THE RADIO EXPERIMENTER'S MAGAZINE

SHORT WAVE CRAFT

January 1935

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HUGO GERNSBACK
Editor

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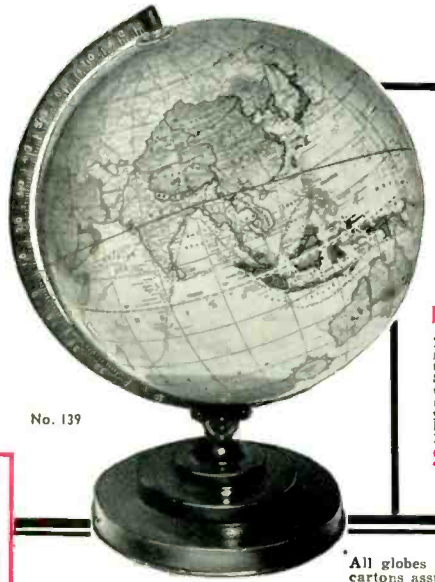

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IN THIS ISSUE: PROMINENT SHORT-WAVE AUTHORS

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SHORT WAVE CRAFT

HUGO GERNSBACK
Editor

H. WINFIELD SECOR
Managing Editor

GEORGE W. SHUART, W2AMN
Associate Editor

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A 5-Meter Portable Transmitter, Using High-Voltage Dynamotor.

3 Tubes=6 in a new "High Efficiency" Superhet Circuit. It has A.V.C. 'n everything, by M. Harvey Gernsback.

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

OUR COVER

● "Xmas Dream of a Short-Wave Fiend," is the subject of our cover illustration this month and undoubtedly thousands of short-wave enthusiasts, people of all ages, will go to bed on Christmas Eve wishing for a fine, new short-wave receiver or transmitter. And who can tell—maybe old Santa will fulfill their dreams.

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HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

Needed Short-Wave Improvements

An Editorial By HUGO GERNSBACK

● SHORT WAVES, as all of us know, are still in their infancy, and much remains to be done, particularly when it comes to 100 percent perfect short-wave reception.

When broadcasting first started in 1920, broadcast reception was also bedeviled with many problems that made reception difficult and often impossible. Radio engineering in the succeeding years smoothed out a great many of the problems and today broadcast reception, while not as yet perfect, is rapidly becoming so.

In short waves, we have a parallel case to the early days of broadcasting, with the exception that the problems are somewhat different, because short waves have their own peculiarities which require entirely different treatment, and for that reason the solution of the problem must be different.

The most important improvement is, of course, the elimination of *man-made* static. This is the great "bug-a-boo" in short-wave reception today. Parasitic noises such as caused by electrical appliances in the building, passing cars and busses, electric motors, trolley cars, etc., all give rise to a noise level which often destroys or badly mars reception. While our new aerials, particularly of the transposition lead-in type, have done much to cure this trouble, still it is not the final word. As I have mentioned before, I still believe that the final solution lies in the vacuum tube, fitted with a special circuit to reject all of the "man-made" static.

Fading *compensation* is next on the list of improvements. While in the multi-tube sets we already have *automatic volume control*, which compensates to a great extent for the fading phenomena, still there is much that remains to be done in this field. On a poor day for reception, even a multi-tube set with automatic volume control does not solve the problem. It is thought by many radio authorities that we must have sets with far greater sensitivity than we have today and then automatic volume control will be more efficient than it is now. More sensitive tubes are coming out all the time, and in a few years it is conceivable that this phase of the problem will have been conquered too, even with sets having as low as three tubes.

This brings us to another point, also coupled with the above problem: There are days in which short-wave reception is exceedingly poor. We may have several weeks of excellent foreign reception followed by days where it is almost impossible to pick up foreign stations, even though they are on the air and going "full blast!" The reason for this is found in the upper layers of our atmosphere, the so-called Heaviside or Appleton layers, which seems to shift, due probably to "sunspot" activity. When this happens, it is as if the high frequency radio currents were "short-circuited" and very little energy, if any, reaches your receiving aerial. That means poor reception for that day and sometimes no reception at all.

Now, of course, the transmitting station engineers or operators know these things, or should know them. When a foreign government spends yearly millions of dollars to maintain their high-powered short-wave stations, they should naturally be sufficiently interested to see to it that their emissions actually reach the ears of the far-distant listeners. If the reception falls off for certain days, the transmitting station should be informed by radiogram or cablegram immediately. The transmitter would then automatically put on higher power in order to cut through the barrier as far as this is possible. It may require the doubling of the power, always providing that the station has that much reserve power to apply. It is felt that most of them either have such reserve power or could get it in order to bridge the "poor" days when it became necessary.

Linked with the above, there is also another improvement or rather service which is badly needed. I term this, for want of a better name, "*Radio Intensity Maps.*" During the past year or so, American readers have become interested in daily weather charts which most of the better newspapers print as a special service. The reader who studies these weather charts gets a pretty good idea what the weather will be during the next 24 to 48 hours.

Radio intensity maps could be printed on the same basis from information gathered by the various governments. Such "intensity" maps would be similar to the weather maps; they would show the prevailing condition of reception in our own country. Foreign countries will, of course, given similar service to their nationals. You would have then, for example, a map in the United States showing intensity lines giving in hundreds of degrees the radio reception to be expected in various parts of the country, and while there would be no high and low barometric regions on the radio intensity maps, there would be *highs* and *lows* for our "radio weather," if I may call it such. There would also be *isorads*, which would replace the *isobars* which are now used on weather maps. *Isorads* are lines running through different localities having the same reception intensity in percentages. For instance, excellent reception in New York, Chicago, and Denver would be linked by an *isorad* line 100. Poor radio reception for a section such as Washington, Atlanta, and Miami, would be marked with 10 on the *Isorads* line. It would be no trick at all for the newspapers to get up such daily radio intensity charts, and the short-wave listeners would get a service which is sorely needed today.

Another needed improvement, particularly for the sets in use by the public, is *automatic bandspread.* At the present time a number of sets are made which have such bandspread arrangements, but they require an extra manual control to switch the bandspread feature into operation. It is felt that an *automatic* control could be incorporated into every set in order to bandspread *continuously.* This is particularly important today, because the public has not as yet become accustomed to the fine tuning necessary in short waves. By continuous automatic bandspreading, the tuning will, of course, not be nearly as fine, and the public will become better educated to the thrills of short-wave reception, programs from overseas, speeches and lectures by famous old-world experts, etc.

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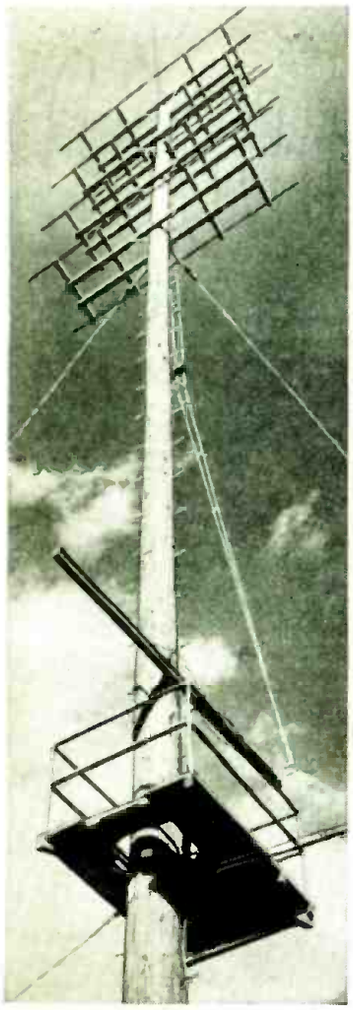
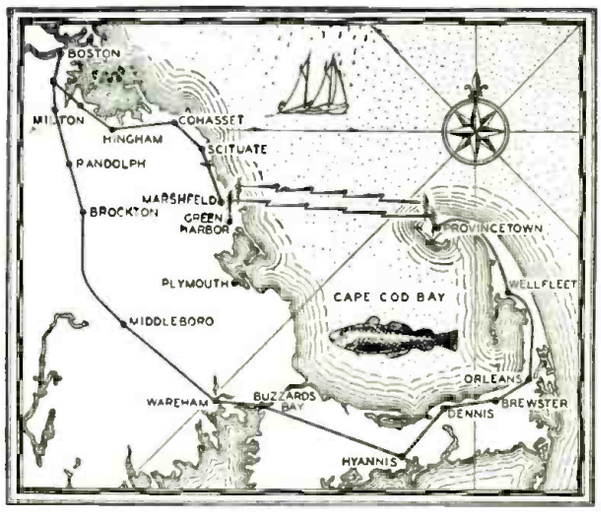


One of the 4.7 meter antenna masts at Green Harbor, Mass.

Ultra Short Waves Extend Land Telephone Lines

By F. F. MERRIAM*

A practical test of 4.7 meter waves over a distance of 25 miles is now being carried out daily between Green Harbor and Provincetown, Mass., across Cape Cod Bay. The engineers of the Bell Labs., developed the automatic 4.7 meter apparatus here described.



Map showing the 25 mile "over-water" gap bridged for daily telephone service by 4.7 meter waves between Green Harbor and Provincetown.

● FOLLOWING the commercial application of short waves to transoceanic telephony in 1928 and 1929, attention was directed by Bell Telephone Laboratories toward determining the properties and usefulness of ultra-short waves. The short-wave transoceanic circuits are operated at frequencies between 5 and 21 megacycles while the ultra-short waves are at frequencies above 30 megacycles, which is generally taken as the upper limit of the short wave range. It had previously been discovered that these higher frequencies were not in general reflected from the Kennelly-Heaviside layer. They were, therefore, considered primarily suitable for short-distance communication, where the waves followed essentially an optical or straight-line path from the transmitter to the receiver. In the telephone plant there are instances where natural barriers so separate points only a short distance apart that it is difficult and expensive to construct ordinary telephone lines or submarine cables to connect them. It seemed that for such conditions ultra-short wave radio extensions might be a satisfactory means of giving telephone communication. To be economically feasible, however, such radio circuits must be inexpensive both in first cost and in operation.

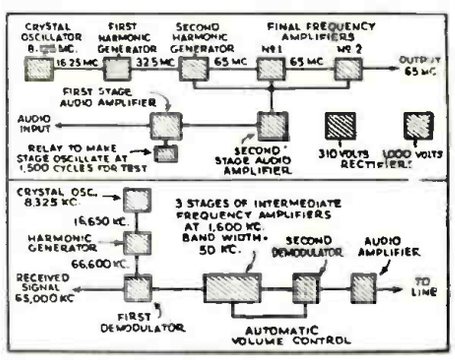


Fig. 1—block schematic of ultra short-wave transmitter; Fig. 2—schematic of ultra short-wave receiver.

During the last few years, the Laboratories have been experimenting with an ultra-short wave circuit between Deal and Holmdel, N.J., with the thought of developing equipment capable of unattended operation. Some time ago this development reached the stage where it seemed desirable to carry out a trial of a two-way circuit under conditions approximating commercial use to gain experience with the problems involved in regular operation. In particular, it was desired to design and install the radio stations for operation without direct attendance, so that the apparatus could be located remotely from a central office.

After a study of possible locations, it was decided in cooperation with the New England Telephone and Telegraph Company to carry out the trial installation across Cape Cod Bay, between Green Harbor and Provincetown, Mass. The coastal station of the New England Telephone and Telegraph Company, already existing at Green Harbor, made a convenient place in which to install one end of the system. The physical conditions are also favorable for an ultra-short wave link between that point and Provincetown, 25 miles away. The sand dunes near Provincetown, rising about 100 feet in height,

(Continued on page 553)

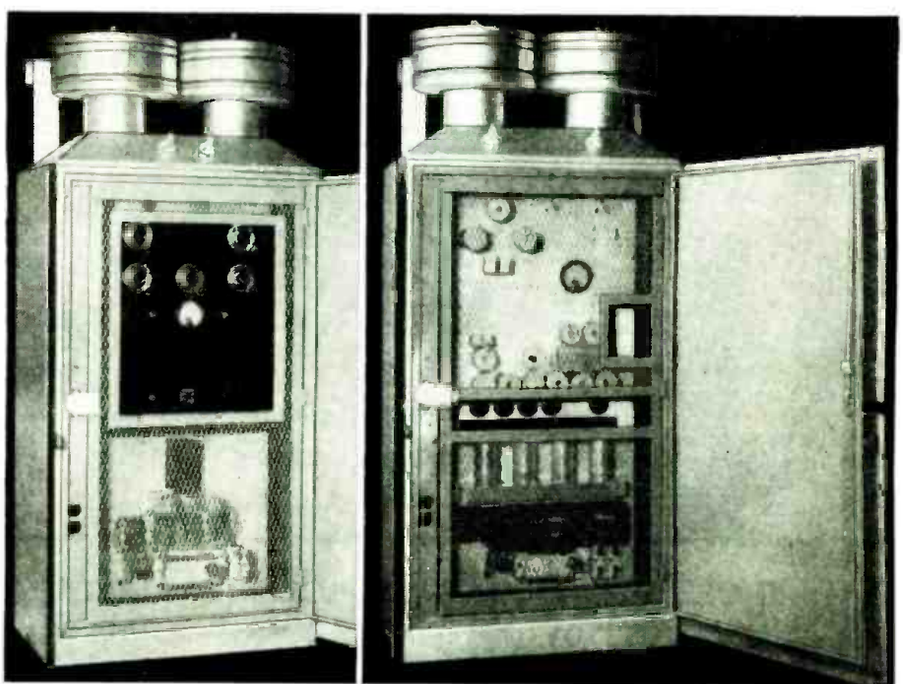


Fig. 4, left, shows 4.7 meter Receiver mounted in metal container suitable for pole mounting and fitted with safety provisions to prevent maintenance experts from getting a high voltage shock; Fig. 3 right, shows 4.7 meter Transmitter also arranged for pole mounting. Photos courtesy Bell Tel. Lab.

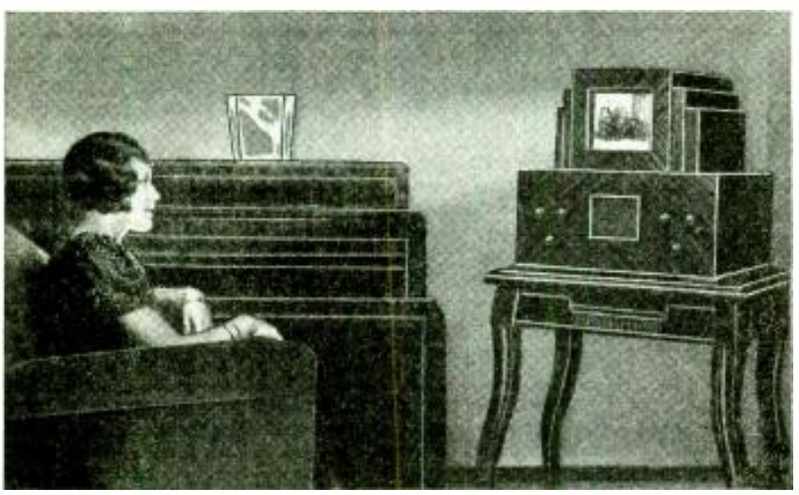
*Radio Research, Bell Telephone Laboratories.

They Are TELEVISING IN Berlin!

While practical public television is fast asleep in this country, the German and other European television experimenters have been forging ahead, and the accompanying illustrations and discussion give some new light on what we "might have done"!

By H. WINFIELD SECOR

From data supplied by our German Correspondent



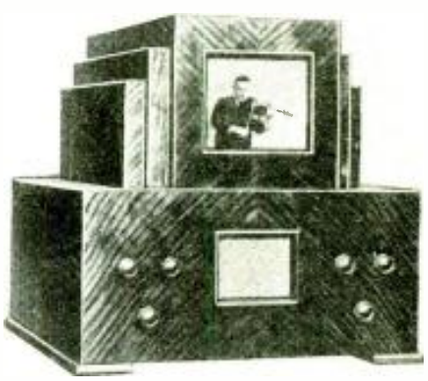
Here we see the latest manufactured model of combination voice and image Television receiver in use in Germany. This is the Loewe apparatus.

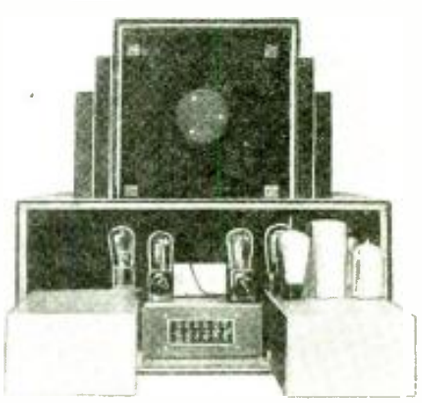
● TELEVISION has been making fast strides in Germany, and several other European countries, including England and France. Practical everyday television in America has, sad to relate, almost gone backward instead of forward and it is a pity that American radio experimenters and the public at large have been for the past two years, and still are, without television except for a few stations which are bravely broadcasting a few programs here and there across the country. All we hear in this country is that the laboratory images are *wonderful*, but it is too bad that we could not have kept up the momentum in television broadcasting that we had a couple of years ago.

The photos on this page just go to show what can be done—this is the latest Loewe television apparatus developed and perfected in Germany. This apparatus is being manufactured in quantity and it not only reproduces the moving television image on the screen of the receiver, but the "sound" as well! The tuner is incorporated in the lower part of the cabinet as well as the control knobs for the framing of the image and the modulation of the cathode ray or Braun tube.

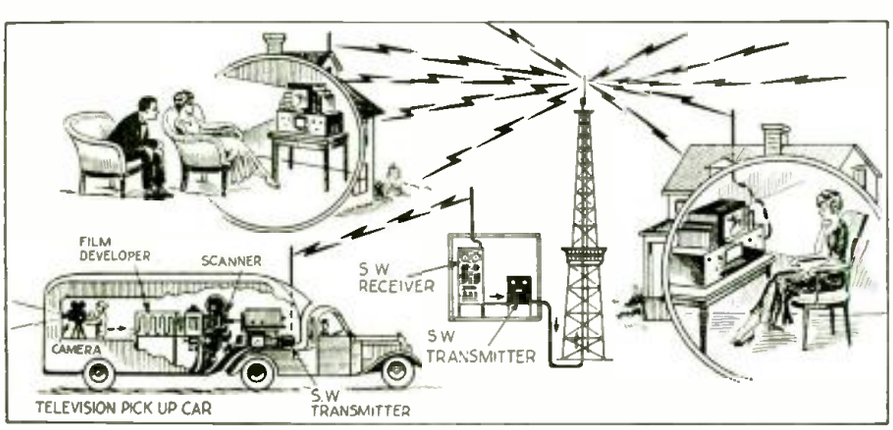
This excellent television apparatus was exhibited at the last *radio exposition* in Germany. The images were very fine indeed, the improved detail being due to the use of as high as 180 lines per inch in the scanning. The wave length used for transmitting the television images in Berlin is 6.92 meters or a frequency of 42,900 kc. The next step will be the use of microwaves, having a length of one centimeter up to one meter possibly. The German *Reichspost* in connection with the Reichs Broadcasting Company have decided to carry out several elaborate television experiments through the coming months, and to aid in making these experiments, the television image "pick-up" car here shown was designed and built. The sound movies are taken from this truck and the film reel developed in the astonishing time of 1 minute, developing requiring 20 seconds, fixing 20 seconds and washing and drying 20 seconds. The pictures are photographed and sound recorded also, the same as regular "talkie" films, at the rate of 25 frames per second; thus all flickering of the image is practically eliminated.

It is interesting to note that with an image requiring 40,000 points of light and 25 frames per second, and 180 *(Continued on page 563)*

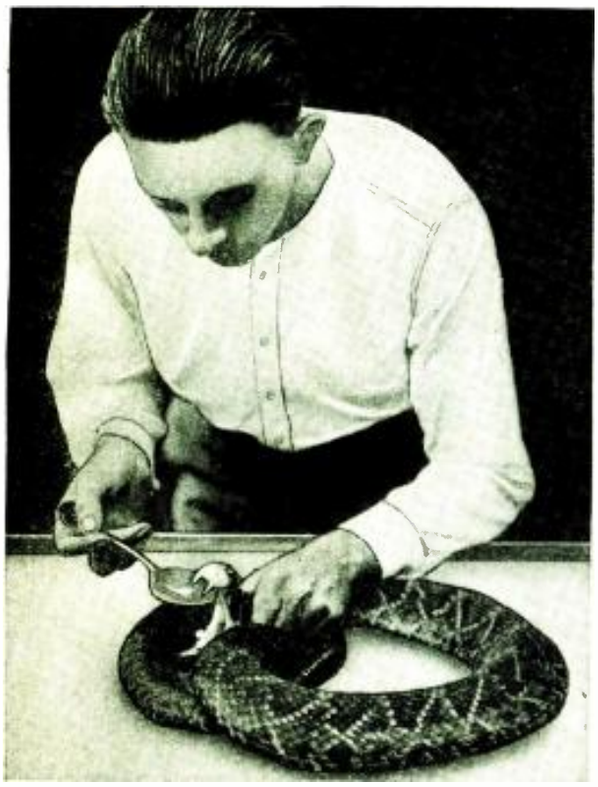




Top photo—front view of the combined "image and sound" television receiver for the Home. Center—rear view of the Loewe "home" televisor, and lower photo the cathode-ray or Braun tube used to reconstruct the image.



The newest German television system, whereby scenes are photographed from the "pick-up" camera truck here shown, the "talkie" movie film developed in one minute, flashed by short waves to the television broadcast station and picked up in theater or home on short waves also.



Dr. Delmar Nicholson of Orlando, Fla., who makes a specialty of removing the poison from rattlesnakes to be used for treatment of spinal meningitis. He is here shown removing the poison from a 6-foot specimen of the dangerous rattler—the Florida diamondback.

Short Waves Reduce POISON IN ASPIC VIPER'S VENOM

By DR. MARIE PHISALIX and DR. COLONEL FRANCOIS PASTEUR*

● The poisonous effect of the venom of the Aspic viper was greatly reduced by subjecting the venom to a high frequency oscillating field. The various experiments carried out by the two French savants are here described and undoubtedly these experiments, in the editor's opinion, will lead to a successful method of treating persons infected with snake venom with high frequency oscillations.

