intact; guarantee two years to run. H.A.C. S.W. log 500 stations. G. C. Gallagher, 18 Delano Avenue, San Francisco, California.

FOR SALE—TRF SET, 13-200M. 5 tubes, airplane dial, separate preselector, 2 sets Hammarlund coils, 5 in. speaker, power-supply with built-in voltmeter. Set in varnished wood cabinet. Complete with tubes $18.00. Howard Deans, 226 Cherry St., Sharon Hill, Pa.

1000 VOLT POWER SUPPLY $15 complete. John Henninger, 2012 N. Howard St., Philadelphia, Pa.

FOREIGN POSTCARD COLLECT-ors: Will exchange picture postcard, your locale for mine. Please autograph picture side of card before sending. Harold S. Clein, 1821 Santa Ynez Street, Los Angeles, California, U.S.A.

SWAP: ¼ H.P. MOTOR AND Craftsman bench saw. Will cut up to 1¼" stock. I want good amateur superhet receiver, W3CD, 133 Linden Ave., Collingswood, New Jersey.

SELL OR TRADE. 16mm MOVIE projector, same as new. Make me an offer. Max Welton, 31 E. 24th St., Holland, Mich.

SELL. COMPLETE. RSR CLIP-per communication receiver, like new, $22.50. William Hall Jr., 708 N. Bever St., Wooster, Ohio.

SELL OR SWAP 6 PAIR SHORT wave coils (12 coils) from a National SW45. Good condition. J. De Sousa, Jr., Box 180, Medway, Mass.

CLEANING UP—YOUR CHANCE —new Cannonball headset 5000 ohms, $2.00 postpaid—used 2000 ohm headset 55c postpaid—1 new Utah magnetic loud speaker unit, 40c postpaid—1 dual magnet speaker in cabinet, 12x12x7, in excellent condition, $3.00 postpaid—1 RCA Radiola, 7 tube electric, A1 condition, table model $10.00 prepaid, 1—5 tube Erla battery radio, complete with 230 tubes, $3.00, table model, not prepaid, 1 small 3 tube battery radio $1.25 not prepaid. Assortment of radio parts (value about $10.00) 50c postpaid. 1 small magnetic speaker in cabinet 65c postpaid. 1 Corona portable typewriter, in A1 condition, slightly dusty, new ribbon, prepaid $10.00. 1 Springfield single shot 22 cal. rifle, excellent condition, $2.50 prepaid. All above guaranteed to be worth more than the price asked for same. Will swap any of the above for small gasoline motor, suitable to build a motor scooter. Address Paul H. Hammel, 308 N. First St., Lehighton, Penna.

WILL SWAP OR EXCHANGE: One Detrola short wave converter including three tubes. This converter is slightly used. Have received foreign stations and hams with it. It is in first class condition. Will swap or trade for Preselector or what you? Write: Charles Stephens, 1 North Street, Randolph, Mass.

WILL TRADE 38 CAL. 5-SHOT revolver in A-1 condition for A.C. receiver all wave; 5 meter equipment, small phone xmitters or xtal mike. Walter Juranic, RFD No. 2, Red Hook, N.Y.

WILL EXCHANGE A GRUNOW 6 tube all-wave superheterodyne receiver, 4 bands, 13 to 550 meters, no plug-in coils, DX verifications all continents, for a typewriter in good condition. Herman Fischer, 181 Park Place, Brooklyn, N.Y.

I HAVE 2,000 AMERICAN AND foreign postage stamps mounted in good album. Also many duplicates. Will swap for fairly good preselector or what have you. Write Vincent Salerno, 2009 Woodlynne, Ave., Camden, N. J.

FOR SALE 1937 HALLICRAFTER Sky Chief, like new, in A-1 condition, $30. William F. Smith, 11 Stewart St., Bx 273, Dolgeville, New York.

WILL SWAP A 600 POWER triple objective Brownscope "Professional" Microscope, and a "Baby Cyclone" midget gasoline Airplane motor, for what have you?; the above are in A-1 condition. Wm. Bugajski, 2635 E. Ferry, Detroit, Mich.

I WOULD LIKE TO BUY USED two 110-115 Volt A.C. Turntables and two Astatic Crystal Pickups, also an Astatic Crystal Microphone. Alfred B. Shenton, Box 248, East Liverpool, Ohio.