● IN earlier experiments we showed the action of various types of radiation on the venom of the *Aspic Viper*. The recent entry of short waves into the field of general therapeutics encouraged us to try their action also on this venom.

The technique of the researches we undertook can be understood from the following statement of our experimental conditions:

The solution of venom (10 in 1000) in saline (salt) solution, to the total quantity of 50 cubic centimeters was placed in a conical Erlenmeyer flask made of pyrex glass, having a total capacity of 100 cubic centimeters and a flat base 55 millimeters in diameter. It was suspended to avoid all propagation of the waves by direct contact, and corked to prevent evaporation and heat radiation, with an electrode of spherical base, 20 centimeters in diameter on either side. One cubic centimeter of this solution is sufficient to kill a mouse of 20 grams weight, following subcutaneous inoculation. The initial and exterior temperature of the liquid was 22 degrees; in the course of the experiments this temperature mounted to between 37.5 and 38 degrees no matter what the duration of the exposure, but the last represents an extreme figure beyond which it never rose.

Therefore the modifications in the chemical structure can be attributed solely to the electrical action of the short waves.

The power-head between the electrodes, which were sometimes 15 and sometimes 30 centimeters apart, was constant at 25 watts. The wave-length was fixed at 20 meters, thus corresponding to a frequency of the order of 15 million cycles per second.

EXPERIMENT 1—Length of exposure, 15 minutes: distance of the electrodes, 30 cm.; dose inoculated 1 cc.

Three mice were given the irradiated solution. Two of them weighed 23 and 19 grams; both died 1 hour 30 minutes after injection; the third, weighing 19 grams, died after 5 hours. Unirradiated solutions produce death for mice of this type after 6 hours normally. The toxicity of the venom thus seems to have grown, and the succeeding experiments show the reason.

EXPERIMENT 2—Length of exposure, 30 minutes; distance of the electrodes, 30 cm. (12 inches); dose innoculated 1.1 cc. (cc=cubic centimeter.)

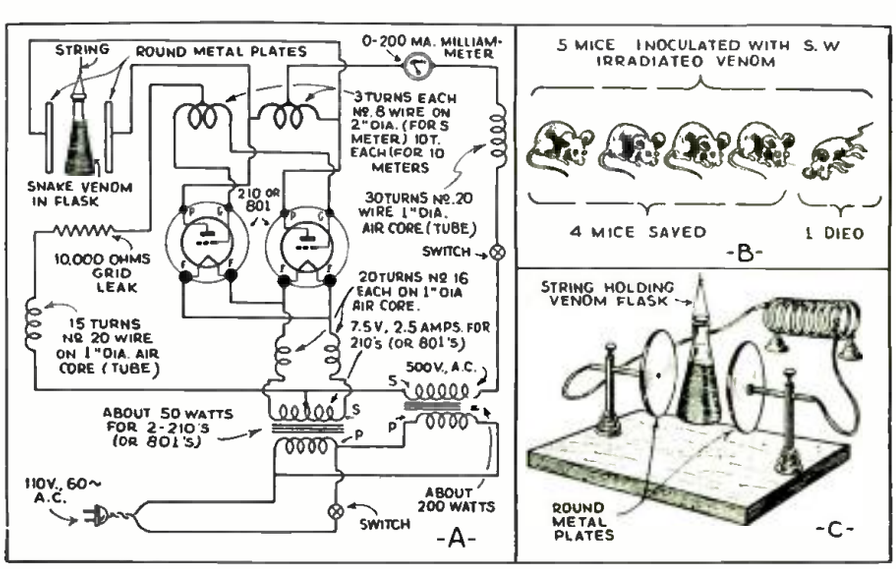
Four mice were inoculated with the irradiated solution, all weighing 23 grams each. Two of them died after 3 hours, the third after 7 hours, and the fourth in slightly less than 12 hours.

Two control mice were inoculated with unirradiated venom. One died after a period greater than 12 hours, the other resisted the venom, and moreover was vaccinated by it, for 6 days later he resisted a dosage of 1.1 cc. of pure venom, a dose infallibly fatal to a fresh animal. Thus the irradiation had had no effect on the venom.

EXPERIMENT 3—Length of exposure, 15 minutes; distance of the electrodes, 30 cm.; then another exposure of 45 minutes; distance of the electrodes 15 cm, dose injected 1 cc.

Three male mice were used. One, weighing 20 grams died after 20 hours; the two others, which weighed 19 grams each, died after 7 and 8 hours respectively. The control mice died after 5 and 6 hours respec-

(*Continued on page* 573)



Above: Hook-up of high frequency oscillator similar to one used for such experiments as those described. Right: In one test 4 out of 5 mice were saved and only 1 died, after being inoculated with "irradiated" snake venom. Venom is treated by suspending between 2 discs connected to high frequency oscillator.

*See also the Academy of Sciences (French), proceedings: Vol. 199, No. 3, July 16, 1934, page 235.

COLD CATHODE Tube Demonstrated!

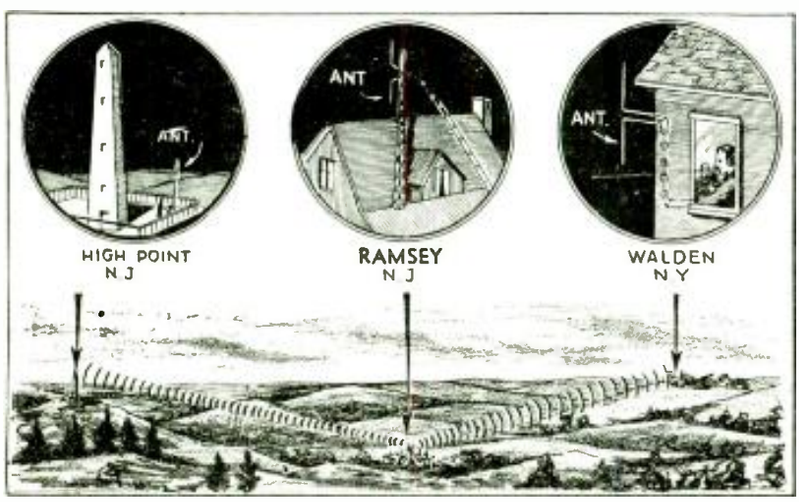
Has No Filament or Grid

● MR. P. T. FARNSWORTH, of television fame, has displayed his genius by inventing a cold cathode tube. The new tube has no filament or grid and is one of the outstanding tube developments so far to take place in the radio industry. The tube consists of two cathodes and a ring-anode sealed in an evacuated glass envelope. It can be used as a detector, modulator, or oscillator, and has tremendous possibilities. It can be made to generate oscillations over a frequency range from 2000 kc. to 60 mc., the limits of which only depend on the dimensions of the tuned circuits and it has a power output of approximately 25 watts with 35 watts input. At a recent demonstration, one of these new tubes was used to maintain communication between San Francisco and Honolulu, and between New York and San Francisco, on approximately 35 meters. On this test, the cold cathode tube was used to drive a pair of 150 watt tubes in the final amplifier of a transmitter. With 1100 volts, at 30 milliamperes, on the anode, ample excitation for the two 150-watt tubes was obtained. The cathodes of these new tubes are coated with Caesium silver oxide to facilitate secondary emission. A large solenoid is placed around the tube and supplied with direct curent in order to maintain an intense magnetic field which envelopes the tube. When used as an amplifier a high frequency voltage should be applied to the cathode terminals and a DC voltage should be applied to the anode, to hold it at a positive potential with respect to the cathodes. In this case, the cathodes are shunted with a coil and variable condenser in parallel. This tuned circuit, of course, should resonate at the frequency of the applied high frequency voltage. The longitudinal magnetic field prevents any flow of free electrons in the inter-electrode space from being drawn to the anode. The high frequency (*Continued on page* 555)

Ralph M. Heintz (center) explains the operation of the Farnsworth Cold Cathode Tube to Bernard H. Linden (left), U. S. Radio Inspector, and Donald Lippincott (right), director of Television Laboratories, Inc.

Over Mountains on 5 Meters!

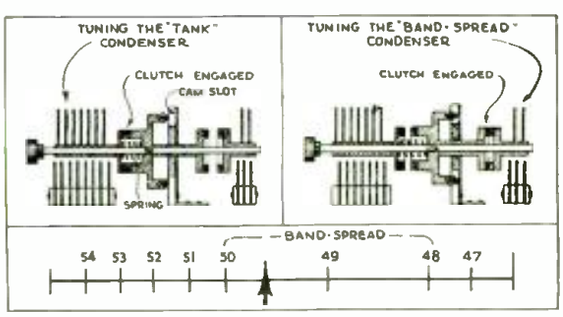
● THE old question of whether or not communication on ultra high frequencies can be held between stations located in mountainous areas seems to have taken a backward step within the last few months. Scientists have claimed that ultra high frequencies are more or less quasi-optical—that is, the transmitting and receiving stations must be in optical sight of each other. Recently Dr. Marconi in an interview with the editors, stated that he had been successful in getting through mountainous areas on the ultra high frequencies but that he was unable to state whether or not the signals went *over* or *through* the mountains until further tests had been made. In the drawings, we have endeavored to show the readers the condition which exists between three stations namely portable W3AC at High Point Park, N.J., W2HBW at Walden, New York, and W2AMN (*Continued on page* 558)



Remarkable distances, considering the intervening mountainous country, have been covered on the 5-meter band as shown in the accompanying picture.

Automatic Band-Spread!

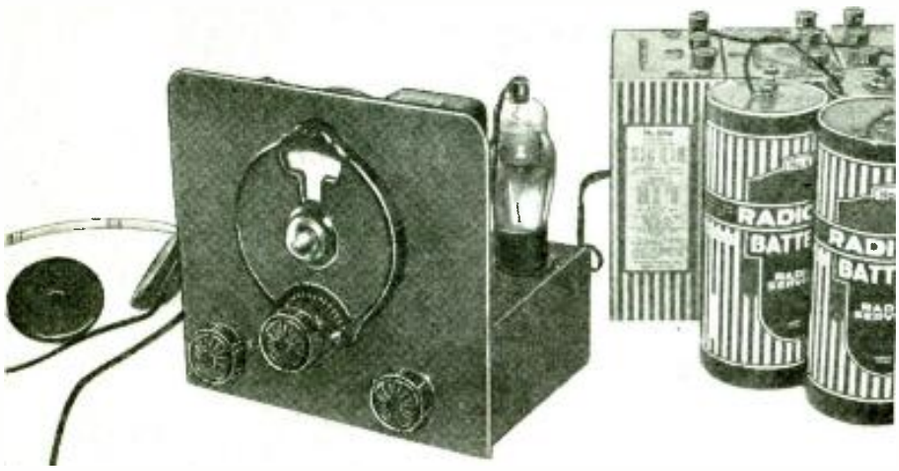
● WHAT practically every All-Wave receiver needs today is some form of *band-spread*, especially when trying to separate the stations in the badly crowded 49-meter band, which carries quite a number of American, as well as European short-



We predict that tomorrow practically every All-Wave receiver will have some form of "automatic band-spread" to simplify tuning on such crowded bands as the 49 meter

wave broadcast programs. Hugo Gernsback, the editor of this magazine, has conceived a very ingenious arrangment of *automatic band-spread*, which we dare say will be found on practically every *all-wave* set tomorrow, in some form or other. As the diagram shows it would be a very simple matter to adapt Mr. Gernsback's idea to any receiver so that when the main tuning knob is turned and the indicator is on the 49-meter band, for example a cam-operated clutch attached to the main tuning shaft disconnects the "tank" condenser and connects a *band-spread* condenser in its place. The ap- (*Continued on page* 558)

"Economy 2" Battery



Above—is the general view showing the "Economy-2" together with the necessary batteries. Note the extremely neat appearance of this set.

● SHORT WAVE "fans," step right up! Here is the short-wave battery set you have been waiting for! It has all the "earmarks" of a set using the A.C. operated tubes, but works efficiently on dry cells! It makes use of the new type 15 tube, which has an indirectly heated cathode and allows the use, at last, of efficient electron-coupled circuits with battery tubes.

● THE fellows in the rural districts where there is no electric power supply, at last have an excellent chance to construct a receiving set with all the "earmarks" of an *electrified* 110 volt outfit. This is made possible by the introduction of the new Sylvania type 15 screen-grid pentode. It is a modern tube, designed to work from a two volt battery supply with moderately low current drain (.22 ampere). Its greatest feature of course is the *indirectly heated cathode*. This makes possible the construction of a set that has *no microphonic tube noises!* The tube has an amplification factor of 600 with 135 volts on the plate!

As a regenerative detector or oscillator the tube performs equally as good as most of the others which work on higher heater voltages. The input (grid to cathode) capacity is only 2.35 mmf. rendering it better suited for high and ultra high frequency work than many other types of screen-grid tubes. The set herein described uses two of these tubes, one as a *regenerative detector* and the other as a *triode audio amplifier*.

The detector is connected up in the usual manner, but the audio differs somewhat from the usual run of circuits. The 15 type tube could not be used satisfactorily in the audio stage as a pentode, because of its high plate impedance and the fact that we must connect the earphones in its plate circuit in this particular receiver. To get around this we have connected it up as a triode by connecting the screen-grid directly to the plate. The suppressor of course cannot be connected to the plate because it is already connected to the cathode inside the tube. Bias is obtained, in the usual manner, by inserting a resistor in the cathode circuit.

With this new tube we can use some of the well-known electron-coupled circuits in a much simpler manner. There is a wonderful opportunity for the "battery set" constructor and many new ideas will undoubtedly be presented in the near future.

3 Dry Cells Run 2 Tubes

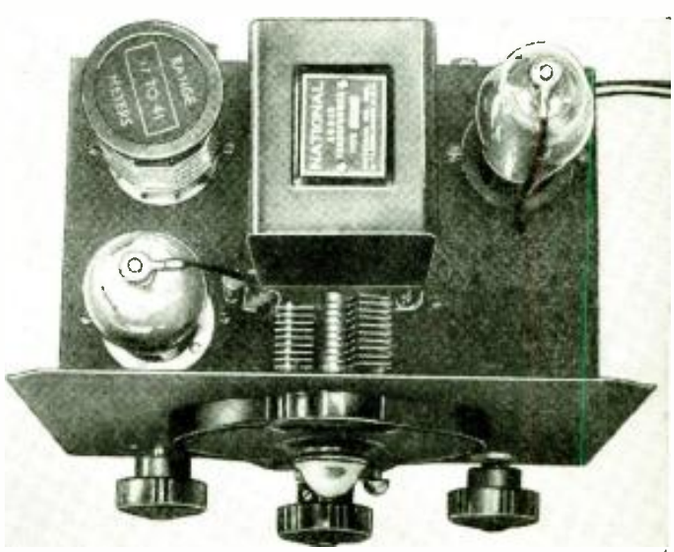
The heater current of the 15 is .22 ampere and while this is considerably higher than the average battery-operated tube, it can be worked out very nicely by simply connecting the heaters in series. In using dry batteries we find that they will give better and more economical service when the current drain is low. When we connect these tubes in series, we have to increase the voltage; however the current requirements remain the same. (.22 ampere.) For two tubes the voltage required is 4 and for three tubes the voltage is 6. A three tube set could be run very economically with four dry cells.

The various values used in the detector circuit are nearly the same as in any regenerative set. The grid condenser is a .0001 mf. affair and best results were obtained with a three megohm resistor for the grid-leak. Plug-in coils are used for convenience and are the new Hammarlund type wound on ribbed "XP-53" forms and cover a range of from 17 to 270 meters. Only two windings are used, one for the *tickler* and one for the *grid coil*. The tuning condenser has a capacity of 140 mmf.; for band-spread another small condenser having a capacity of 35 mmf. can be shunted in parallel with the larger condenser and serves to effect *band-spread;* the large condenser will then be used to adjust the range of the smaller one.

Regeneration Control

The antenna is connected directly to the grid of the detector through a small Hammarlund variable padding condenser, having a capacity of 25 mmf. This condenser is mounted directly on the front panel for convenience and after once set for a given antenna needs little attention. Regeneration is controlled by a potentiometer connected in the screen-grid circuit of the 15 detector and gives very smooth control of feed-back. If the builder does not wish to use this method it can be arranged so that the plate condenser is variable instead of a fixed affair and regeneration controlled by varying the capacity. In this case the potentiometer is not necessary. The screen-grid lead is connected directly to the 22.5 volt terminal of the "B" battery.

Having a very high plate impedance the 15 tube when used as a detector requires either resistance or impedance coupling to the audio stage. In this set we use a National *impediformer*. However a 250,000 ohm resistor could be used but with considerably less volume.



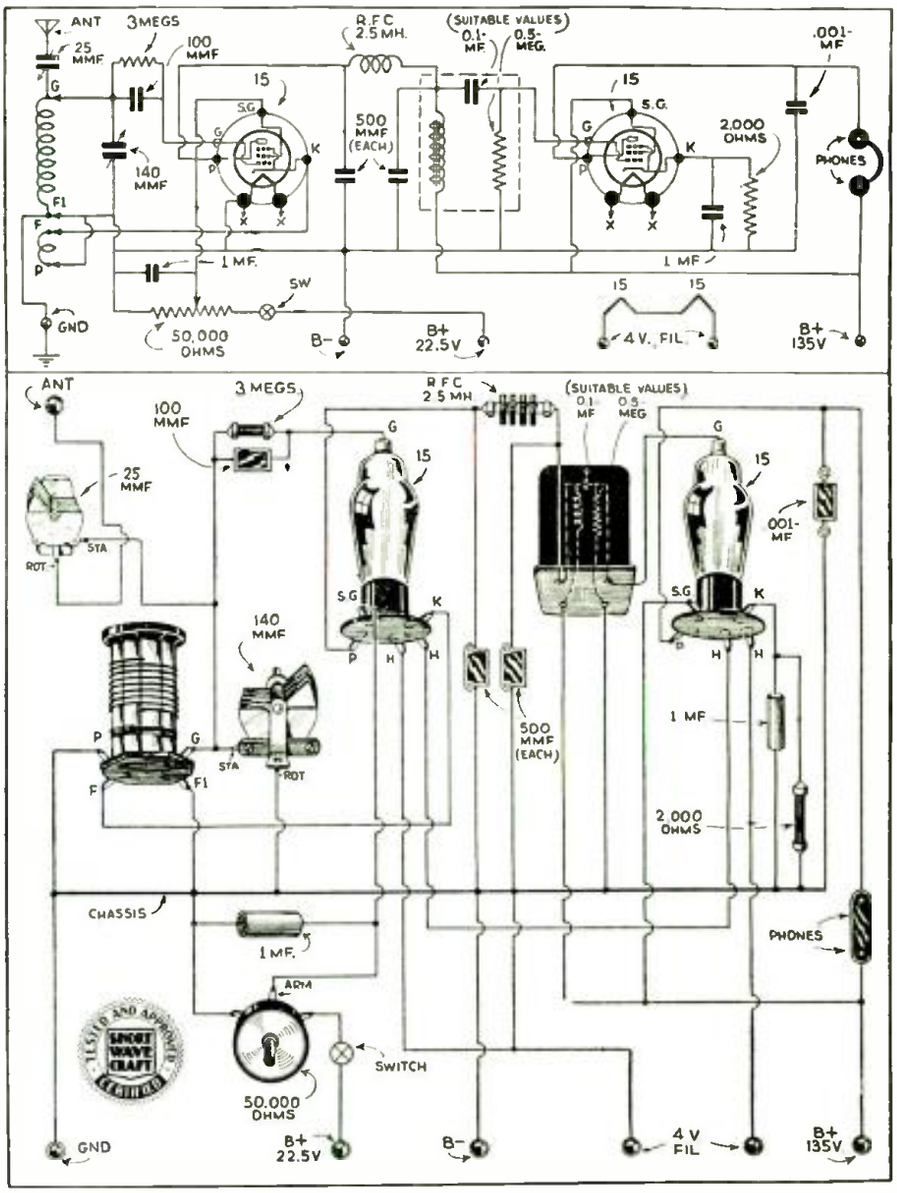
Above we have the top view, showing the arrangement of parts used in the battery operated "Economy-2."

Receiver

In the plate circuit of the 15 detector we have a radio frequency filter consisting of two fixed condensers and an r.f. choke. Two .0005 mf. condensers and a 2.5 mh. choke are used. This eliminates considerable trouble in that the R.F. currents are kept out of the audio system and a more stable set will be the result.

The audio component in the plate of the detector is fed into the audio amplifier through the .1 mf. audio coupling condenser. The grid of the audio amplifier is returned to the "B" negative through the one-half megohm grid-leak.

This set requires 4 volts for the heater supply and is run off three dry cells. This gives 4.5 volts for the two tubes or 2.25 volts for each. This, while higher than recommended, seems to have no ill effects on the life of the



Right—We have the diagrams, both schematic and physical, of the "Economy-2," using type 15 tubes.

tube. If the reader wishes to be more exact it is recommended that he use a 6 ohm variable rheostat in order that proper voltage may be obtained.

Placement of Controls

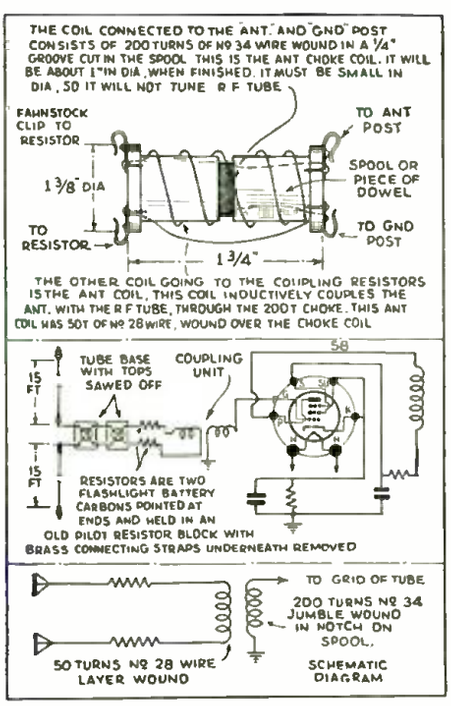
Looking at the front of the receiver we find that the main tuning dial is in the center of the panel and the antenna trimmer is located on the left-hand side. On the right-hand side is the *regeneration-control* potentiometer. In the rear view the tube nearest the coil is the detector tube. The coupling choke is located between the two tubes. If one wishes to operate the heaters of

(*Continued on page* 567)

Coupling Doublet Aerial to Untuned R.F. Set

● Here is an interesting short-wave kink. It is a device to couple a transposed antenna to an untuned R.F. set. It consists of a wooden thread spool 1⅜" x 1¾", boiled in paraffin, with a ¼" deep groove cut in the center (a wooden dowel may be substituted for the spool). In this groove 200 turns of No. 34 wire is wound in "jumble" (i.e., helter-skelter) fashion. This coil is the choke of the R.F. stage. It must be small in diameter so it will not tune the R.F. tube to a certain frequency. Over this winding a layer of insulating paper is wound. Over this 50 turns of No. 28 wire is wound, layer fashion, for a length of one inch. This coil is the antenna coil. The antenna is inductively coupled to the receiver by these two coils. Two Fahnstock spring clips are screwed to each end of the spool and the four leads of the two coils are respectively connected. A single layer of tape is then wound around the spool to give it a "commercial" appearance.

The antenna coupling resistors I used with this device were two flashlight battery carbons, pointed at each end and held in an old resistor block with the brass straps underneath removed. The regular choke or resistor in the set is removed and the secondary of the coupler connected to the antenna and ground posts, or it can be built into the receiver.

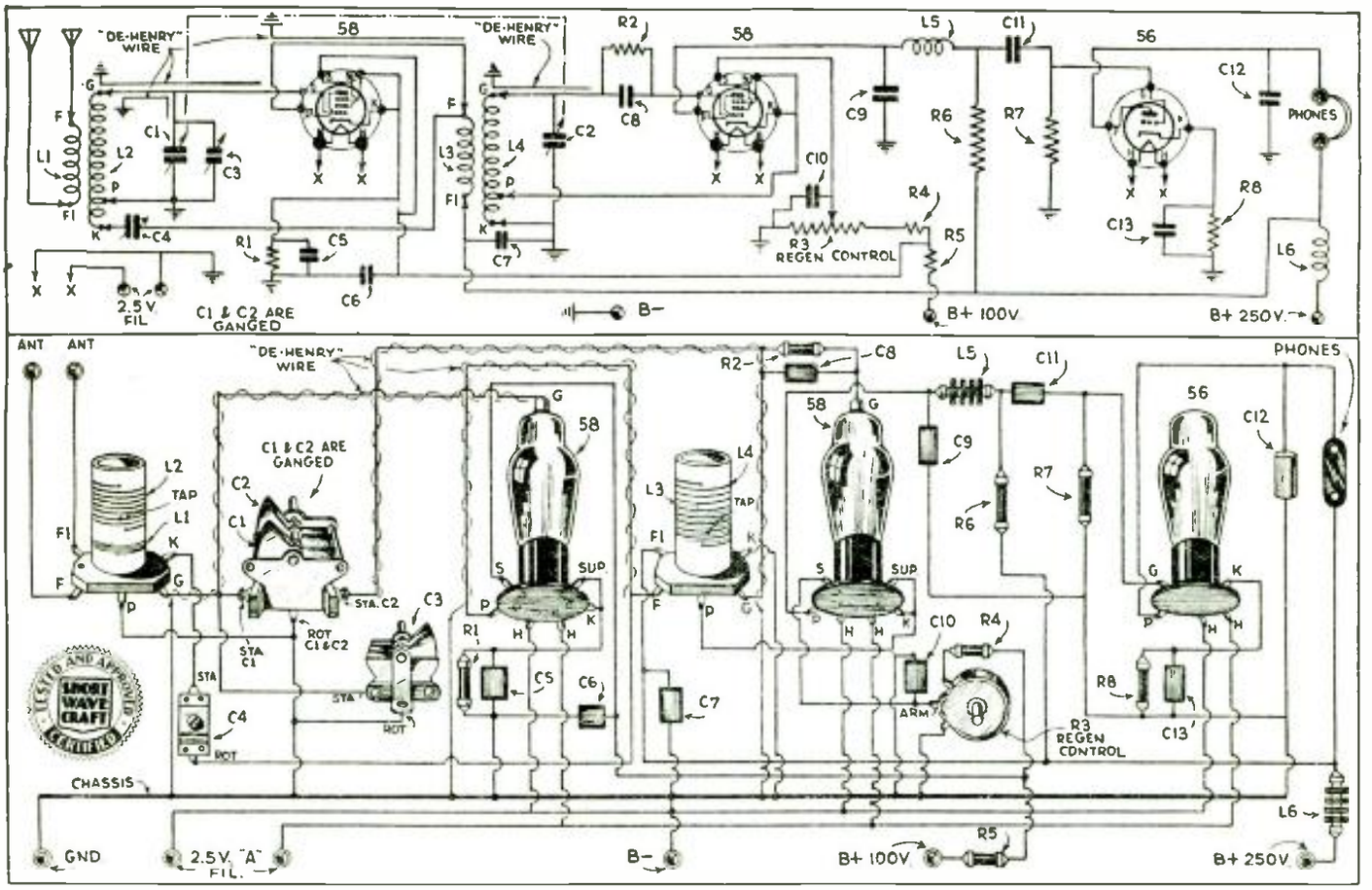


Of course, there is little use of using a special coupler and its associated equipment if a good job is not done in constructing and erecting the antenna. In noise reducing antennas it is absolutely necessary to mount the antenna as far away as possible from all sources of noise. This means that the lead-in will have to be extremely long in most cases. Two sections of the flat top in the antenna can be 15, 30, or 50 feet long each. Use enameled wire, either stranded or solid, preferably No. 12 gauge. The feeders can either be transposed with transposition blocks having one and one-half to two inch centers or can consist of any of the present day high frequency cables which

Left—complete group of drawings showing the construction and connections of the doublet antenna "coupler."

(*Continued on page* 569)

The SHORT-WAVE FAN'S



Although you may never have built a short-wave receiver, you will have no difficulty in building this smooth-working, extremely easy tuning Short-Wave Fans' "DX-ER" here described by Mr. Worcester, famous designer of the Oscillodyne, and many other sets previously described in this magazine. Both schematic and picture wiring diagrams are here presented.

● PERHAPS the most puzzling question confronting the S.W. enthusiast is that of the best type of receiver to build. The three types of receivers finding the most appeal at present are the simple regenerative receiver, the tuned R.F. regenerative receiver, and the superheterodyne. This latter circuit has the advantage over the other two as regards selectivity, but has the disadvantages of high cost and complicated construction. Aside from these disadvantages is the undesirable phenomenon of repeat points or image interference which is inherent in a superheterodyne circuit and can only be eliminated by employing a signal frequency preselection amplifier at a still further increase in the cost and involved construction. The simple regenerative receiver, on the other hand, has the advantage of extreme simplicity and low cost and is capable of receiving any signal that can be picked up on the much more complicated superheterodyne, providing that there is not too much adjacent channel interference.

The remarkable efficiency of the regenerative receiver is due to the combination of the regenerative action, which effectively reduces the losses in the tuned input circuit to zero, and the high resistance grid leak-condenser combination, which provides a type of amplification in itself, by permitting the mean grid potential to vary with the signal due to the blocking action produced. The main disadvantages of this circuit are the extremely critical regeneration control and the phenomenon of "dead-spots" produced at intervals in the tuning range by *antenna resonance*. This latter difficulty can be overcome by employing an untuned R.F. amplifier stage. The over-all efficiency of the receiver is adversely affected by this procedure, however, due to the fact that the untuned *amplifier* actually acts as a "losser" at the higher frequencies, such as those employed for short-wave broadcast transmission.

Overcoming Disadvantages of Simple Regen. Set

The tuned R.F. regenerative receiver overcomes both of the disadvantages of the simple regenerative set by impressing a stronger signal upon the grid of the detector, and further by isolating the *high-gain* detector circuit from the antenna system. The addition of a tuned R.F. stage introduces some complication in that rather extensive shielding of the two circuits is necessary if interlocking of controls and possible oscillation are to be eliminated. Obviously, an additional tuning condenser, set of plug-in coils, tube, and trimming condenser are also required. In the past, it has not generally been found possible to obtain sufficient gain in the R.F. amplifier to warrant the installation of the above additional apparatus, with the consequent increase in cost of the completed receiver and attending constructional difficulties. While a voltage gain of 200 is possible in an R.F. amplifier stage at a frequency of 465 kc., and a gain of 50 or more easily obtained throughout the broadcast band, it is not ordinarily possible to exceed a gain of 5 or 10 at the frequencies used for S.W. broadcast transmission.

For some time the writer has been interested in the problem of increasing the "gain" in a short-wave R.F. amplifier stage and has incorporated his findings in this connection in the receiver to be described in this article. Two main reasons were found for the marked decrease in amplification at the S.W.B.C. frequencies and satisfactory methods of eliminating same were evolved. The first and most obvious difficulty experienced on the short waves was the much poorer L/C ratio existing when the conventional 100 or 140 mmf. tuning condenser were employed. The smaller the ratio of inductance to capacity in the tuned circuits the smaller is the voltage developed across the same at resonance. Of course, this voltage also depends on the series resistance of the tuned circuit and consequently this latter quantity should be reduced to as low a value as possible. In this receiver, the L/C ratio is increased by employing tuning condensers having a maximum capacity of only 25 mmf. Separate plug-in coils

"DX-ER"

By J. A. WORCESTER, JR.

THIS MONTH'S $20.00 PRIZE WINNER

● This set was designed especially for the 19, 25, 30 and 49 meter short-wave broadcast bands. Among the new features—this set spreads the stations over the dial for easy tuning; lead inductance loss is reduced to a minimum; detector is electron-coupled; R.F. stage is neutralized; "doublet" aerial is used; improved signal strength provided by high L-C ratio, due to using low-capacity tuning condensers.

As will be seen from this picture the various units comprising Mr. Worcester's latest receiver are well isolated by proper shielding. This set will enable you to enjoy the daily "musical" and other programs broadcast by "World-Wide" short-wave stations on the 19, 25, 30, and 49 meter bands.

are then provided to cover the 19, 25, 30, and 49 meter broadcast bands. Another advantage resulting from the use of a small tuning capacity is the greatly increased station separation on the dial, which reduces the congestion usually experienced on the shorter waves and obviates the necessity of providing a band-spreading arrangement. The series circuit resistance is reduced by employing isolantite coil forms and by spacing the turns. Resistance introduced by the variable condensers is minimized by employing a low-loss unit in which dielectric losses are greatly reduced by employing "mycalex" insulation.

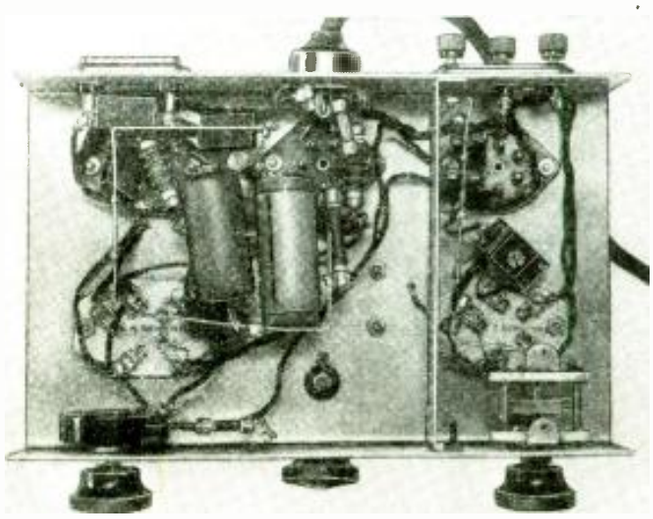
Precautions Necessary to Eliminate Losses

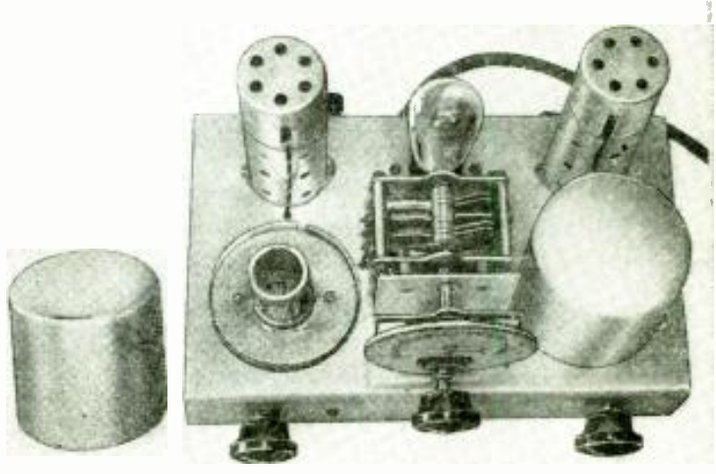
In spite of the above precautions it will be found that results still fall far below the value theoretically possible. A careful study of this situation revealed that this state of affairs was largely due to the characteristic impedance of the wiring itself. Although it may appear that the amount of wire carrying R.F. does not amount to much as far as actual length is concerned, it should be remembered that 6 inches of wire at the frequencies employed in S.W. broadcasting is equivalent to one mile of wire used to transmit voice frequencies. Hence, it will be appreciated that in an electrical sense we are dealing with *fairly long lines* and the distributed constants of the same will have to be taken into consideration. Any electrically *long line* having distributed constants has what is known as a *characteristic impedance*. This impedance depends on the value of the various constants and more particularly on the *distributed inductance and capacitance*. If we assume for the sake of illustration that the *characteristic impedance* of the lead connecting the plate of the R.F. amplifier tube to the primary winding of the R.F. transformer has a characteristic impedance of 25,000 ohms, it is apparent that even if we increase the shunt impedance of the tuned output circuit to infinity, which can be approximated by the critical application of regeneration, the actual plate load *as the plate sees it*, is only slightly greater than the characteristic impedance.

If the lead in question were several wavelengths long, then the plate load would be determined entirely by the characteristic impedance of the wire and would be entirely independent of the plate load. As it is, the effect of the plate lead is to decrease the impedance of the circuit at resonance. The above discussion applies equally in the case of the grid leads and leads connecting the secondary inductances to the variable condensers.

"De-Henried" Wiring

In this receiver the above discussed effects were eliminated by employing what for convenience's sake will be called *de-henried* wiring. The purpose of this construction is to reduce the inductance of the leads carrying R.F. current to a negligibly (*Continued on page* 549)





The two photos above show bottom and front views of the Short-Wave Broadcast Fan's "DX-ER." It employs but 3 tubes and operates from the 110 volt A.C. circuit. The plate supply can be from B-batteries, B-eliminator, or power-pack.

5-Meter SUPER-HET

By George W. Shuart, W2AMN.

Above we have the general view of the compact, ultra-high-frequency superheterodyne.

● SUPERHETERODYNE receivers have become the "by-word" in radio reception on all wave lengths above 10 meters. It has been proved to everyone's satisfaction that a *superhet* is far superior to any other kind of receiver. That is, providing it is *well designed!* However on the ultra high frequencies the superhet has never become very popular; this is due to several well-known facts. First—most of the amateur transmitters operating on the higher frequencies are of the modulated oscillator type and are consequently very unstable because of the high degree of frequency modulation. And—frequency modulation and superhets don't agree!

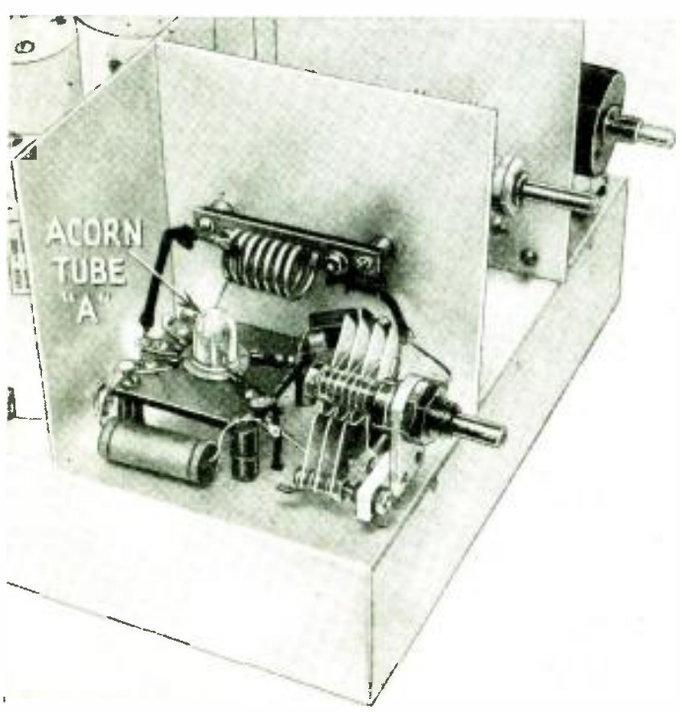
Second—it has been, up to the present time, very difficult to obtain tubes for the high frequency portion of the superhet that were suitable. Third—the background noise such as power-leaks, automobile ignition and general QRM caused by hundreds of electrically operated devices are amplified to a very great extent on a receiver using double detection and more or less override the desired signal.

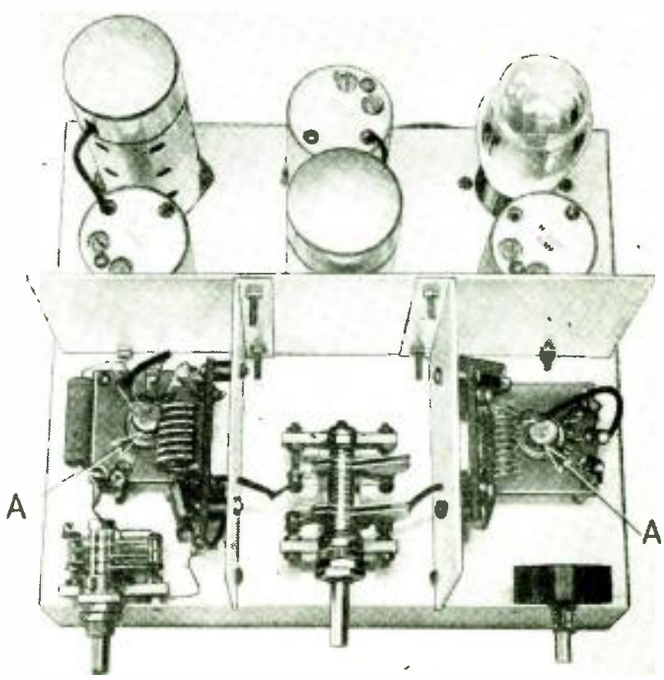
All but the last of the above can be overcome very successfully in the following manner: We can improve our transmitters by using M.O.P.A. circuits, and by making use of the "Long Lines" in the tuning circuits, described by the writer in recent issues of this magazine. We now have the new RCA 955 tube which is especially designed for frequencies above 56 megacycles. With the above mentioned facts in mind the decision was made to design a superhet, that was usable under ordinary conditions, and prove to ourselves just when and where a "superhet" could be used.

Some very interesting effects were noticed during the process of designing this receiver. We found that about 75 percent of the stations now operating in the 5-meter band could be received with fair intelligibility, at a far greater volume level than with an ordinary super-regenerative set which is extensively used today. Stations that were too weak to be understandable with the super-regenerator were brought in with *comfortable room* volume on the superhet, although in locations having a high level of "man-made" static the superhet proves to be far too sensitive and its full value could not be appreciated.

The Circuit Uses 2-955 Acorn Tubes

The high-frequency converter section of this set uses two RCA 955 Acorn tubes, one as *detector* and the other as the *oscillator*. The circuits are more or less conventional and little need be said of them. The cathode in both cases is not at ground potential. In the first detector we introduce regeneration in order to increase *sensitivity;* the diagrams are self-explanatory. Coupling between the oscillator and first detector is accomplished by virtue of the tuning condenser construction. The condenser is a National type SE90 remodeled to have two sections consisting of two rotors and two stators in each section. The rotor plates are so placed that they do not come between the stators of each section. In other words the stators are responsible for





These two views clearly illustrate the general construction and layout of parts. Note the specially constructed two-gang tuning condenser.

Uses ACORN Tubes

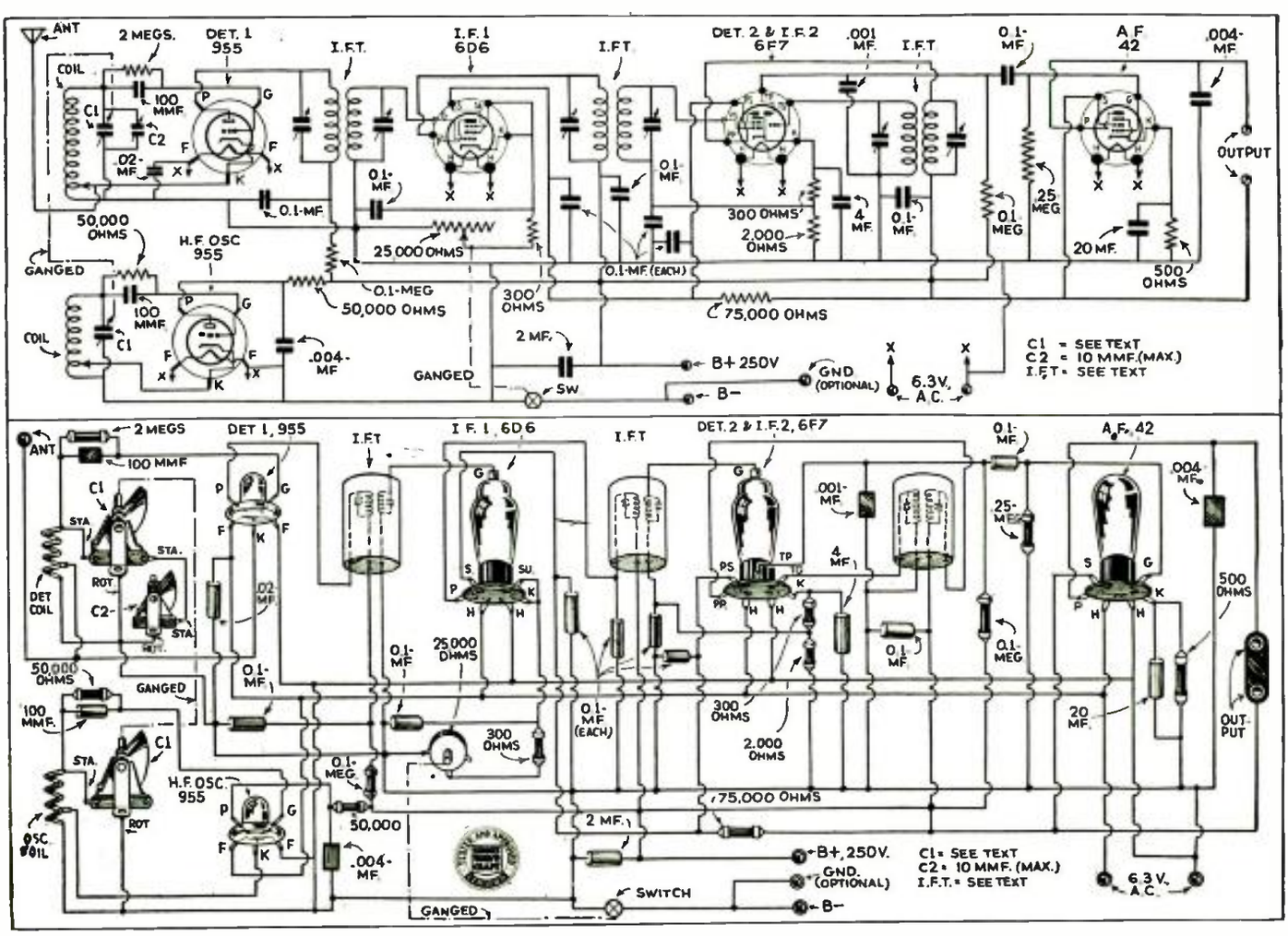
Are superhets practical on ultra-high frequencies? The author has endeavored to present in this article some very interesting facts regarding the construction of an up-to-date, ultra short-wave superheterodyne receiver, and has clearly brought out its advantages over other types of receivers. This set uses the new RCA "Acorn" tubes in the high frequency portion. Special information is given regarding the proper construction of the intermediate frequency transformers, which are really the "heart" of a set of this kind. Five tubes are used, which provide 6-tube performance.

coupling between the oscillator and detector. The spacing between the two condensers being approximately one-half inch. If the builder wishes to *spread the bands* over a greater portion of the dial it is suggested that the tuning condensers have only one rotor and stator plate. With the four plate condensers the 5-meter band covers about 30 points on the dial (at the low capacity end of the scale) and it is so sharp that it is possible to receive five strong stations over the width of a single division! *Is that selectivity*, when compared to a super-regenerator?!