SELL:—1937 PEAK PRE-SELEC-tor, Wright DeCoster 10" P.M. speaker, Utah Transformer, 380 Volts C.T. 150 mils., all in excellent condition, or will swap any or all of the above for good volt-ohm-milliammeter or what have you in the line of receiving equipment. Fred Campbell, 3346 Boulevard, Jersey City, N. J.

I HAVE A USED RTI COURSE which I would like to trade for a mimeograph. There are some lessons missing from the course, but all the tests and correct answers are intact. J. S. Jackson, Jr., 1306 Adam Street, Bowling Green, Ky.

THIS MAGAZINE AND OTHER magazine subscriptions given in exchange for stamps from your everyday mails. Foreign contacts especially desired. Radio W7GEQ, Gold Beach, Oregon, U.S.A.

WANTED, RIDERS MANUALS, No. 1-2-3-4-5-6. State Cash Price and Condition, in reply. Modern Electric, Middle Valley, N. J.

I HAVE A FULLY EQUIPPED bicycle in good condition which I will trade for a receiver, transmitter, testing equipment or other radio parts. Write and make offer and ask for details. Bob Yeager, 30 N. Third St., Madison, Wis.

HAVE A COMPLETE DOCTORS Diagnostic set including Opthalmoscope, Auriscope with 3 Speculs and additional supplies for set. English manufacture never used. Uses American battery, will trade for up-to-date Ham commercial equipment. L. Reiss, 1230 Park Ave., New York City.

See Page 522 for Classified Advertisements

Short Wave Leaguers who are interested in this branch of science and would like to hear more news about astronomy over the radio. So, "hams," if you are interested in this other equally fascinating science, you can do us a very great service by keeping us informed on new comets, sun-spots, eclipses, etc.—EDWARD L. SMILEY, 221 S. Main St., Abbeville, La.

(Our congratulations, Edward on your interest in astronomy, and we are quite sure that you will hear from many other short-wave fans and hams who are likewise interested in this branch of science. There are many important astronomical aspects to short-wave problems, which students like yourself can help to clarify during the next decade.—Editor)

THE "PROF. DOERLE" A GREAT SET!

Editor,

I have just built the *Prof. Doerle* receiver from diagram given in the Question Box of the March '37 issue, and it sure is a great set.

In five days I have received short-wave broadcasts from England, Germany, Cuba and South America, as well as the U. S. I have heard "ham" stations in Pennsylvania, New Jersey, Ohio, Michigan, Iowa, Missouri, Minnesota, Kansas, Alabama, Mississippi, North Carolina, Texas, Georgia, Oklahoma, Florida, California, and South Dakota—also *portables* in Louisiana and Colorado.—CHARLES DIXON, 621 Henry St., Belle Vernon, Pa.

A BOOST FROM ENGLAND

Editor,

Just a few lines from an English reader expressing my admiration for *Short Wave & Television.* There is no other "mag." like it in England, and although I do not get it until 3 months after publication, it is always very up-to-date.

I am also interested in transmitting and would be pleased to correspond with anyone, anywhere, on S-W reception and transmission (and *television*, if of interest to anybody!).—ANTHONY GEORGE HOBSON, 99 Woodhouse Road, Doncaster, Yorkshire, England.

How to Get Crystal Control on 5 Meters

(*Continued from page* 518)

pull amplifier. The modulator is a 6L6 driven by a 6C5.

Figure E shows the RF section of a 60 watt transmitter using a 6J5G as the crystal oscillator. The oscillator drives a 6L6 as a doubler to 5-meters and this in turn drives the 35T in the final. The 6L6 tube is easily over-driven and for this reason, considerable care should be exercised in adjusting the coupling between it and the oscillator tank.

The constructional details and circuit diagram of a complete single tube 5-meter crystal control transmitter are shown in Figures F and C. It consists of a single 6E6 as a crystal oscillator and doubler modulated by a 6F6. This transmitter is simplicity itself, both in performance as well as in construction, and due to the fact that crystal control is used, results equivalent to a 10 to 12 watt self-excited rig are obtained. The performance of this transmitter is a good example of what can really be done with crystal control on 5-meters.

Not only does the 10-meter crystal make possible, portable 5-meter crystal controlled transmitters, but it also greatly simplifies the construction of high power transmitters. When these facts are considered, together with the concentration of power on a single frequency, the desirability of crystal control is obvious—and the practical answer is the use of the HF2 10-meter crystal unit.

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(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.)