In the diagram it can be seen that the antenna connects to the cathode tap on the coil, this is to prevent the detector from oscillating. If trouble is encountered due to oscillation here, it is advised that a variable resistor or potentiometer be put in the "B" plus lead of the detector. Shielding is accomplished by the three upright aluminum sections formed to provide three compartments; the cabinet used is a National SW3 metal box.

The Low Frequency Amplifier

The greatest trouble in *superhets* of this kind has always been in the "IF" amplifier. Conventional "IF" amplifier design is not practical on the higher frequencies. The "IF" amplifier must be rather broad in frequency response and have a nearly "flat-topped" *selectivity* curve. The writer has designed the IF transformers so that *double hump* selectivity is obtained. This effect is obtained when the two sections of the transformer have a high value of mutual inductance. Very close coupling between the windings causes high mutual inductance and (*Continued on page* 571)



Above we have the schematic and physical drawings of this ultra-high-frequency superheterodyne, clearly showing the connections to various parts.

WORLD-WIDE SHORT-

Hints in Short-Wave Receiver Design

● THE circuit here, which appeared in the latest issue of *Bastelbriefe Der Drahtlosen*, a German radio magazine, while fundamentally quite common, being of the regenerative type with a stage of R.F. amplification and a pentode audio stage, has some novel tricks tucked away which are not at first evident.

The short-wave experimenter would do well to study this circuit carefully, and profit by this well-designed set, as yours truly—the Editor—did.

First, look at the *power-supply* section of the set. It appears to have a few extra condensers, but is otherwise commonplace. These condensers, though, are what "do the trick!" Four .1-mf. by-pass condensers shunted across the high voltage winding and the rectifier filament winding prevent any stray R.F. currents to feed into the grid or plate circuits of the R.F. or detector tubes. The use of the condensers across the rectifier filament is unusual, and quite logical, as this winding is at a high potential with respect to the core and the other windings of the transformer. In addition, it will be noticed that the usual buffer condensers have not been omitted from across the primary winding. This combination will no doubt help to remove some of that annoying background noise with which you have been troubled.

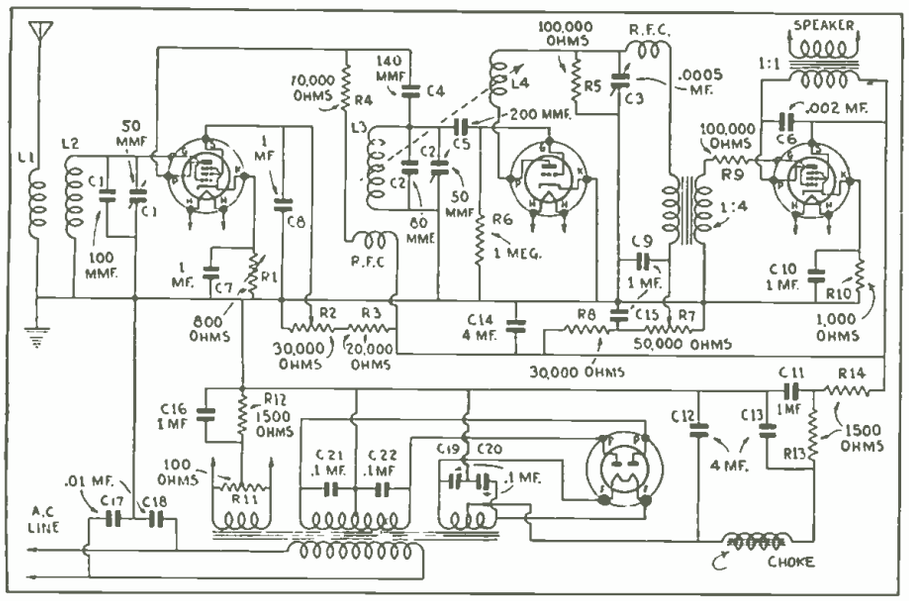
Next, a continuously variable control in the form of a variable resistor and a fixed limiting resistor is used for the screen-grid of the R.F. tube. This seems superfluous, at first, but is a very handy control to have, when the last ounce of amplification is desired to bring in that weak station. By bringing the R.F. tube to a point approaching oscillation, the output of this tuned stage can be almost doubled, according to some experiments tried by the Editor. But the adjustment is dependent on frequency—therefore the adjustable control.

Regeneration in this set is controlled by a plate condenser, shunted by a fixed resistance. This resistor has the effect of broadening the adjustment of the condenser, to facilitate adjustment, and while it may reduce the regeneration a little, this is easily compensated by a little closer coupling of the tickler coil. The resistor also has a tendency to prevent "fringe howl" and is really a worth-while kink.

To further prevent the last named trouble, a resistor is connected in series with the secondary of the A.F. transformer which has the effect of suppressing oscillation tendencies in the pentode amplifier.

One other scheme resorted to, which is worth mentioning in this receiver, is the method of coupling the R.F. amplifier to the detector. Capacity coupling is used, but as R.F. chokes are notably full of resonance points (even when well-made and designed) a 70,000-ohm resistor is connected in series with the choke. Then, if any resonance points are encountered, the R.F. currents will be blocked at least by the high resistance. The plate voltage, though, is not seriously reduced as the resistance is not very high. The resistor acts as a sort of extra protection against "dead spots."

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

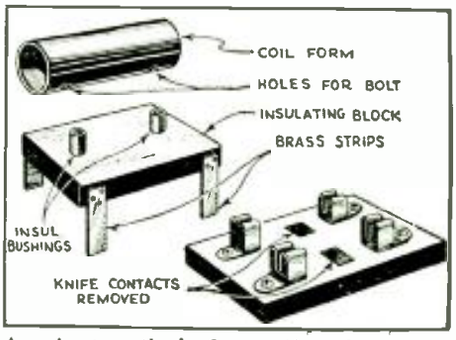


Improved German hook-up of 3-tube S.W. receiver with highly filtered power-supply. Regeneration is controlled by a variable condenser shunted by a fixed resistance.

S.W. Coil Mounting

● ODD methods of mounting plug-in coils for short-wave receivers have long been the secret hobby of many a short-wave enthusiast, including the Editor.

An issue of *Toute La Radio*, a French magazine, contained a method which is interesting because it is so unique in design and also because it utilizes some of those old parts which are cluttering up the box in which you keep unused coils, condensers and similar "gadgets."



A unique method of mounting short-wave plug-in coils, using parts of an old knife-switch.

As shown in the accompanying sketches, the scheme consists of taking double-pole, double-throw knife switches, removing the throw contacts and insulated handle and putting the remaining four contact clips to work holding coils which are made to fit.

The knife portion of the switch is cut up into sections which are secured to bakelite, wood, or similar blocks of the right size, depending on the dimensions of the switch. The coils, themselves, which may be of any desired type, are secured to the insulated block and wired to the strips on the sides.

Only one switch is needed for each coil assembly, and any desired number of coils can be made to plug into the receptacle thus formed.

An Inexpensive Transmitter

● LAST month's *Bastelbriefe Der Drahtlosen* featured an inexpensive amateur transmitter, covering the usual amateur bands of 20, 40 and 80 meters. While simple transmitters are not often advocated for amateur construction in this country, due to the interference difficulties encountered when such broadly tuned circuits are employed, this transmitter when used for C.W. work will be sufficiently selective as a beginner's unit.

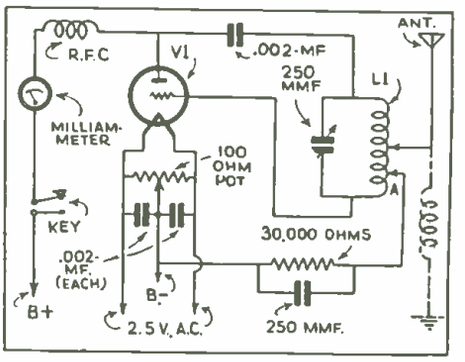


Diagram of simple triode transmitter.

The transmitter contains a single tube of the triode type using an A.C. filament supply. The coil for the 80 meter band consists of 15 turns of No. 10 or 12 wire, wound on a form 3 inches in diameter. The 40 meter coil contains 10 turns and the 20 meter coil, 6 turns. A spacing of approximately ⅛ inch is left between turns.

In the circuit here, direct coupling is used between the tuning coil and the aerial. The radio regulations in the U. S. prevents the use of such coupling and it will be necessary

WAVE REVIEW..

Edited by C. W. PALMER

to connect the aerial to a small coil consisting of 3 or 4 turns of heavy wire wound on a form about 1½ inches in diameter.

The R.F. choke in the plate supply circuit consists of 250 turns of No. 28 D.C.C. wire on a 1 inch form. The values of the remaining parts are shown in the circuit.

While the construction of a simple transmitter of this type is quite easy, the experimenter must keep several things in mind. First, it is necessary to have an amateur transmitting license to operate any radio transmitter. This applies to a unit of any power, however small, since short-wave transmitters can cover great distances with the simplest types of equipment. Second—it is necessary to keep within the regulations of the government regarding the frequency on which signals are transmitted; and third—with a transmitter of this type very low power should be used so that it does not interfere excessively with other amateurs. A small receiving tube such as the type 56 with about 200 volts on the plate will be a satisfactory compromise.

A Cuprous Oxide Rectifier

The newest German wonder—a cuprous oxide rectifier that can be used as a diode rectifier, second detector, or A.V.C. rectifier.

● ALTHOUGH this device is not especially suited to short waves, it is of interest to the short-wave fan, who builds the superhet type of set.

It is a new cuprous oxide rectifier designed with the idea of keeping the internal capacity low, so that it can operate on frequencies well up into the radio frequency spectrum.

This rectifier, which can be used as a "diode" type rectifier, as a second detector or as an A.V.C. rectifier, consists of a series of five elements housed in a small insulated tube, with metal ends.

This rectifier will carry approximately .25-ma. continuously and will operate efficiently on wave lengths as low as 200 meters. The capacity is too high for successful operation on the short waves, but since the superheterodyne circuit is so much in favor, it can be utilized very effectively.

This new rectifier is available in Germany under the trade name of *Sirutor-Rafa.*

Ultra-Short Wave Developments

● THE introduction of ultra-short-wave radio communication into commercial use has speeded the practical development of this phase of communication to a marked degree.

The use of these waves for telephony across the English Channel, etc., have furthered the need for dependable circuits and devices.

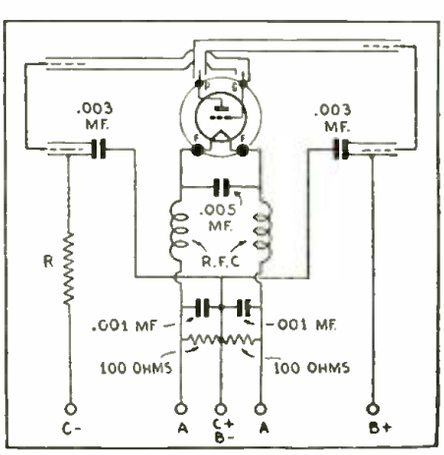


Diagram shows method of tuning grid and plate circuit by sliding copper tubes.

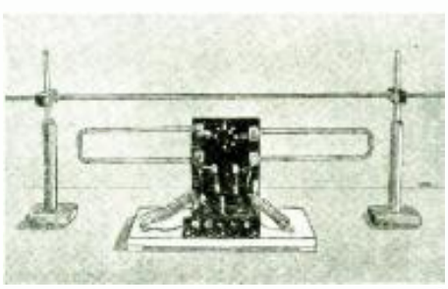


Photo of "trombone" tuner for grid and plate circuits of ultra short-wave set.

One of the difficulties that has hindered the rapid development of transmission on "ultra-shorts" is the need for flexible control of frequency, especially if *dipole* aerials are utilized.

A recent issue of *Funk* magazine, a German publication, outlines a new method for tuning transmitters—a development of Messrs. Kuhn and Huth—which overcomes some of the difficulties mentioned above. As shown in the accompanying illustrations, it consists of an oscillatory circuit in which the grid and plate tuning is accomplished by shifting sliding copper tubes which make up the grid and plate inductances, until the correct inductive and capacitative value is attained. A study of this circuit shows the similarity to the commonly used "tuned-grid, tuned-plate" circuit which all Hams have used on longer wave lengths at one time or another.

This easily tuned oscillator is then coupled to a half-wave radiator by simply bringing the entire oscillatory circuit near the aerial. This provides variable coupling to permit variation of output and to reduce aerial damping to a minimum. The oscillator can, of course, be coupled to any form of radiator, either inductively or through a suitable condenser, though other methods than the one shown do not offer the same flexibility or ease of adjustment.

The oscillator shown is a simple, theoretical circuit, which may be modulated, amplified, or keyed in any desired manner. It will, however, give the experimenter some "food for thought" along the lines of simplification and ease of adjustment.

Directional Effects on Ultra-Shorts

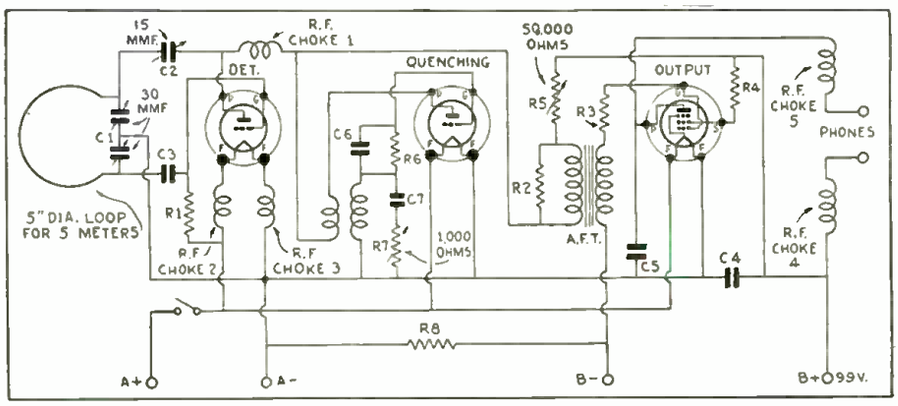


Diagram of "loop" receiver for 5 meters. It's a super-regenerator.

● EVEN so lucrative a field as ultra-short-wave amateur radio becomes prosaic if the experimenter does not have some object in view when pursuing his hobby. A well-known writer in *Wireless World* appreciated this fact in presenting some practical observations on a radio field day held in England a short time ago.

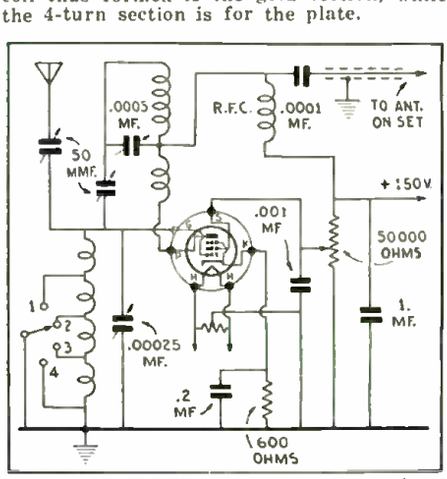
The aerial systems on ultra-short waves—that is wave lengths below 10 meters, act entirely different than the same systems on longer waves. For example, the point of greatest signal strength when using a loop aerial for reception (position of the loop) is just opposite to that on longer waves, when a horizontal di-pole type of radiator is used at the transmitter. Also, using a loop, signals fall very rapidly if the loop is less than 4 feet above the ground, but do not increase to a noticeable degree if greater heights are used.

In the attached circuit, a simple 3-tube super-regenerator is shown. This circuit was used by the author of the article mentioned in the Ham's "field day" and shows how a loop aerial can be connected to an ultra-short-wave receiver. (The loop should be approximately 5" in diameter for 5 meters.—Editor.)

An Italian Converter

● IN this month's mail bag of foreign magazines, we have a new one—*Radio Lux* from Milan, Italy, which presents a simple short-wave converter.

The converter covers the wave lengths between 12 and 70 with a set of four tapped coils in the grid circuit. The grid coils are wound on a piece of 1½-inch-diameter tubing and consist of 4 turns for the first section, 4 for the second, 5 for the third and 6 for the fourth. Number 24 enamel wire is used and a space of ¼ inch is left between sections. The oscillator coils consist of 10 turns of No. 24 enam. wire on a tube 1½ inch in diameter with a tap at the sixth turn. The 6-turn coil thus formed is the grid section, while the 4-turn section is for the plate.



New "Hot" S-W Converter circuit from Italy. The tube is a R.F. pentode.

Short Wave SCOUT NEWS

Report from Official Listening Post of Geo. D. Sallade, Sinking Spring, Pa.

● RECEPTION at this post was excellent in the last month. Several new signals were heard in great fashion.

All short wave "fans" should give a vote of thanks to the Eucharistic Congress which indirectly was responsible for many broadcasts from the South American city, Buenos Aires. Among the transmitters heard at this post were LSY, LSQ, LSX and LSN.

For several days a new Netherland station has been heard with an R9 signal. The approximate frequency is 15,220 kc. The schedule is almost identically the same as PHI. This station I believe is operated by Phillips Radio.

On October 19 a new German station was heard testing with Tokio. The call was announced as DFC and the wavelength as 20 meters.

"La Voz del Tropico" was heard transmitting a program for the I.S.W.C. on October 20th at 9:15 P.M. E.S.T. Signal strength was very good.

The Japanese transmitter on 6700 kc. continues to be heard at R6 strength. The best time in Eastern Pennsylvania is about 6:00 A.M. E.S.T.

On October 23, J1AA on 15760 kc. was heard testing with KWO. The time was 6:00 P.M. E.S.T.

Two recent verifications are printed below:

Roma (125) 21/9/34
Via Calabria N. 46/48

Dear Sir,

We are in receipt of your letter Sept. 3, 1934 and we confirm as correct your reception of our Station IRM on the date and time given.

We are sorry not to be able to send you any schedule of transmissions because only on special occasions our short-wave stations retransmit programs from the Italian broadcasting stations.

Yours truly,
Societa Italo Radio (signed)

Moscow, the 5th October, 1934.

Dear Sir,

We have received your letter of the 15th ultimo, and beg to confirm your report of our test transmission on that date through our Radio Stations RKI and RNE.

Yours very truly,
(signed)

Official Listening Post Report from Heinie Johnson

● OCTOBER has been a treat in more ways than one to "short-wave fans." The air has cleared up, new signals have appeared and DX hounds have begun "dial twirling."

Regardless of opinion of any expert to the opposite, CQN is the call of a Chinese signal on 52 meters. Works irregular in early mornings, phonograph records and voice. Most powerful signal heard here this month, especially on morning of October 9.

Watch for "Radio DUSA" located at Lima, Peru. Heard evening of October 20 on 51 meters. Post Office Box announced as 853.

This new catch is an R9 signal with a fine quality program.

Every "fan" in America should be able to enjoy an evening of excellent music from COC now. This station will receive many reports. Post Office Box 98, Havana, Cuba.

YDA on 49.02 meters is heard almost daily. Strong signal but fairly high noise level. We believe our good friend who enjoys reputation of being the world's No. 1 announcer has deserted PHI to work at this station and where is PHI?—we have not heard them for a couple of weeks. Tune for YDA early in mornings.

Our Jap. friend, JYR, JYM, etc., has moved main channel operation to about 42 meters. Good signal.

"League of Nations" heard well on 38 meters.

GSB now working each night until 3:30 a.m., C.S.T.

19 meter band better than usual.

Germany has a new signal on about 16.50 meters.

This post wishes to thank the many "fans" who wrote to him during the past 60 days and assures you that he enjoys your letters. Effort has been made to answer all individually. For those interested in our receiving equipment we suggest that you write Mr. James Millen, National Company, Inc., Malden, Mass. He will send you technical details.

Shortly we will tell you how to cover all continents in 24 hours.

We will pick a day of week when needed signals are sure to work and will give exact time to best receive each signal. Will include some good catches, so watch for it. —Heinie Johnson.

Oliver Amlie A Happy Trophy Winner

● I received my Trophy Wednesday Noon, and I will have photos made up for the next issue of SHORT WAVE CRAFT. I think the Trophy is a "honey." My Boss and Madam like it very much, and my wife is crazy about it—she dreams of it at night! As for me, I don't know what to say; it seems like a dream, and I look at it all the time. I am more than pleased with my most beautiful Trophy, and a thousand thanks to SHORT WAVE CRAFT for this cup.—Oliver Amlie, Philadelphia, Pa.

Florian Poeschl Pleased With Tro

Point Man Wins Radio Trophy

Once again the Point and its citizens will be proud to know that one of its residents has obtained the unique distinction of being the only individual in the whole Dominion of Canada who has won a Cup for Radio Efficiency.

The man in question is Mr. Florian Poeschl owner of Frank's Radio Service, and the reason for his success was that, with his own built short wave set he got no less than 168 stations from practically all over the world: South America were all heard Australia, Japan, Europe and clearly and distinctly on this set. The Trphy is a marvellous piece of Silverware and anyone desirous of seeing it can see it after the Radio Show (where it is now on display) at 0702 Charlevoix St. The inscription on the Trophy reads:— AWARDED TO FLORIAN POESCHL for his contribution towards the advancement of the Art of Radio by Shortwave Craft.

Readers will join us in tendering him hearty congratulations upon his achievement.

At left we have reprinted a clipping from Mr. Poeschl's local newspaper. Below—Mr. Poeschl himself with his handsome SHORT WAVE SCOUT Trophy Cup.

Editor, SHORT WAVE CRAFT:

I cannot find words to express the joy which overcame me, as I received the beautiful Trophy. I wish to thank you very, very much for the same. I am especially happy to be the only Canadian winner so far, and also that I had the largest list ever sent in to you. I had an article about the "Trophy" in the local newspaper and the Trophy was also at the local Radio Show. Everyone that sees the Trophy is highly delighted with it. Herewith are pictures and I leave it to you to choose anyone you like for publication; I am also enclosing the newspaper clipping. I am very sorry that I cannot send you a reception report this month as I have very much to do which prevents me from listening in at present time. But I will do my best to send you a "listening post" next month.

I again thank you very much for the Trophy.

Florian Poeschl,
0702 Charlevoix St.,
Point St. Charles, Montreal., P.Que., Can.

"O.L.P." Report from John Sorensen, Bronx, New York City

● ALL G, D, and F stations were heard well. Also EAQ, ORK, PCJ, 19 ms., PHI, 25.6 meters, TIEP, HJ1ABB, HJ1ABD, HJ4ABB, COC, HC2RL, LSX, LSQ, PRF5, YV2RC, CJRO, XEBT, HIX, VK2ME, WOB, WCG, WCF, WEL, WEP, WCO, YV5RMO, HJY, HBL, OA4B—this besides many "locals" has been coming in here R8-9-QSA4-5. The following R4-6, QSA2-4; VK3ME, VK3RL, VLK, 28.5 meters; IRM, RNE, RW15, LKJ1, OXY, JVT, KNRA. I have increased my aerial to 370 feet long. All my reception is on *loud-speaker!* The 19 meter band has been good mornings till noon; 25 meters fair afternoon till 5 p.m. 31 meters—good till 9 p.m. 49 meters good after midnight.

(*Continued on page* 566)

SHORT WAVE SCOUTS

ELEVENTH "TROPHY" WINNER

Frank Hogler, 222 Wyckoff Ave., Brooklyn, N.Y.

110 Stations; 55 Verifications

● THIS month's SHORT-WAVE SCOUT Trophy goes to Mr. Frank Hogler of Brooklyn, N.Y. Mr. Hogler has submitted one of the best lists that we have received thus far. It includes a total of 110 stations, with 55 veries. There were no disqualifications in Mr. Hogler's entry and it was complete in every detail. The receiver used in building up this fine list of stations heard was a Model A, 16 tube MID-WEST All-Wave Receiver, used in conjunction with a 50-foot antenna of No. 12 enameled copper wire and a 20-foot transposed lead-in. The antenna is located 15 feet above the roof of Mr. Hogler's residence. Congratulations, Mr. Hogler, for your very fine list.

The list of stations submitted by any entrant in this "Trophy Contest" may be for any 30-day period. It is advisable to keep your list of stations until you have completed the necessary 50 percent veries, so that you can mail the entire list, including your verified and unverified stations, together. The verification cards submitted *must be those received in answer to inquiries, on programs heard during the 30-day period you select!* "Old veries" will be disqualified. Take an oath before your local notary public to the effect that you have personally received and listened to stations listed in your entry. Mention in your list the 30-day period which you have selected. Group the *verified* and *unverified* stations in two distinct lists, and state what 30-day listening period the list is for.

Mr. Hogler's Verified Station List

(June 6 to July 5)

LSX—28.98 M.—Transradio International, San Martin. 329. Buenos Aires, Arg., S.A.
PRA3—36.65 M.—Radio Club De Brazil, Rio de Janeiro, Brazil. S.A.
OCI—16.06 M.—All-America Cables, Inc., Lima, Peru. S.A.
HC2RL—45.00 M.—Calle Tomas Martinez No. 307. Guayaquil, Ecuador. S.A.
YV2RC—49.08 M.—Broadcasting Caracas, Caracas, Venezuela. S.A.
YV3RC—48.78 M.—Radiodifusora Venezuela, Caracas. Venezuela. S.A.
HJ4-ABE—50.6 M.—Radiodifusora de Medellin. Medellin, Colombia, S.A.
HJ1-ABB—46.46 M.—La Vos de Barranquilla. P.O. Box 715, Barranquilla. Colombia. S.A.
PRADO—19.43 M.—Fabrica de Tejidos-de "El Prado," Riobamba, Ecuador. S.A.
XEBT—49.83 M.—El Buen Tono, S.A. Mexico, D.F.
XETE—31.25 M.—Empresa de Telefonos Ericson. P.O. Box 1396. Mexico, D.F.
VK2ME—31.28 M.—Amalgamated Wireless, (A/SIA) L.T.D., Sydney, Australia.
VK3ME—31.55 M.—Amalgamated Wireless. (A/SIA) L.T.D., Melbourne, Vic., Australia.
VK3LR—31.31 M.—National Broadcasting Service, Lyndhurst, Vic., Australia.
CT1AA—31.25 M.—Radio Colonial. Av. Antonio Augusto de Aguiar, 144, Lisbon, Portugal.
EAQ—30.43 M.—Radiodifusion Ibero-Americana, P.O. Box 951, Alcala 43, Madrid. Spain.
FYA—19.68 M.—Direction de la Radiodifusion, 103 Rue de Grenelle, Paris, France.
FYA—25.20 M.—Direction de la Radiodifusion, 103 Rue de Grenelle, Paris, France.
FYA—25.63 M.—Direction de la Radiodifusion, 103 Rue de Grenelle, Paris, France.
I2RO—25.4 M.—Ente Italiano Audizioni Radiofoniche, Rome, Italy.
PHI—16.88 M.—Radio Hilversum (Philips Radio) Eindhoven. Holland.
ORK—29.04 M.—Radio Ruyaselede, West Flanders, Belgium.
DGU—31.09 M.—Reichspostzentralamt Schöneberger St. 11-15, Berlin, Germany.
HBL—31.3 M.—The Secretary General, League of Nations, Geneva. Switzerland.
HPB—38.47 M.—The Secretary General, League of Nations, Geneva. Switzerland.
DJB—19.73 M.—German S.W. Broadcasting House, Berlin, Germany.
DJD—25.51 M.—German S.W. Broadcasting House, Berlin, Germany.
DJC—49.83 M.—German S.W. Broadcasting House, Berlin, Germany.
DJA—31.38 M.—German S.W. Broadcasting House, Berlin, Germany.
GBA—21.44 M.—Rugby Radio Station, Rugby, England.
GBU—24.0 M.—Rugby Radio Station, Rugby, England.
KWU—19.53 M.—Transpacific Communication Co., Ltd., Dixon, Calif., U.S.A.
W9XAA—49.34 M.—Northeast Tower, Navy Pier, Chicago, Ill., U.S.A.
W1XAZ—31.33 M.—Westinghouse Relay Station, Boston, Mass., U.S.A.
W2XE—19.64 M.—Atlantic Broadcasting Corp., New York City, N.Y., U.S.A.
W2XE—25.36 M.—Atlantic Broadcasting Corp., New York City, N.Y., U.S.A.
W2XE—49.02 M.—Atlantic Broadcasting Corp., New York City, N.Y., U.S.A.
W9XF—49.19 M.—National Broadcasting Corp., Chicago, Ill., U.S.A.
W8XK—19.72 M.—Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., U.S.A.
W8XK—13.93 M.—Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., U.S.A.
W8XK—25.27 M.—Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., U.S.A.
W8XK—48.86 M.—Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., U.S.A.
W8XAL—49.50 M.—Crosley Radio Corp., Cincinnati, Ohio, U.S.A.
W3XAU—31.28 M.—Broadcasting Co., Philadelphia, Pa., U.S.A.

(*Continued on page* 569)

ELEVENTH "TROPHY CUP" WINNER

Presented to

SHORT WAVE SCOUT

FRANK HOGLER

Brooklyn, N.Y.

For his contribution toward the advancement of the art of Radio

by

SHORT WAVE CRAFT

Magazine

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

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

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

The purpose of this contest is to advance the art of radio by "logging" as many short-wave commercial phone stations, in a period not exceeding thirty days, as possible by any one contestant. The trophy will be awarded to that SHORT WAVE SCOUT who has logged the greatest number of short-wave stations during any 30-day period; at least 50 percent must be "verified."

HONORABLE MENTION AWARDS

William H. Martin
Canton, Mass.

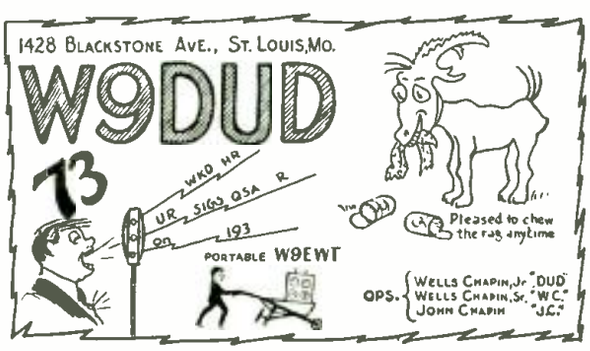
78 Stations, Total; 40 Verifications

SHORT WAVES and

Hats Off to This Crackerjack Station Operated by Wells Chapin, Jr., W9DUD

"Prize-winning" station photo awarded One year's subscription to SHORT WAVE CRAFT

Zowie! What a ham station this turned out to be! We'll bet Mr. Chapin spent a young fortune on dials and meters alone. The transmitter is rated at 600 watts output!



Here's the nifty QSL card W9DUD sends to those reporting reception of his station.

Editor, SHORT WAVE CRAFT:

I noticed in your magazine that you wanted pictures of amateur stations.

W9DUD operates on all bands using a 5-stage crystal-controlled transmitter; final amplifier is capable of 600 watts maximum output. Most work is done on the 75 and 20 meter phone bands. I have worked *all* continents and thirty-five countries. I hold a commercial first operator's license.

I read your magazine quite regularly. 73.

WELLS CHAPIN, JR., W9DUD
1428 Blackstone Ave.,
St. Louis, Mo.

is that it satisfies *every reasonable requirement* of a short-wave publication and may the good work continue. Regards to all those responsible for its success—73.

Very truly yours,

KING J. FOTHERGILL
297 Baltic Street,
Brooklyn, New York.

(Mighty fine work, King, and just shows what a real short-wave "fan" can do, when he makes up his mind to get somewhere. —Editor.)

WE HAVEN'T "MISLED" HIM YET!

Editor, SHORT WAVE CRAFT:

Beyond any doubt for the short-wave "fan", SHORT WAVE CRAFT is the best twenty-five cents' worth to be had.

From your March, 1934, issue I constructed the "2-tube" receiver as shown on page 659 by Mr. Cosman. However, I employed data given by Mr. Malsberger for construction of the power-pack because I had on hand a half dozen .01 mf. capacity condensers. From your January issue of this year, from data supplied by Mr. Tipsel, I built a power transformer using No. 36 enamel wire, instead of No. 34 as specified for high voltage coils. I wound the coils all by hand and while this was somewhat tedious, I enjoyed doing it this way. This transformer supplied the power to the set.

Such stations as VE9GW, W8XK, W2XE, W1XAL, W3XAL, W1XAZ, W2XAF, W9XF, will at times operate the speaker. K4SA, in Porto Rico, and some station in South America, are the only foreign stations to be brought in outside of a little ship-to-shore chatter, but I don't sit up nights to 3 or 4 a.m. I haven't gone to any trouble of installing any special type of antenna. Doubtless results may be bettered by doing so. SHORT WAVE CRAFT hasn't fooled me yet with any misinformation on constructional data.

GEORGE H. FIELDHOUSE,
5300 39th Ave., S.,
Minneapolis, Minn.

(The editors try to make the articles in SHORT WAVE CRAFT *as accurate as possible, but now and then slight errors will occur, due to typographical or draftsmen's mistakes. We are glad that you liked the articles by Messrs. Cosman, Malsberger and Tipsel.—Editor)*

A Nifty S-W "Listening Post"

Editor, SHORT WAVE CRAFT:

I am sending you a picture of my short-wave "listening post." It is not a "ham" licensed station yet so have not added the transmitter, but as I expect to go up soon for my ticket, I am living in the hopes of completing this outfit with a nice panel job.

I first became interested in amateur radio about one year ago, after having the great pleasure of reading issues of *Radio-Craft* and SHORT WAVE CRAFT given me by a friend.

Starting out with a little 3-tube "battery job," I soon replaced it with the 4-tube "Regent" that you see in the picture. Then last June I decided for something a bit better so got the Patterson PR-10. I will give you a brief report on the layout here.

On the wall are two pictures of the U.S.S. *New York* that I served on back in the war days. Below them, from left to right, is a picture of the XYL, then my certificate of membership in the ARRL, another membership certificate from the *Short Wave League*, directly over the Patterson receiver is a list of the abbreviations and their meanings used in amateur work. On the table at the left is my Patterson PR-10 receiver used for DX-ing, below that on the shelf I keep all my issues of SHORT WAVE CRAFT, below them a two-stage P.A. amplifier and now on the desk I have an assortment of radio and electrical books, a Readrite Model 710 tester and my Regent 4-tube job, used merely for copying code. I also have a code-practice oscillator for practice purpose. the mill (typewriter) is concealed in the desk while it is being used as my work bench. Hi, Hi.

I have never missed an issue of your splendid magazine since I was first introduced to it, and each issue is looked forward to with great interest. All I am able to say about this magazine

King J. Fothergill of Brooklyn certainly has a snappy looking short-wave "listening post," equipped with a typewriter n'everything.

LONG RAVES . . . OUR READERS' FORUM

THE "GLOBE-TROTTER" BRIDGES THE ATLANTIC EASILY

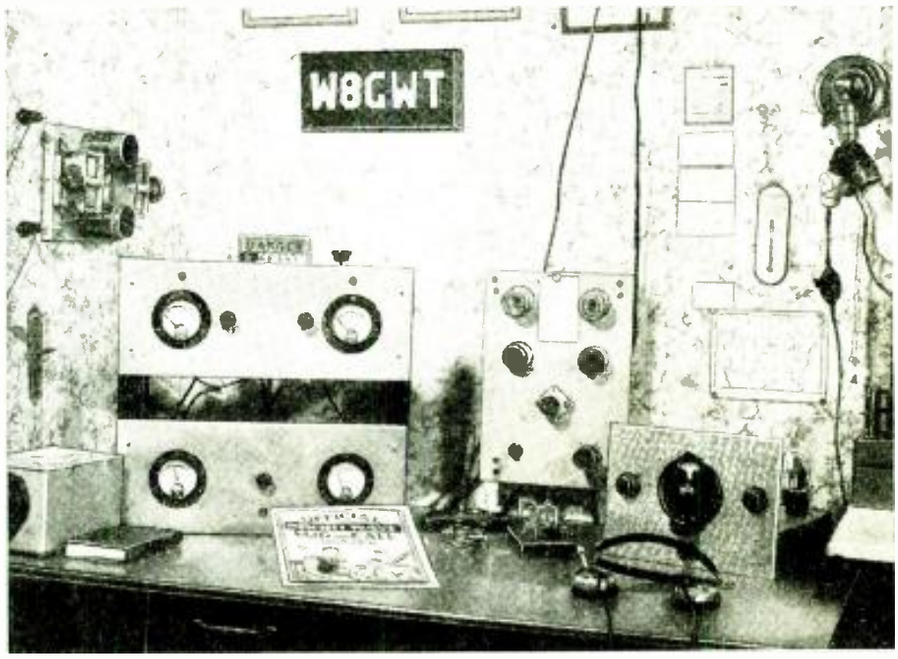
Editor, SHORT WAVE CRAFT:

Been reading your "mag" now for over a year and I think you publish some mighty fine articles in it. Have read what all of these "fellers" have to say about the different circuits, and after putting it off for some time, I am now going to tell you about the *Globe-Trotter* I built. I constructed it in a Crosley "Bandbox" case, substituted an inductance coil in the antenna for the 100 mmf. postage stamp condenser, and added an extra spaced variable condenser in the tuning circuit for band-spread, and Boy, Oh Boy, do I get DX! I have heard all the hams from here to the Pacific, Mexico to Canada, and plenty of foreign stations. I listened to G6RX, England on 4,320 kc. for over an hour. I am not going to take up your time with a long list of stations, but I want to tell you that the little *Globe-Trotter* sure "brings them in"!

I like your articles on *simple transmitters*, also; give us plenty of them. Well I'll be seeing you again, best of luck, es 73.

LESTER MACGOWAN,
S. Paris, Maine.

(Glad to know that you "bridged the Atlantic" with the "Globe-Trotter" receiver; this set made many thousands of friends it seems, and one of the reasons for its success apparently is its extreme simplicity and lack of any "fancy frills." More power to you and the "Globe-Trotter."—Editor.)



W8GWT hands out a "hot" signal when its owner, Francis Orcutt, takes hold of the key. This station is an Official Relay station and operation has been mainly on the 80, 40 and 20 meter bands.

Francis Orcutt Maintains a Busy Station

Editor, SHORT WAVE CRAFT,
New York, N. Y.:

W8GWT has been consistently on the air since early 1932. Operation has been mainly on 80 and 40 meters with some 20-meter operation. Five-meter operation is contemplated for "local" communication and experimenting during the coming fall and winter. W8GWT is an Official Relay Station of the A.R.R.L. and 80-meter operation is principally for activity in "traffic nets." Forty meters is used for *rag-chewing*, "dx," and for "traffic relays" over longer distances.

The present "rig" as shown consists of the usual 47 crystal oscillator, a 46 doubler or buffer, depending on the band operated in and a 510 amplifier. Antennas consist of an 80 meter single-wire fed Hertz and a 40 meter Zepp, with arrangements for coupling with the Collins network.

The receiver shown is used for all types of short-wave listening and consists of a 35 RF stage, a 24 detector and 27 audio. It has ample gain for loudspeaker operation, but phones are used most of the time. Besides its use in connection with the station, I frequently tune for the foreign short-wave broadcasters, and most of the usual ones have been received, including the Daventry and Zeesen stations, EAQ, CT1AA, HJ1ABB, LSX, VK3ME, YV1BC, and many others in the various classes of short-wave stations. Amateur phone stations from England, Ecuador, Panama, Cuba and Dominica have been heard on 20 meters. Besides short-wave reception, I am interested in "dx" on broadcast band (1500-550 kcs.) and every state in the Union, Mexico, Cuba, Canada, Porto Rico, Dominica, Salvador, Argentina, and Australia have been *verified*.

73 to SHORT WAVE CRAFT and to the "Ham" and "SWL" fraternity.

FRANCIS ORCUTT, W8GWT,
127 South Avenue,
Pen Yan, N. Y.

(Some "rig" Francis, and we are pleased to note the wide diversity of your short-wave activities.—Editor.)

AMATEUR RADIO STATION W9LFF

Editor, SHORT WAVE CRAFT:

W9LFF is the station owned and operated by yours truly in Iowa City, Iowa. This station has been on the air since April 25, 1933.

The first transmitter was a 160 meter phone outfit on 1,780 kilocycles. Due to the lack of power the station was changed to a code outfit using two 45s in parallel with 200 volts on the plate. The receiver used was home-made from a description given in an old issue of SHORT WAVE CRAFT. It used a 56 detector and a 56 stage of audio. This was used for about 500 contacts on 3,535 kilocycles.

On July 2, 1933, the transmitter was changed to a single 210 in a tuned-plate, tuned-grid circuit with 500 volts of power, and a National SW-3, receiver was purchased. This layout was used until March 24, 1934, with over 1,500 contacts checked up; the station was arranged as you see it in the picture.

Max Otto, W9LFF, of Iowa City, Iowa, has built himself a nifty looking transmitter, and by the display of QSL cards his station must "click."

The transmitter which is in operation now is a 47 crystal-controlled oscillator which gets its power from a 300 volt power supply mounted on bottom shelf of the rack. The next stage is two 46s which are run on 400 volts from the bottom shelf also. The final stage is a 203-A with 1,200 volts on the plate.

The antenna used is a single wire full-wave on 80 meters. It is 325 feet long and is 45 feet above the ground. The antenna is coupled to the transmitter by a Collin's antenna coupling system.

The transmitting rack is made entirely of wood. It contains three sections; the bottom one contains three separate power supplies. The middle section has the oscillator and buffer stages and the top one houses the final amplifier.

The meter is a Weston 0-200 milliameter which can be plugged into any of the stages by means of a patch-cord.