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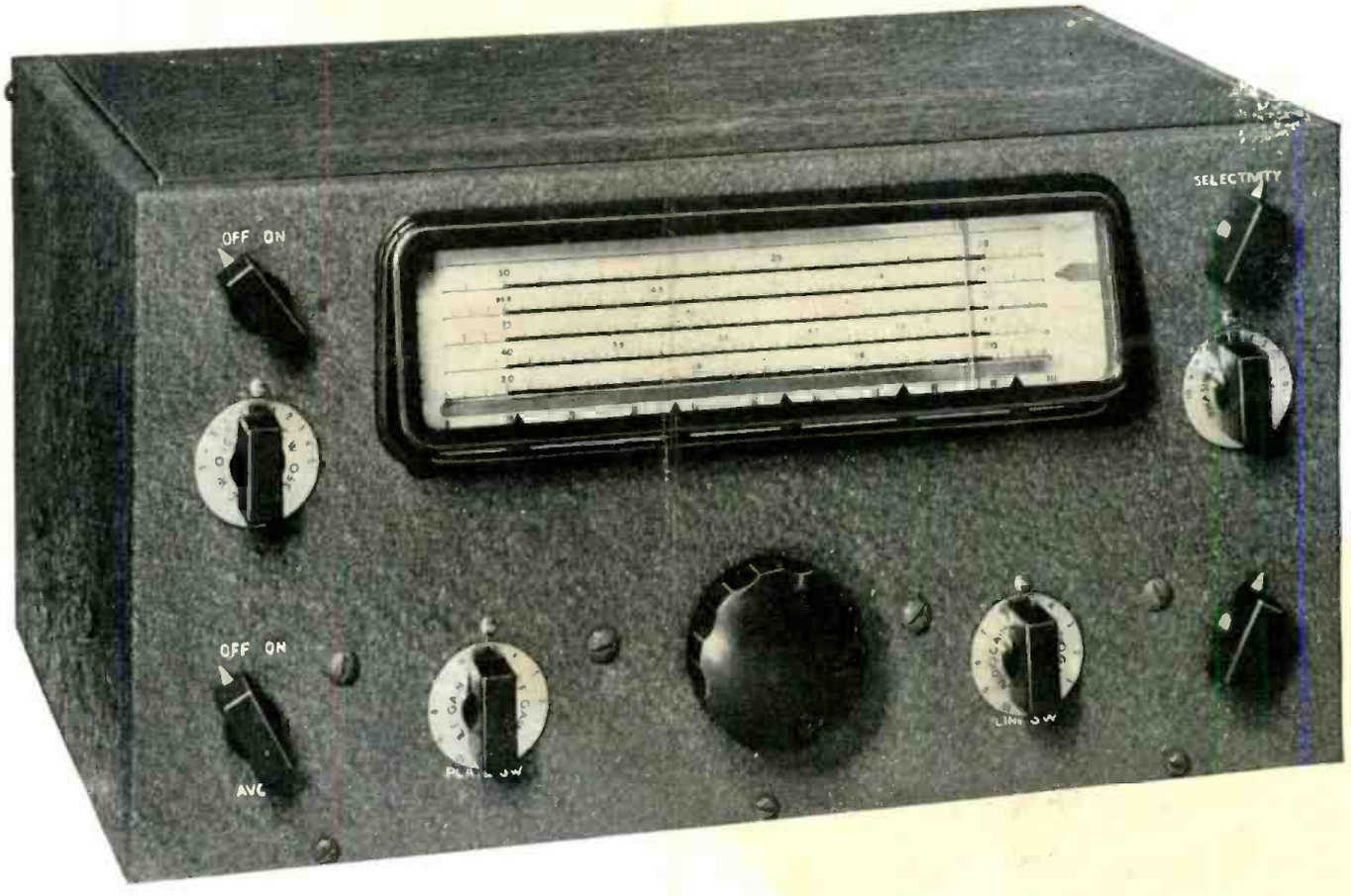
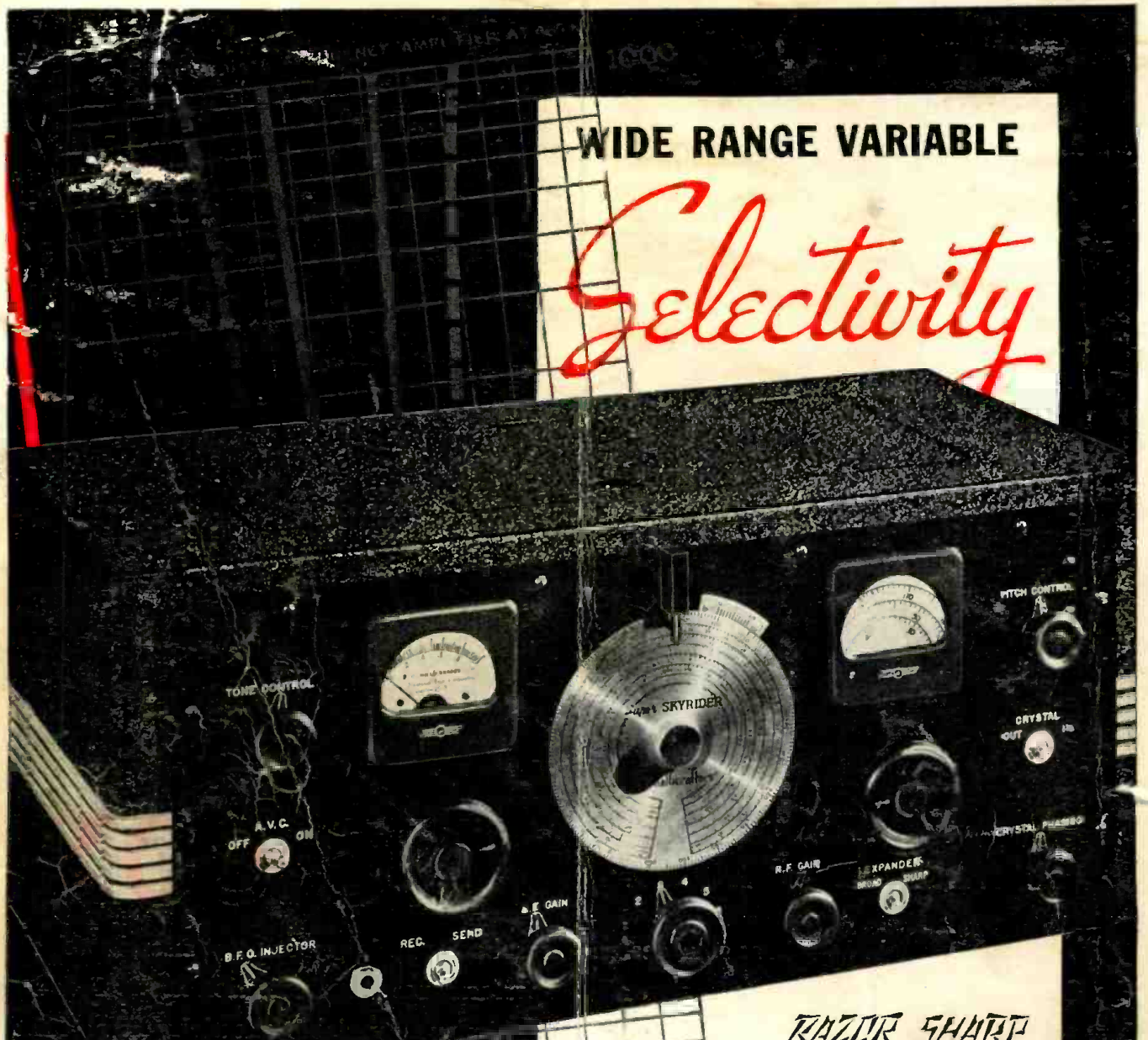


The

NATIONAL NC-80X

See the new National NC-80X at your dealers. It embodies basic new improvements that for the first time make it possible to design a high-performance communication receiver at a low price. A new crystal filter circuit provides continuously variable selectivity from 400 cycles to 5 kilocycles, and wide phasing range. By its use, noise and interfering signals are reduced enormously. A high IF frequency (1560 KC) separates image frequencies by so great a span that they are readily rejected. These features make it practical to eliminate preselector stages. Use of new tubes designed for very low plate voltages allow AC-DC operation without sacrifice in performance. Thanks to such refinements, it has been found possible to engineer this new receiver with the high quality of the NC-100X, including the famous Movable Coil Tuning Unit, and yet achieve the remarkably low price of $88.00 Net, complete with speaker, tubes, and power supply. Two models are available, the NC-80X with coverage from 550 KC to 30 MC, and the NC-81X Amateur Model (illustrated) covering five amateur bands with extreme bandspread. The new National Catalogue No. 270 describes this fine receiver in detail.

NATIONAL COMPANY, INC., MALDEN, MASS.



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