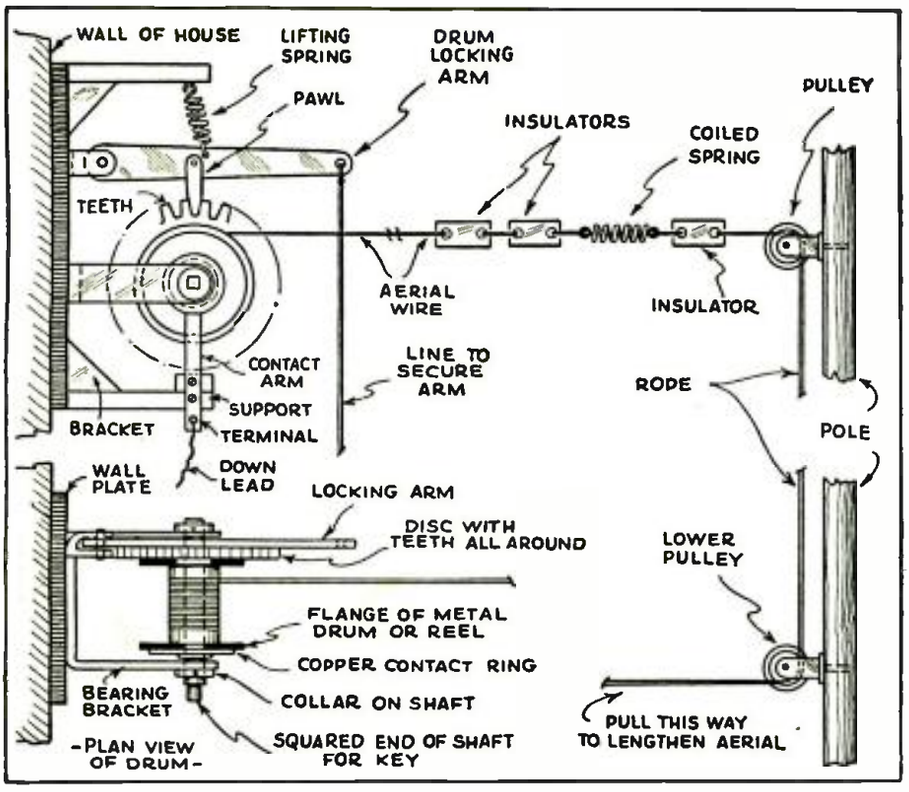
The receiver next to the rack is a 4-tube B.C. (broacast band) receiver. The National SW-3 is still being used, as you can see; it is on the right side of the tahle. On top of the SW-3 can be seen a home-made monitor which is caged in a hand-made galvanized iron can. The statue of "Micky Mouse" on top of the monitor is the mascot of the station.

This station operates on all three main amateur bands and has many "skeds" and handles a lot of traffic. A good friendly QSO (contact) is welcome at all times.

Yours truly,
MAX OTTO, W9LFF,
824 No. Gilbert St.,
Iowa City, Iowa.

(Well you've certainly been through the mill, Max, and we salute your fine "log" of 1,500 contacts.—Editor.)

A Variable Wavelength Antenna



Interesting details of the construction followed in building a variable wavelength antenna are illustrated above.

● IN THE early days of short-wave reception every amateur dreamed of having efficient tuning condensers which would be smoothly and silently variable; then came the variable grid-leak, volume control, and now variable-mu valves.

This desire to have various features of variable value has caused attention to be directed to the aerial used for short-wave reception, the idea being to have the aerial of such a length that it favors a certain wavelength or band of wavelengths.

The natural wavelength of any aerial depends primarily on its length, and the wavelength (in meters) can be found by multiplying its length in feet by 0.3 and the result by 4. For example, an aerial 50 feet long has a natural wavelength of 50 x 0.3 x 4 = 60 meters, or, if we wish to know what length of wire to use in order to obtain a given natural wavelength, we must multiply the number in meters by 3.3 and divide the result by 4. Thus, if we require an aerial with a natural wavelength of 30 meters, the length of wire required will be $\frac{30 \times 3.3}{4} = 24.75$ feet or 24 feet 9 inches.

The following table (obtained by the above method) will give a close idea as to the different aerial lengths required to cover the waveband between 10 and 80 meters, the usual range covered by most dual-range tuning coils for short-wave work:

(Continued on page 552)

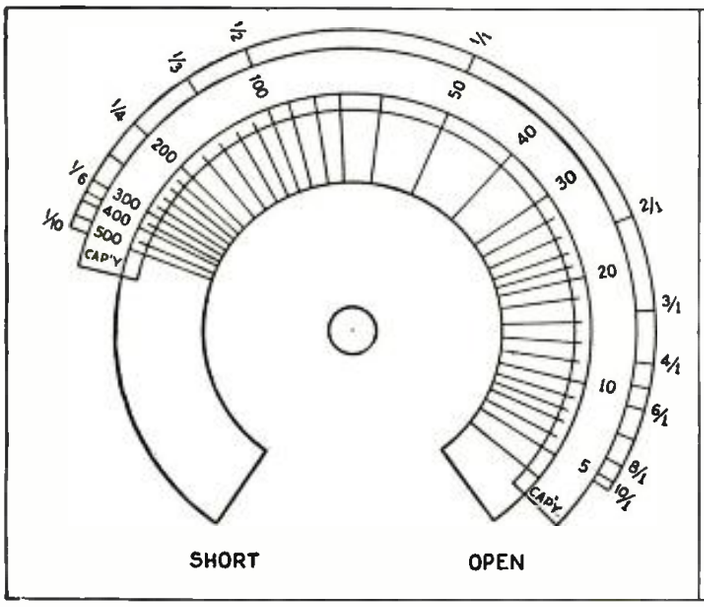
A Direct-Reading Condenser Tester

By F. L. SPRAYBERRY

● PRACTICALLY every experienced serviceman has, no doubt, frequently been in a position where he has wanted to test a condenser for capacity but where he has been without the means of doing so. Recently, however, a simple circuit has been developed in the writer's laboratory to fill this increasingly important need. With this, it is not only possible to test condensers for capacity, but also for shorts and opens. Electrolytics as well as condensers of other types can be handled quickly and conveniently. Moreover, all three tests may be made at the same time and while the condenser is in the receiving circuit providing there is nothing connected in parallel with it. Should another part be connected in parallel to the condenser, it is only necessary to disconnect one side to apply the test.

This new circuit (shown in Figure 1)

(Continued on page 560)



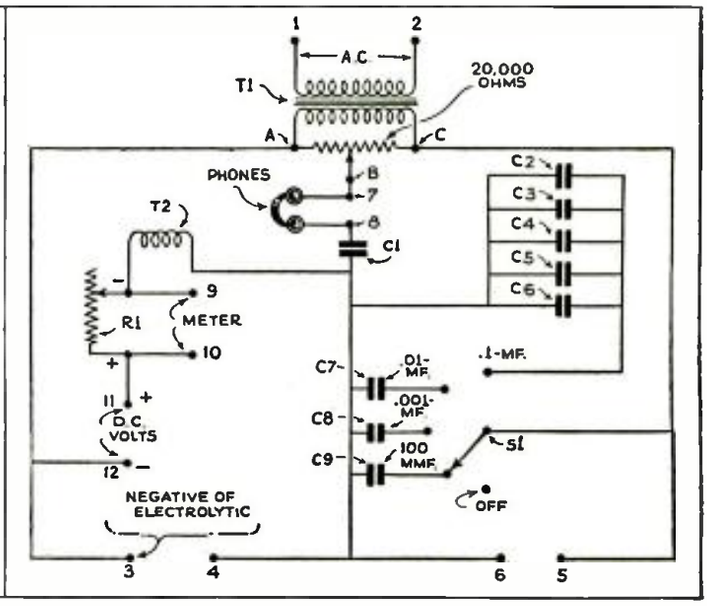


Fig. 1, at right, shows simple circuit connections of the balanced bridge for measuring condenser values; Fig. 2, at left, shows special dial which is used on the potentiometer.

A Low-Power Phone TRANSMITTER

With Full Constructional Details

This article describes how to build a low-priced phone and "CW" Ham Transmitter, which, thanks to carefully thought out design, sure "steps out"! It contains a single 46 tube as the final modulated R.F. amplifier.

By W. A. WOEHR, W9PTZ

Here we have the photograph showing the complete transmitting and receiving station of Mr. Woehr, W9PTZ. Note the convenient "rack and panel" arrangement used in mounting the various units of the transmitter.

● AMATEUR radio being just a hobby, it seemed very practical to construct a low-power transmitter with a minimum of cash outlay and yet have something which would justify its existence. What the author has done along this line, others interested in phone transmitters should also be able to duplicate, and in most cases better "buys" may be made, depending on the size city you happen to live in. Usually the larger the city the better the bargains, but suffice it to say the station about to be described was constructed at Geneseo, Illinois, a town of 3,900 population. But now let's get on with our story.

W9PTZ first went into operation February, 1934, on the 160 meter phone band with a "bread-board" transmitter consisting of a 47 crystal oscillator and a 46 R.F. amplifier, modulated by a 250. The speech amplifier was a 27, modulated by a single-button mike. Results were very promising for such low-power, so that plans and construction of the present transmitter were put under way. As seen in the photo, it consists of a very compact yet easily accessible layout, built on the familiar "rack and shelf" style. Briefly the layout is as follows: bottom shelf is the "power-supply" unit, second shelf the audio and modulator unit, third shelf the crystal oscillator and R.F. buffer stage, and top shelf the final R.F. amplifier and antenna tuning unit. A condenser mike is used and it can be seen at lower left of picture, together with a single-button hand mike. Two dry cells, in back of the transmitter, furnish current for the mike and filaments of the 30's used in the pre-amplifier of the condenser mike. A separate "B" eliminator is used with the pre-amplifier, although plans are under way to incorporate a separate filter and tap-off of the main power supply for the pre-amplifier "B" voltage.

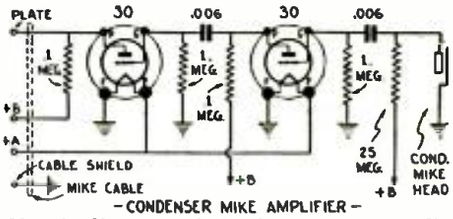
The receiver is the improved *Victor Superhet*, as described by the author in the Nov. '34 issue of SHORT WAVE CRAFT. To the right of the receiver is the loud speaker cabinet, which also contains the receiver power supply as well as the last audio tube and speaker.

Antenna Details

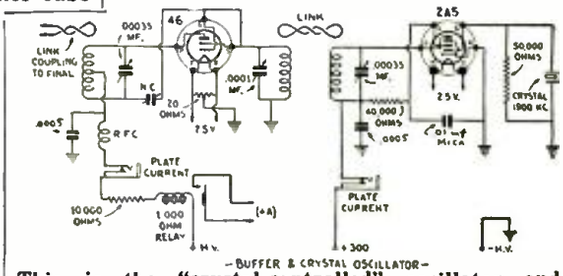
A 125 foot antenna and counterpoise system is used for transmitting, while a separate antenna is used for the receiver. When transmitting only two switches are used, for the *send* and *receive* positions, one on the transmitter and one on the receiver.

For the details of the transmitter construction we will take the power supply unit and describe it first. The chassis is built of white pine covered with clear lacquer (or white shellac). A two inch strip is built around the chassis, giving it sufficient depth so that all small parts may be mounted underneath and out of sight. Also most of the wiring is run below deck in point-to-point fashion. The main power supply, 500 volts filtered D.C., consists of a 175 watt transformer having a 1,100 volt ct. (center-tapped) secondary, two 7½ volt windings, and a 3 volt winding. This unit is sold by mail-order houses for $2.00 to $3.00 including a small resistor to use for the filament of the 83 rectifier tube when running it from one of the 7½ volt windings. The other 7½ volt winding lights the 250 modulator tubes. The 3 volt winding is not used. The filament of a 201A is connected in series with the negative high voltage and serves as a fuse in case anything should go wrong while operating the transmitter. This eliminates the possibility of burning out a filter choke or power transformer. Use an old 201A tube as they can usually be picked up for the asking.

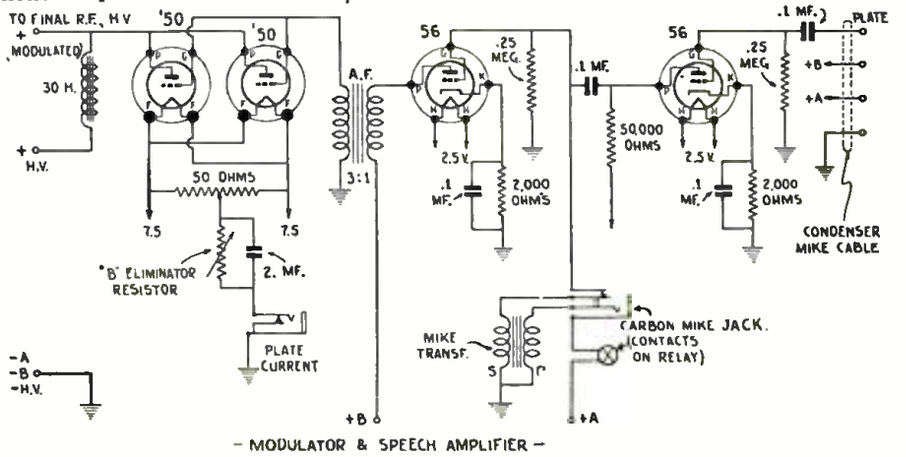
(*Continued on page* 548)



Circuit diagram of the 2 stage pre-amplifier used in conjunction with the condenser microphone.



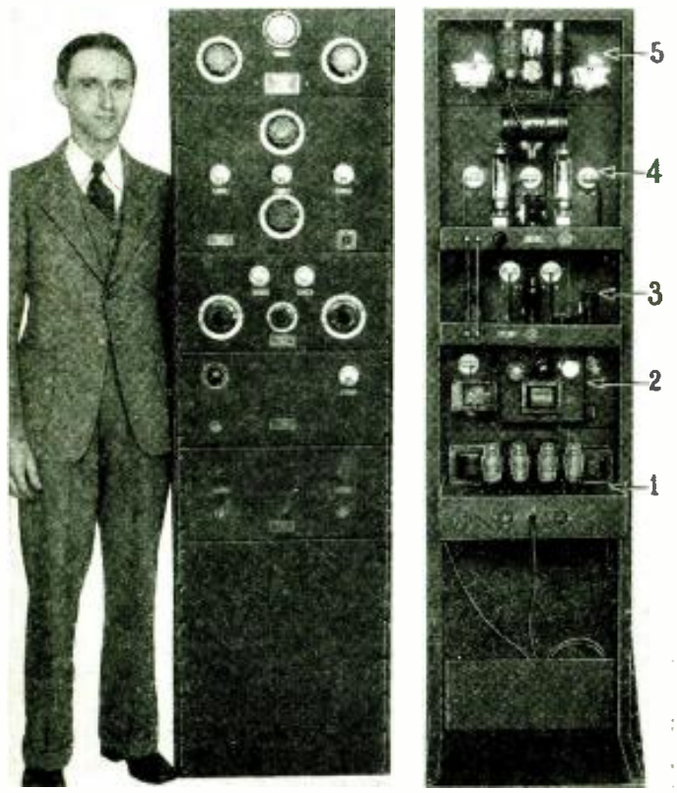
This is the "crystal-controlled" oscillator and buffer, using a 2A5 link-coupled to a 46.



Above—we have the audio amplifier and modulator portion of Mr. Woehr's efficient transmitter.

WHAT'S NEW In Short-Wave Apparatus

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



The designer poses with this beautiful modern rack and panel, 100-watt transmitter. No. 1—power supply unit. No. 2—modulator. No. 3—"Les-tet" exciter unit. No. 4—push-pull final amplifier. No. 5—antenna-matching network.

No. 236

Modern 100-Watt TRANSMITTER

100-Watt C.W. or 40-Watt Phone

By FRANK LESTER, W2AMJ*

● RACK-AND-PANEL construction, in the minds of most amateurs, has been associated with commercial stations. In the past this type of transmitter design has been something nice to think about, but few "hams" have had enough money to enjoy its obvious advantages in the way of appearance, mechanical strength, and electrical flexibility. For either permanent or experimental installations, a *rack* job is unquestionably ideal.

In his capacity as head of the amateur division of a large Eastern radio firm, the writer has noted the steadily increasing interest in rack transmitters and he has also observed that the biggest deterrent to their more widespread use is *price*. Accordingly, he decided to investigate the situation and see if something couldn't be done about it. From reading the hundreds of letters that came to him from amateurs all over the country, he judged that there was a definite demand for a transmitter of 100 watts rating, this figure representing a good level; anything smaller would not satisfy hams who already were pumping 40 or 50 watts into a single 210, and anything larger would mean excessive cost, particularly in the way of power equipment. The rack-and-panel idea, of course, was to be followed out entirely. The transmitter must also have the utmost stability, be arranged for optional modulation apparatus for phone at minimum cost, contain plenty of meters to tell what is going on in the circuits, and be adaptable to different types of antenna.

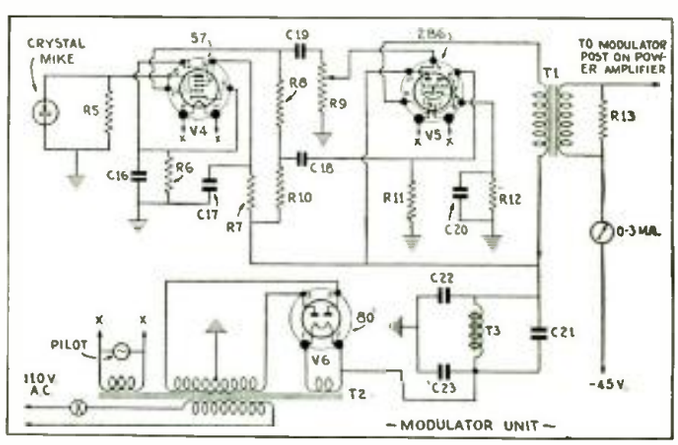
The transmitter as illustrated has been built up of a number of independent but *inter-connecting* units, a description of which undoubtedly will interest readers of SHORT WAVE CRAFT who are amateurs now or will be amateurs shortly.

First for a general idea of the outfit's physical size and layout. The whole job stands 6 feet high off the ground, and measures 19¾ inches wide and 16¾ inches deep at the base. The rack is of sturdy one-inch structural iron, the panels of ⅛ inch steel. All surfaces are finished in black crackle, which is impervious to finger marks, moisture and all the other abuses to which a radio transmitter is subjected. There are five units of uniform width, from top to bottom as follows: universal antenna coupling unit, push-pull power amplifier, "Les-Tet" exciting unit, modulator, and power supply. A blank panel closing in the bottom is furnished for any use the owner cares to put it to.

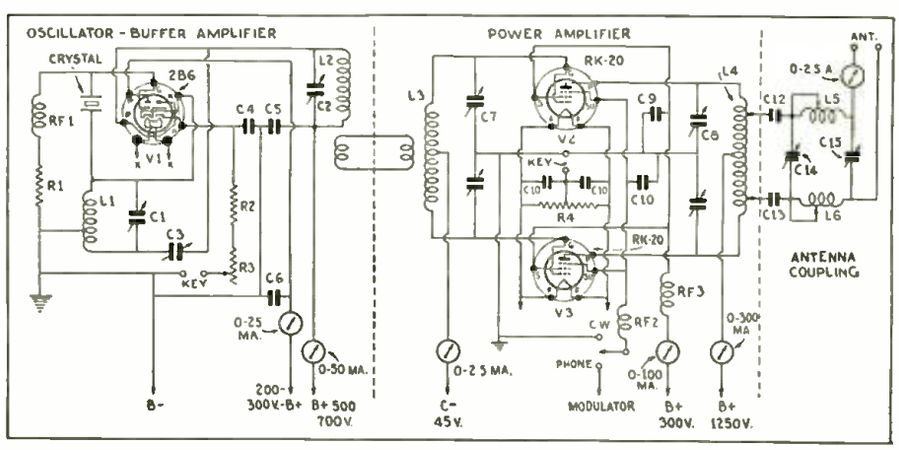
Les-Tet Exciter Unit

The "Les-Tet" exciter unit is shown diagrammatically in Fig. 1. This uses a single 2B6 tube in a circuit developed by the writer and found to possess highly desirable characteristics. The 2B6, which has not received the recognition it deserves, consists of two triodes in one envelope, with the cathode of the first and smaller "tube" connected internally to the grid of the larger "tube." This construction permits the use of the 2B6 as a marvelous crystal oscillator and buffer amplifier (or doubler) combination. The crystal is connected directly across grid G1 and cathode K1 of the first tube unit. The plate tank circuit, consisting of plug-in coil L1 and condenser C1, is connected above ground—between the cathode and ground, as shown. L1

(*Continued on page* 559)



Circuit diagram of speech amplifier and modulator designed for suppressor grid modulation.

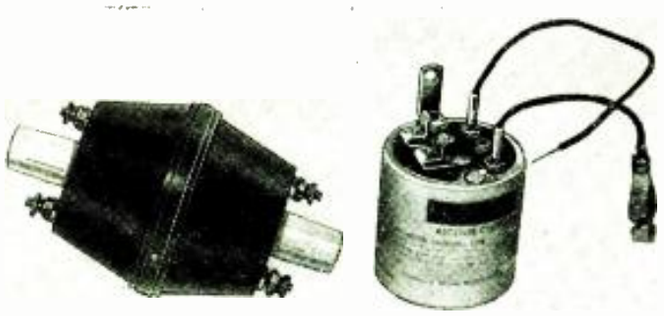


Above we have the diagram of the radio frequency portion using a 2B6 as oscillator and buffer, and a pair of RK-20's as "power amplifiers."

*Engineer, Wholesale Radio Service Co., Inc.

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

New Hi-Fi Aerial and Receiver Coupler



Left—New Hi-Fi Antenna and Receiver couplers, designed to increase the effectiveness of "noise-reducing" antennas. Designed by Arthur Lynch.

●

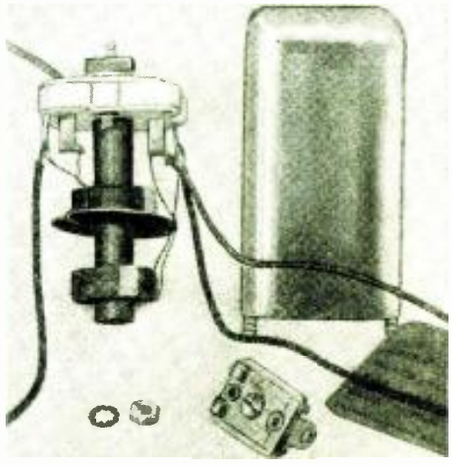
● IN the photograph we see the new Lynch antenna coupler and the Hi-Fi receiver coupler. The antenna coupler is housed in a weatherproof bakelite case, with the coils and condensers mounted inside on an Isolantite insulator. The two sections of the doublet antenna are fastened to this insulator and in this way there is absolutely no strain on the more delicate parts of the impedance matching transformer. This is intended primarily for doublet antennas, where a reduction in background noise is necessary. This patented coupler performs very efficiently on the broadcast band, as well as the short-wave bands, and does not present the usual loss of the signal strength on the broadcast band when used with an all-wave receiver.

Refer to No. 245.

The receiver coupler is designed to match the transmission line coming from the antenna coupler and provide effective coupling to the receiver. It is adjustable for high and low impedance input windings to the receiver.

The antenna coupler consists of a special matching network which allows effective coupling on the short-wave bands and causes no loss in signal strength to stations in the regular broadcast band.

Midget I.F. Transformer and New Equalizing Condenser



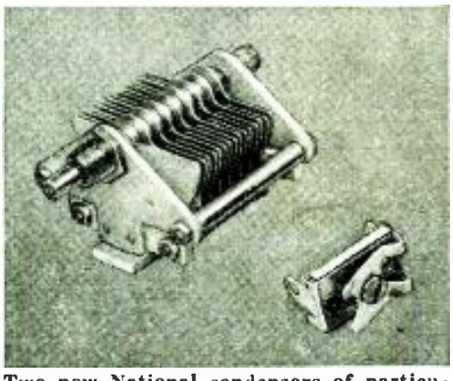
The new Hammarlund "midget" I.F. transformer and also latest "padding" condenser. No. 238.

● IN the above photograph we have two new Hammarlund products—one is an exceptionally small and efficient I.F. (intermediate frequency) transformer. It is designed to be used in compact receivers of the superheterodyne variety. Except for its size this transformer is mechanically and electrically the same as the popular two-inch Hammarlund transformers. It is a double-section transformer having both inductances tuned. The condensers are mounted on an isolantite base. The measurements are 3½ inches high by 1 7/16 inches square.

The other interesting new item is a miniature equalizing condenser, measuring but 5/8" by 3/4" in size. This should prove very popular with the short-wave "Fans," inasmuch as it can be tucked into an out-of-the-way place. Mica dielectric is used; also phosphor bronze spring-plates and it is mounted on isolantite.

Two New National S-W Condensers

● THE National Company of Malden, Mass., recently announced the introduction of two very interesting items intended for short-wave use. One is the model TMS variable transmitting condenser available in two sizes, having a working voltage of 1000 and 2000 for use in oscillator, buffer, and doubler and low-power amplifiers of transmitters. It is an all-aluminum affair and it is solidly constructed with *isolantite* insulation. It should prove invaluable where space is at a premium. In the lower right-hand portion of the photograph we see a new mica dielectric midget *padding* condenser mounted on a *steatite* base. It is extremely light in weight and small in size and can be conveniently mounted directly on the leads, in much the same manner as fixed condensers, chokes, resistors, etc., are being used. It should serve excellently for padding various tuned circuits.



Two new National condensers of particular interest to all S.W. "Fans." No. 239.

The De Luxe Gothic RGH 4

● THE handsome panel niche makes for convenience in changing from one band to another as well as exceptional efficiency and short leads. The niche is made of metal and is formed to make a shield for the coil that it houses. No *hand-capacity* effects are evident on any of the bands.

The circuit is of the regenerative type with three circuit coils in the tuned R.F. and the detector stages. A single 2A5 in the output stage with a matched speaker is sufficient to bring in even the European stations on the loud-speaker.

The detector plate choke is a shielded high-impedance type, capable of carrying at least 3MA without saturation.

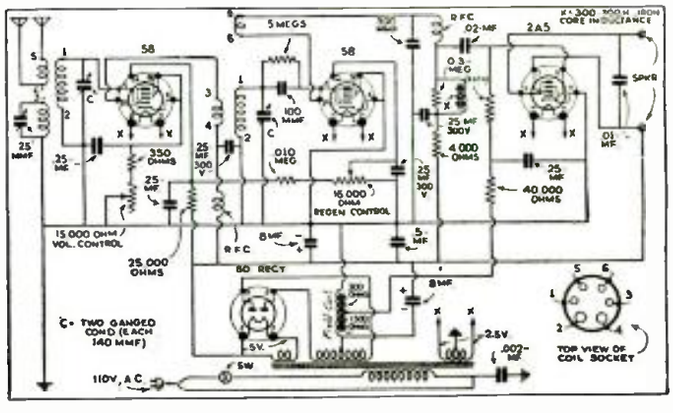
In wiring the set all the filament, screen, and B plus leads are run around the edges of the chassis, so as to leave the center clear for the small parts and the more important wires. The radio frequency and detector plate and grid leads are wired from point to point with heavy bus-bar. The leads to the detector and the radio frequency grids should be as short as possible with No. 18 stranded wire.

When the set is completely wired, check

(*Continued on page* 575)

By Robert G. Herzog, B.S., E.E.*

*Chief Engineer, Thor Radio Co.



Above—the Deluxe Gothic RGH4, a 4-tube short-wave receiver of improved design. Right—diagram showing values of parts and hook-up. No. 240.

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

Velocity MIKE Gives High Fidelity

Note the "professional" appearance of this new velocity type microphone, which is capable of excellent quality reproduction.

● THIS new Amperite *Velocity Microphone* opens up a new field for the radio experimenter who is interested in *high-quality* reproduction of voice or music. The velocity microphone being well-known as a high quality instrument has become rather popular within the last few years. This microphone has a frequency response of from 42 to 10,000 cycles per second, with a maximum difference of only 1 DB. (decibel). The instrument is made very rugged and is designed to take considerable abuse. It is not affected by temperature, pressure, or humidity, and is thoroughly shielded with a bronze and steel case. The model shown is the RA1 and is designed for public address and amateur radio work. The one necessary piece of equipment that has to be used with a microphone of this type is an additional two stages of pre-amplification. We are showing a suitable circuit using two types 56 or 37 tubes. The output transformer which couples the microphone to the input circuit of the amplifier is contained directly within the base of the microphone. It is truly professional in appearance and should appeal to the most critical radio man.

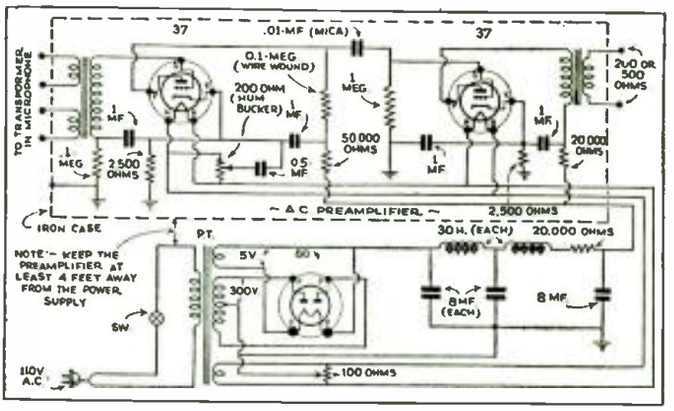


Diagram of suitable "pre-amplifier" to be used with the velocity type microphone. No. 241.

All-Electric All-Wave Set

By Guy Stokely, E. E.*

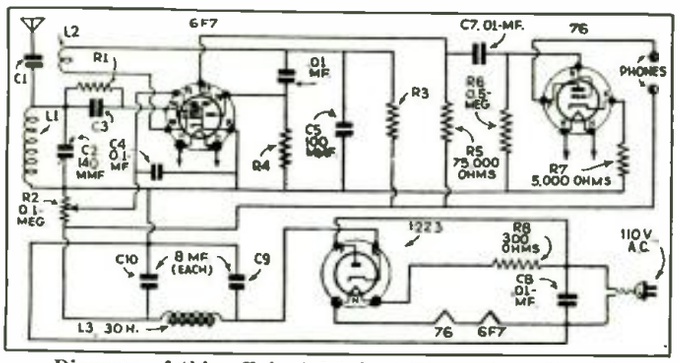


Diagram of this efficient 3-tube S.W. receiver. No. 242.

● THIS all-wave receiver has been designed to meet the present demand for a simple, inexpensive, and completely electrified short wave receiver that is capable of world-wide reception. There are many problems involved in the design of such a receiver. These problems are concerned with the attainment of sufficient oscillator stability, sensitivity, selectivity, and hum attenuation, and still employ only the absolute minimum number of parts. The present design, in the opinion of the author, represents the greatest value per unit of investment that it is possible to attain in designing such a simple receiver.

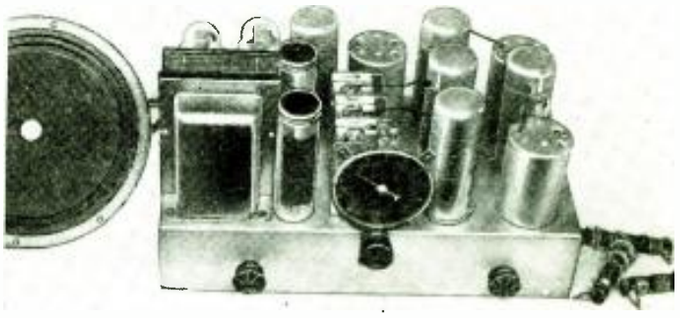
*E. E. Ellen Radio Laboratories.

(*Continued on page* 556)

15 to 2000 Meter Receiver

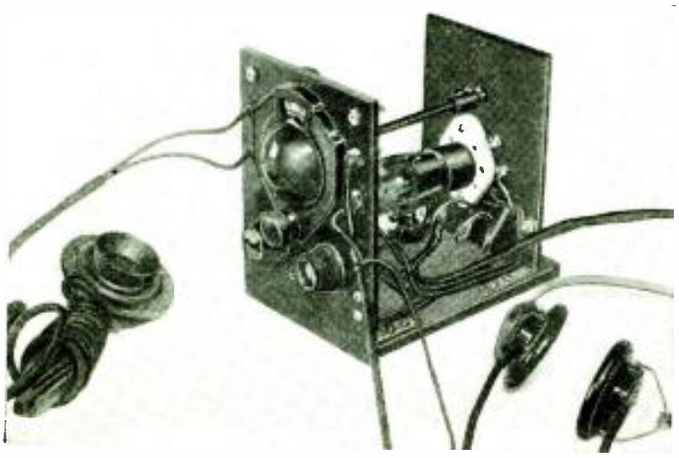
● HERE is a really modern 15 to 2000 meter superheterodyne receiver. The short-wave bands from 15 to 200 meters, as well as the broadcast band and other wave lengths up to 2000 meters can be received very efficiently on this *Trans-Universe* receiver. It uses a new development in the switch and coil assemblies. In the photograph the coils can be clearly seen beside the set and are identical to those incorporated in this receiver. It has full automatic volume control with an inter-channel noise suppressing switch. By a simple flip of this switch, all noises usually encountered in between stations with receivers having automatic volume control can be eliminated. The set uses a stage of tuned R.F. ahead of the first detector and this stage is *tuned* all the way down to 15 meters practically eliminating repeat points on wave lengths as low as 15 meters.

(*Continued on page* 558)



Wiring diagram of the "Trans-Universe" All-Wave Receiver No. 246.

A TRANSCEIVER of Improved Design



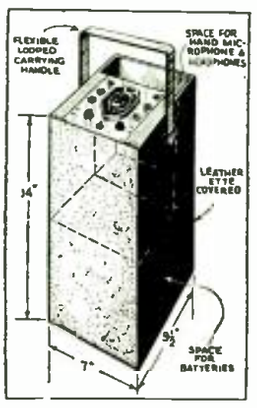
The "works" of the Knight "Transceiver." No. 243.

● THE Transceiver which is here described, illustrates the simplest and least expensive form in which the unit can be constructed.

This transceiver offers a good illustration of the use of a type 19 tube as a push-pull oscillator for transmission, and a push-pull super-regenerative detector for reception. The plate coil is made of a copper tubing. The grid coil is placed inside of the plate coil, affording unity coupling. The center tap of the grid is brought out through a hole in the tubing. The tank is tuned by means of a 15 mmf. midget variable condenser.

Grid modulation is employed, the microphone varying the grid bias at voice frequencies. It is well to note at this point, that the transmitter will not oscillate with the microphone lying flat. This may be illustrated by holding a single turn of wire through a pilot light near the tank

(*Continued on page* 557)



Drawing showing case which houses the "Transceiver" and battery compartment.

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

Extremely compact yet a very smooth-working set is the new Harrison "5 in 3" 3-tube S.W. receiver. It uses plug-in coils and has all the latest refinements. No. 247.

Five-In-Three Makes Compact A.C.-D.C. Set

By WILLIAM GREEN*

● This remarkable 3-tube receiver actually gives the results of five tubes! A 6F7 tube takes care of the R.F. and detector stages; a 76 is the first A.F. and a 12A7 acts as a power output pentode and rectifier.

● AFTER trying many different circuits I realized that what a fellow really needs is a set small in size, light enough to be easily carried around, with power supply, speaker, and all built right in. A set that really gets them all on the speaker with real volume. The receiver shown here is really all of this and more. Its weight with tubes, speaker, etc., in operating condition is only eight pounds, and what's more you can plug it into any 110 volt outlet, either A.C. or D.C., and you're ready to go. The set has been designed so that it is very sensitive to the weakest signals which are built up through the successive R.F., detector, high gain first audio, and power pentode output stages so that they reach the speaker with lots of clean volume.

Secret of the Circuit

After carefully looking over the current requirements of new tubes the ones that I found to fit in exactly with the requirements were the 6F7 pentode-triode, the 76 super-triode, and the 12A7 power pentode-rectifier. Let us take them in order. The 6F7 tube contains four grids, two plates, a cathode, and a heater. By referring to the diagram you will note that a grid and a plate are used as a triode and the remaining three grids and plate constitute a separate super-control R.F. pentode. The only common element is the cathode.

We all know the real heart of a short wave receiver is in the radio frequency and detector portion and when we speak of sensitivity we think of these circuits. Therefore, several different circuits and arrangements of parts were tried in order to select the smoothest operating, most powerful, and most sensitive combination. The result is the set described here which by far exceeded my fondest hopes. An R.F. stage is used to couple the antenna to the triode. The pentode is here selected so that a high gain may be provided before the signal reaches the detector. This is essential in a receiver that is to provide maximum amplification of the very weak signals. The R.F. stage has been carefully balanced and is condenser coupled to the following tube. The triode is the regenerative detector. Although an effort was made to eliminate superfluous parts, and thus make not only its cost low and the set light, but also easy to build and wire; enough bypass condensers were used to insure complete absence of hums, whistles, and fuzzy tone in the signals. Regeneration, you will find, is practically constant over the entire tuning range, with the annoying "dead spots" conspicuous by their absence. When building the detector I tried every conceivable type of feed-back and regeneration control. The potentiometer type was finally selected. In every way the potentiometer proved far more suitable. A variable condenser has a decided effect on the tuning. This means that it would be practically impossible to accurately log a station. With the control I have used, a station once received will always reappear at the same dial setting. It is interesting to note at this point that in one trial of the set it was found unnecessary to touch the regeneration control after it was once set. Several stations, one after the other, were tuned in using only one control—the tuning knob.

Two Audio Stages

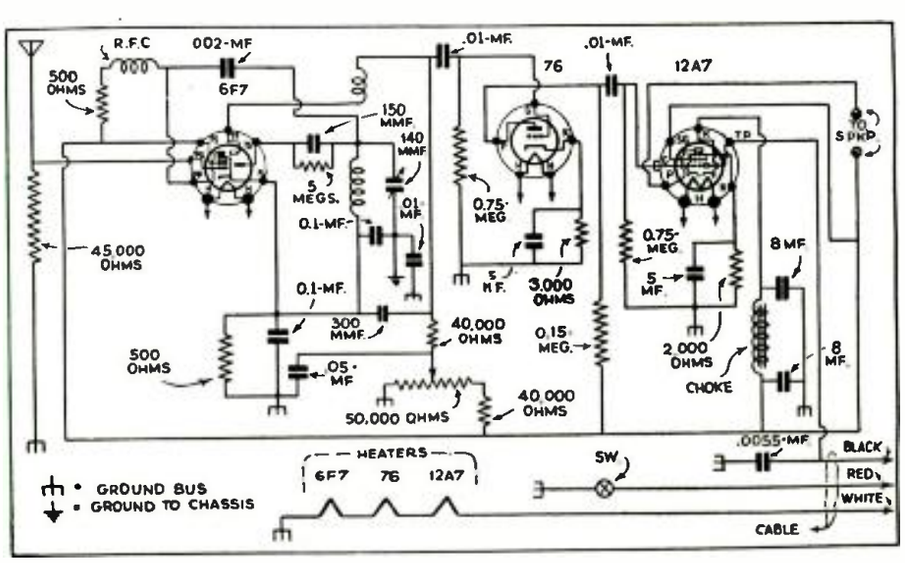
For the purpose of amplifying the signals, it was found necessary to use two stages. Here, as well as in the radio frequency end of the set, a great deal of consideration was given the choice of the most suitable tubes. Every tube was tried including the 6C6, 6D6, 37, and the 76. The latter was finally selected because it gave good voltage amplification with a minimum of distortion. The high gain of this super-triode was utilized by providing an unusually high plate load resistor—150,000 ohms!

The final circuits are in another new combination tube, the 12A7. This tube contains a pentode audio output section and a diode rectifier section all in one glass envelope. The pentode section is a full sized output tube and it swings the speaker with ease. The diode section is conventional in every way and is practically the same as a 12Z3.

Self-Contained Power Supply

The 110 Volt current after passing through the rectifier is filtered by the choke and two 8 mfd. electrolytic condensers in an effort to eliminate every trace of hum.

(Continued on page 552)

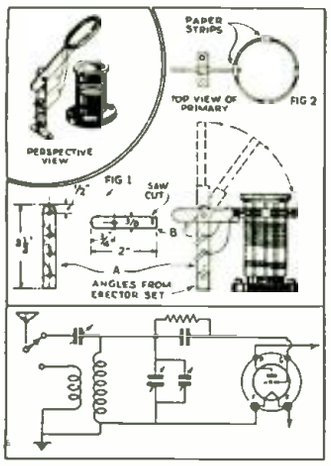


Wiring diagram for the Harrison "5 in 3" A.C.-D.C. set which operates on 110 volts alternating or direct current.

*Design Engineer, Harrison Radio Company.

$5.00 Prize SIMPLE ANTENNA COUPLER

Here is a description of a home-made antenna coupler that can be used in conjunction with any of the four prong plug-in coils. Two pieces of hard rubber were cut from an old panel and drilled as shown in the accompanying drawing. (Fig. 1). The primary coil consists of ten turns No. 21 D.S.C. copper wire, wound on a form of approximately two and one eighth inches. Paper is first wrapped several times around



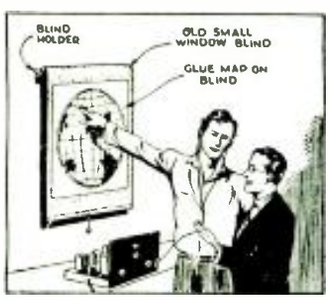
a two inch form and the end pasted. The wire is then wound over this, the turns being kept close together, and glued in several places. Small strips of paper are then glued on the outside of the coil and left to dry. The coil is then removed from the form and the strips of paper are then fastened around the turns, making a firm, self-supporting coil. The coil is fastened to the little rubber strip by inserting it into the saw cut at one end and glued. (Fig. 2)—Ernest Dummer.

▼ ▼ ▼

HANDY MAP

This map will be most convenient to a Short Wave DX'er. I am very much satisfied with this map.

It is made out of an old blind, set up the blind and glue your map to it. When not in use zip-up. This is welcome where space is limited.—John Vetter.



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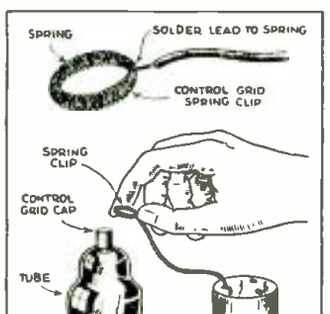
GRID CLIP FROM CURTAIN SPRING

Here is a description of an improved grid cap connector made out of spring curtain rods. A spring can be obtained at any five and 10 cent store. Cut a piece of spring about one and one half inch long, put the ends together and put a drop of



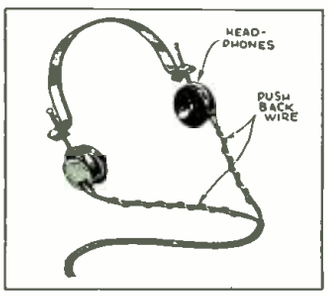
solder on to hold the ends tight together. Then solder a piece of wire on for the connection. Then place the completed cap over the grid connection of the tube as shown.—Ervin Sperath.

$5.00 FOR BEST SHORT WAVE KINK

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

KEEPING PHONE CORDS UNTANGLED

After having so much trouble with the wire on my set of headphones, always continually twisting, I hit upon the idea of twisting push back wire around the two wires from phone to plug in cable. It solved the situation completely as it keeps the wires in the most convenient place.—Joel Levy, Jr.



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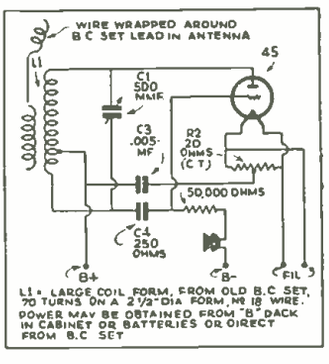
SIMPLE P.A. SYSTEM

Many times I have desired to make use of a public address system at parties, etc., and finally hit upon the idea of constructing a 245 oscillator which can be connected directly to the broadcast receiver. The oscillator is modulated with an ordinary microphone in series with the B negative supply. By tuning the oscillator and broadcast receiver to resonance the oscillator acts as a miniature broadcasting station and full speaker volume can be obtained. However, care should be taken to make sure that this instrument does not interfere with other receivers in the neighborhood.—Marine Schell.



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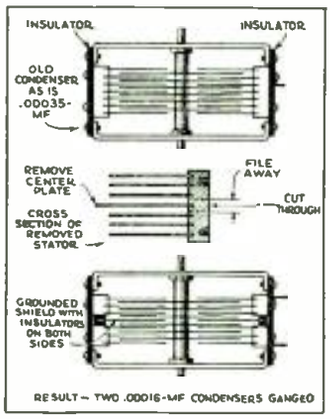
HANDY 2-GANG CONDENSER KINK

Short Wave condensers are quite expensive and having some old 00035 on hand I thought of separating the stator plates in half and making two small condensers which would be ganged together, and varied by the same rotor.

Taking the condenser in half, with the center plate removed and four plates on each side, the condensers will have a capacity of about .00016 mf. each.

The old condenser is taken apart or rather the stator is removed, the sides cut through at the middle plate which is removed, and the inside ends filed smooth. A metal plate is cut out to fit in between. And when the stators are assembled back this plate is inserted between the stators with rubber insulators holding it in place tightly. It is then grounded thus shielding the two condensers.

I have used this condenser in the two tube super-het in your December issue and have obtained fine results. Diagram appears above in next column. —E. M. Granville.



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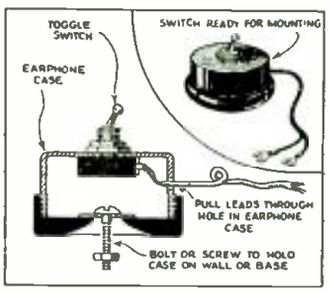
HANDY SWITCH MOUNT

Here is drawing of a defendable switch mount. This is made from an old discarded metal cased earphone. You just have to drill a hole in the middle and mount the switch. Then lead the wires from the switch out of a hole drilled in the side.

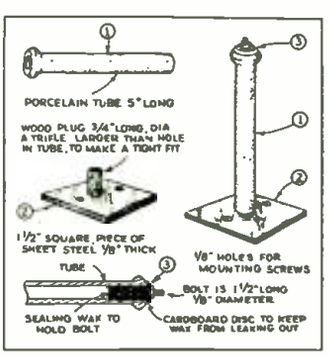


This is very handy for "bread-board" transmitters and receivers and in dark places where it is hard to find small toggle switches. It is a good idea to have a large washer when you mount the earphone cap, so as to take the strain off the bakelite.—Joe Bergsleker.

▼ ▼ ▼

NOVEL STAND-OFF INSULATOR

A very efficient stand-off insulator can be constructed from a 5 inch porcelain insulating tube. Both ends of the tube are fitted with wood dowels in order to facilitate mounting. The drawing below clearly shows how the screw is fastened in one end and how the base is fitted to the other end. —George Shenberger.



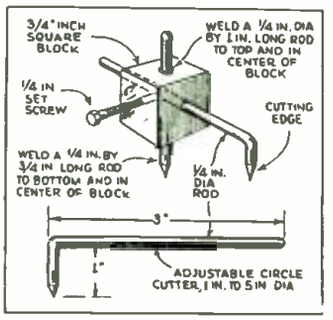
HANDY SUBSTITUTE

For the "Ham" who gets all set to test his Transmitter some evening and finds that his neon test bulb has been lost, stepped on, or the baby has swallowed it.

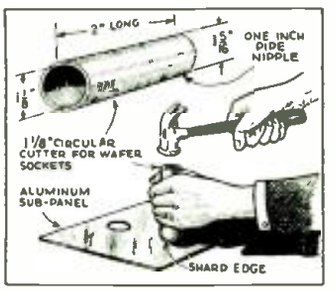
Dig down in the junk box and salvage an old Raytheon Rectifier tube, type BH, connect the four prongs with a piece of bare wire and you have as serviceable test bulb as you had before, giving a glow much the same as your neon bulb.—Marine Schell.

▼ ▼ ▼

TOOLS FOR WORKING METAL CHASSIS



The above diagram clearly shows the construction of an instrument which can be used for cutting large holes in bakelite or metal panels. The drawing clearly indicates how simply this tool can be constructed. The cutting instrument should be made of high grade steel especially where hard materials are being worked. The ¾ inch square block can be made of ordinary iron. The drawing below shows a very simple method

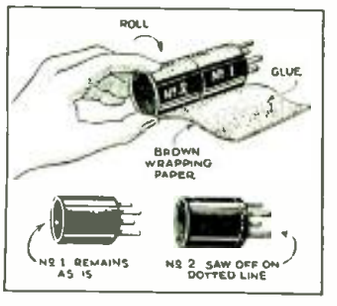


of constructing a punch for making socket holes in metal panels or chassis. Secure a piece of 1 5/16 inch outside diameter pipe, file each end as straight as possible and sharpen one end in order that a cutting edge will be effected. Simply place the panel to be punched over some hard wooden material.—S. B. Wells.

▼ ▼ ▼

INCREASING SIZE OF TUBE BASE COILS

By using two tube bases as shown in the diagram you can increase the length of the coil in order to accommodate the larger windings. This is done by sawing off the prong end of one tube base. Then put the two coils end to end and wrapping them with glued paper. B. S. Dekker.



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CHEAP LEAD-IN

I think that a pair of lead-in bowls made from two coffee pot tops is the cheapest that any "Ham" can get. Drill a hole in each top and through the pane of glass, then put one on each side of the window pane with a 6"x¼" brass bolt with a washer and nut on each end of the tops.—Harry Gaul.

Short Wave Stations of the World

Complete List of Broadcast, Police and Television Stations

We present herewith a revised list of the short-wave broadcasting, experimental and commercial radiophone stations of the world. This is arranged by frequency, but the wavelength figures are also given for the benefit of readers who are more accustomed to working with "meters."

All the stations in this list use telephone transmission of one kind or another and can therefore be identified by the average listener.

Herewith is also presented a very fine list of police as well as television stations. **Note: Stations marked with a star ★ are the most active and easily heard stations and transmit at fairly regular times.**

Please write to us about any new stations or other important data that you learn through announcements over the air or correspondence with the stations themselves. A post card will be sufficient. We will safely return to you any verifications that you send in to us. Communications of this kind are a big help.

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

Around-the-Clock Listening Guide

Although short wave reception is notorious for its irregularity and seeming inconsistency (wherein lies its greatest appeal to the sporting listener), it is a good idea to follow a general schedule as far as wavelength in relation to the time of the day is concerned. The observance of a few simple rules will save the short wave fan a lot of otherwise wasted time.

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

To the east of the listener, from about 1 P.M.-6 P.M., the 25-35 meter will be found very productive. To the west of the listener this same band is best from about 7 P.M. until shortly after daybreak. (After dark, results above 35 meters are usually much better than during daylight. These general rules hold for any location.

Short-Wave Broadcasting, Experimental and Commercial Radiophone Stations

21540 kc. W8XK
-B- 13.93 meters
WESTINGHOUSE ELECTRIC
PITTSBURGH, PA.
7 a. m.-2 p. m.; relays KDKA

21420 kc. WKK
-C- 14.01 meters
A. T. & T. CO.
LAWRENCEVILLE, N. J.
Calls Argentina, Brazil and Peru, daytime

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

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

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

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

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

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

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

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

19380 kc. WOP
-C- 15.48 meters
OCEAN GATE, N. J.
Calls Peru, daytime

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

17790 kc. GSG
-B- 16.86 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See
"When to Listen In" Column

17780 kc ★W3XAL
-B- 16.87 meters
NATIONAL BROAD. CO.
BOUND BROOK, N. J.
Relays WJZ, 10 a. m.-4 p. m. every day

17760 kc. DJE
-B- 16.89 meters
REICHS-RUNDFUNK-
GESELLSCHAFT
BERLIN, GERMANY
Irregular 8 a. m.-2 p. m.

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

17310 kc. W3XL
-X- 17.33 meters
NATIONAL BROAD. CO.
BOUND BROOK, N. J.
Relays WJZ irregularly

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

17120 kc. WOY
-C- 17.52 meters
LAWRENCEVILLE, N. J.

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

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

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

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

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

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

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

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

15620 kc. JVF
-C- 19.2 meters
NAZAKI, JAPAN
Phones U.S., 5 a.m. & 8 p.m.

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

15410 kc. PRADO
-B- 19.47 meters
RIOBAMBA, ECUADOR
4:30-6 p. m. Sun.

15355 kc. KWU
-C- 19.53 meters
DIXON, CAL.
Phones Hawaii

15340 kc. DJR
-Z- 19.56 meters
REICHS-RUNDFUNK-
GESELLSCHAFT,
BERLIN, GERMANY
Testing irregularly

15330kc.★W2XAD
-B- 19.56 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays
WGY daily, 2:30-3:30 p. m.

15300 kc. CP7
-B- 19.6 meters
LA PAZ, BOLIVIA

15280 kc. DJQ
-X- 19.63 meters
REICHS-RUNDFUNK-
GESELLSCHAFT,
BERLIN, GERMANY
Tests irregularly

15270 kc. ★W2XE
-B- 19.65 meters
ATLANTIC BROADCASTING CORP.
485 Madison Av., N.Y.C.
Relays
WABC daily, 11 a. m.-1 p. m.

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

15243 kc. ★FYA
-B- 19.68 meters
"RADIO COLONIAL"
PARIS, FRANCE
Service de la Radiodiffusion
103 Rue de Grenelle, Paris
7:30-11 a. m.

15220 kc. PCJ
-X- 19.71 meters
S. A. PHILIPS' RADIO
EINDHOVEN, HOLLAND
Broadcasts irregularly in morning relaying P.H.I.

15210 kc. ★W8XK
-B- 19.72 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
10 a. m.-4:15 p. m.
Relays KDKA

15200 kc. ★DJB
-B- 19.73 meters
REICHS-RUNDFUNK-
GESELLSCHAFT
BERLIN, GERMANY
12:15-2 a. m., 8-11:30 a. m.
Also 4-5:30 a. m. on Sundays

15140 kc. ★GSF
-B- 19.82 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See
"When to Listen In" Column

15120 kc. HVJ
-B- 19.83 meters
VATICAN CITY
ROME, ITALY
5:00 to 5:15 a. m., except Sunday. Also Sat. 10-10:30 a. m.

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

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

(Time given is Eastern Standard Time)

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

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

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

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

14500 kc. LSM2
-C- 20.69 meters
HURLINGHAM, ARGENTINA
Calls U. S., evening

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

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

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

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

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

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

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

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

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

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

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

12840 kc. WOY
-C- 23.36 meters
LAWRENCEVILLE, N. J.

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

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

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

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

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

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

12000 kc. ★RNE
-B- 25 meters
MOSCOW, U. S. S. R.
Sat. 10-11 p. m.
Sun. 6-7 a. m., 10-11 a. m.

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

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

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

11885 kc. ★FYA
-B- 25.24 meters
"RADIO COLONIAL"
PARIS, FRANCE
11:15 a. m.-2:15 p. m., 3-6 p. m.

11870 kc. ★W8XK
-B- 25.26 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
4:20-10:00 p. m.
Sat. till 1 a. m.
Relays KDKA

11860 kc. ★GSE
-B- 25.29 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See
"When to Listen In" Column

11855 kc. DJP
-X- 25.31 meters
REICHS-RUNDFUNK-GESELLSCHAFT
BERLIN, GERMANY
Tests irregularly

11830 kc. ★W2XE
-B- 25.36 meters
ATLANTIC BROADCASTING CORP.
485 MADISON AVE., N. Y. C.
3-5 p. m. Relays WABC

11811 kc. I2RO
-B- 25.4 meters
ROME, ITALY

11795 kc. DJO
-X- 25.43 meters
REICHS-RUNDFUNK-GESELLSCHAFT,
BERLIN, GERMANY
Tests irregularly

11790 kc. W1XAL
-B- 25.45 meters
BOSTON, MASS.
Irregularly in the evening

11760 kc. DJD
-B- 25.51 meters
BROADCASTING HOUSE,
BERLIN
12-4:30 p.m.

11750 kc. ★GSD
-B- 25.53 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See
"When to Listen In" Column

11730 kc. ★PHI
-B- 25.57 meters
HUIZEN, HOLLAND
Daily ex. Tue. & Wed.
8:00-9:30 or 10:30 a. m.

11720 kc. ★CJRX
-B- 25.6 meters
WINNIPEG, CANADA
Daily, 8 p. m.-12 m.
Sunday, 8-10:30 p. m.

11720 kc. FYA
-B- 25.6 meters
"RADIO COLONIAL"
PARIS, FRANCE
6:15-9 p. m.
10 p. m.-12 midnight

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

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

10740 kc. JVM
-C- 27.93 meters
NAZAKI, JAPAN
Phones California evenings

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

10660 kc. JVN
-C- 28.14 meters
NAZAKI, JAPAN
Tests 2-7 a. m.

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

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

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

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

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

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

10350 kc. ★LSX
-C- 28.98 meters
MONTE GRANDE, ARGENTINA
Tests irregularly 8 p. m.-12 midnight. Used in Byrd Broadcasts

10330 kc. ★ORK
-C- 29.04 meters
RUYSSELEDE, BELGIUM
Broadcasts 2:45-4:15 p. m.

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

10290 kc. DIQ
-X- 29.16 meters
KONIGSWUSTERHAUSEN, GERMANY
Broadcasts irregularly

10260 kc. PMN
-C- 29.24 meters
BANDOENG, JAVA
Calls Australia 5 a. m.

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

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

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

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

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

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

9860 kc. ★EAQ
-B- 30.43 meters
P. O. Box 951
MADRID, SPAIN
Daily except Saturday, 5:15-7 p. m.; Saturday, 1-3 p. m., 5:15-7:30 p. m.; Tues. and Thurs. 5:15-7:30 p. m.

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

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

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

9780 kc. I2RO
-B- 30.67 meters
E.I.A.R.,
ROME, ITALY
Monday, Wed., Fri. 6:30-8 p.m. and irregularly at other hours.

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

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

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

9600 kc. ★CT1AA
-B- 31.25 meters
LISBON, PORTUGAL
Tues. and Friday, 4:30-7 p. m.

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

9590 kc. ★VK2ME
-B- 31.28 meters
AMALGAMATED WIRELESS, LTD., 47 YORK ST.
SYDNEY, AUSTRALIA
See
"When to Listen In" Column

9590 kc. PCJ
-X- 31.28 meters
S. A. PHILIPS' RADIO
EINDHOVEN, HOLLAND
Broadcasts irregularly

9590 kc. W3XAU
-B- 31.28 meters
NEWTOWN SQUARE, PA.
Relays WCAU
12 noon 7:50 p. m.

9580 kc. GSC
-B- 31.32 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See
"When to Listen In" Column

9580 kc. ★VK3LR
-B- 31.32 meters
Research Section,
Postmaster Gen'ls. Dept.,
61 Little Collins St.,
MELBOURNE, AUSTRALIA
3-8 a. m. except Sun.

9575 kc. KZRM
-B- 31.33 meters
ERLANGER & GALINGER, INC.
MANILA, PHIL. ISL.
Broadcasts irregularly from 5-9 a.m.

9570 kc. ★W1XAZ
-B- 31.35 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
SPRINGFIELD, MASS.
Relays WBZ, 7 a. m.-1 a. m.

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

9560 kc. DJA
-B- 31.38 meters
BROADCASTING HOUSE,
BERLIN
8-11:30 a. m., 5:15-9:15 p. m.
also 4-5:30 a. m., Sundays

9540 kc. DJN
-X- 31.45 meters
REICHS-RUNDFUNK-GESELLSCHAFT,
BERLIN, GERMANY
Tests irregularly

9540 kc. LKJ1
-B- 31.45 meters
JELOY, NORWAY
Relays Oslo 10 a. m.-4 p. m.

9530 kc. ★W2XAF
-B- 31.48 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays WGY 7:25-11 p. m.
Sundays, 7:25 p. m.-12:30 a. m.

9510 kc. ★GSB
-B- 31.55 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See
"When to Listen In" Column

9510 kc. ★VK3ME
-B- 31.55 meters
AMALGAMATED WIRELESS, Ltd.
G. P. O. Box 1272L,
MELBOURNE, AUSTRALIA
Wed., 5-6:30 a. m.; Saturday, 5:00-7:00 a. m.

9505 kc. ★PRF5
-B- 31.58 meters
RIO DE JANEIRO, BRAZIL
Daily
except Sun. 5:30-6:15 p. m.

9428 kc. COH
-B- 31.8 meters
2 B ST., VEDADO,
HAVANA, CUBA
Daily 8:30-10:30 p.m.

9415 kc. PLV
-C- 31.87 meters
BANDOENG, JAVA
Phones Holland, 7:40-9:40 a. m.

9330 kc. CJA2
-C- 32.15 meters
DRUMMONDVILLE, CANADA
Phones England irregularly

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

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

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

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

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

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

(Time given is Eastern Standard Time)

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

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

8560 kc. WOY
-C- 35.05 meters
LAWRENCEVILLE, N. J.

8380 kc. IAC
-C- 35.8 meters
PIZA, ITALY

8214 kc. HCJB
-B- 36.5 meters
QUITO, ECUADOR
7:14-10:15 p. m. except Monday

8185 kc. PSK
-C- 36.65 meters
RIO DE JANEIRO, BRAZIL
7-7:30 p. m. irregularly
Relays PRA3

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

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

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

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

7400 kc. HJ3ABD
-B- 40.54 meters
P. O. Box 509
BOGOTA, COLOMBIA
Daily 12-2 p. m.; 7-11 p. m.
Sunday, 5-9 p. m.

7220 kc. HKE
-B- 41.55 meters
BOGOTA, COL., S. A.
Tue. and Sat. 8-9 p. m.; Mon. & Thurs. 6:30-7 p. m.

7140 kc. HJ4ABB
-B- 42.02 meters
MANIZALES, COL., S. A.
P. O. Box 175
Mon. to Fri. 12:15-1 p. m.; Tues. & Fri. 7:30-10 p. m.; Sun. 2:30-5 p. m.

6977 kc. EAR110
-B- 43 meters
MADRID, SPAIN
Tues., Sat., 5:30 p. m.

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

6860 kc. KEL
-X- 43.70 meters
BOLINAS, CALIF.
Tests irregularly

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

6750 kc. JVT
-C- 44.44 meters
NAZAKI, JAPAN
Relays JOAK, Tokio
2-8:30 a.m.

6666 kc. ★HC2RL
-B- 45.00 meters
P. O. BOX 759, GUAYAQUIL, ECUADOR, S. A.
Sunday, 5:45-7:45 p. m.
Tues., 9:15-11:15 p. m.

6660 kc. TIEP
-B- 45.05 meters
LA-VOZ DEL TROPICO
SAN JOSE, COSTA RICA
Irregular in evening

6650 kc. IAC
-C- 45.1 meters
PIZA, ITALY
Calls ships, evenings

6620 kc. PRADO
-B- 45.30 meters
RIOBAMBA, ECUADOR
Thur. 9-11:30 p. m.

6611 kc. RW72
-B- 45.38 meters
MOSCOW, U. S. S. R.
1-6 p. m.

6500 kc. HJ5ABD
-B- 46.14 meters
MANIZALES, COL.
12-1:30 p. m., 7-10 p. m.

6447 kc. ★HJ1ABB
-B- 46.53 meters
BARRANQUILLA, COL., S. A.
P. O. BOX 715
11:30 a. m.-1 p. m.; 5-10 p. m.

6425 kc. ★W3XL
-X- 46.70 meters
NATIONAL BROADCASTING CO.
BOUND BROOK, N. J.
Tests irregularly

6316 kc. HIZ
-B- 47.5 meters
SANTO DOMINGO
DOMINICAN REPUBLIC
Daily except Sat. and Sun. 4:40-5:40 p. m.; Sat., 9:40-11:40 p. m.; Sun., 11:40 a. m.-1:40 p. m.

6275 kc. HJ3ABF
-B- 47.81 meters
BOGOTA, COLUMBIA
P. O. Box 317
12-1:30 p. m., 7-11 p. m., exc. Sunday. Wed. and Sat. 6-11 p. m., Tues. and Fri. 6:30-11 p. m.

6272 kc. HI1A
-B- 47.84 meters
P. O. BOX 243, SANTIAGO, DOMINICAN REP.
11:40 a. m.-1:40 p. m.
7:40-9:40 p. m.

6160 kc. ★YV3RC
-B- 48.7 meters
CARACAS, VENEZUELA
Generally 4:00-10:00 p. m.

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

6140 kc. ★W8XK
-B- 48.86 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
Relays KDKA
4:30 p. m.-1 a. m.

6130 kc. ZGE
-B- 48.92 meters
KUALA LUMPUR, FED. MALAY STATES
Sun., Tue., and Fri., 6:40-8:40 a. m.

6122 kc. JB
-B- 49 meters
JOHANNESBURG, SOUTH AFRICA
Daily except Sat. and Sun., 11:45 p. m.-12:30 a. m., 4-7 a. m., 9 a. m.-3:30 p. m.
Sat., only, 4-7 a. m., 9 a. m.-4:45 p. m.
Sun., only, 11:45 p. m.-12:30 a. m., 8-10:30 a. m., and 12:30-3 p. m.

6120 kc. YDA
-B- 49.02 meters
N.I.R.O.M.
BANDOENG, JAVA
10:40 p.m.-1:40 a.m., 5:40-9:40 a.m.

6120 kc. ★W2XE
-B- 49.02 meters
ATLANTIC BROADCASTING CORP.
485 MADISON AVE., N. Y. C.
Relays WABC, 6-11 p. m.

6115 kc. HJ1ABE
-B- 49.05 meters
CARTAGENA, COL.
P. O. Box 31
Daily 11:15 a. m.-1 p. m.; Sun. 9-11 a. m.; Mon. at 10 p. m. Wed. 8-10 p. m.

6112 kc. ★YV2RC
-B- 49.08 meters
CARACAS, VENEZUELA
Sundays, 9-11:30 a. m.; 1:30-10:30 p. m.; Weekdays, 11:30 a. m.-1 p. m., 5:30-9:30 p. m.

6110 kc. ★VE9HX
-B- 49.10 meters
HALIFAX, NOVA SCOTIA
9:30 a. m.-1 p. m.; 6-12 p. m.

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

6100 kc. HJ1ABD
-B- 49.18 meters
CARTAGENA, COL.
11:30 a. m.-12:30 p. m.; 7-9 p. m.

6100 kc. ★W3XAL
-B- 49.18 meters
NATIONAL BROADCASTING CO.
BOUND BROOK, N. J.
Relays WJZ
Monday, Wednesday, Saturday, 5:30 p. m.-1 a. m.

6100 kc. ★W9XF
-B- 49.18 meters
DOWNERS GROVE, ILL.
Relays WENR, Chicago
Daily except Mon, Wed. & Sat., 4:30 p. m.-2 a. m.

6095 kc. ★VE9GW
-B- 49.22 meters
BOWMANVILLE, ONTARIO, CANADA
Sun. 1-9 p. m.
Mon.-Wed., 3 p. m.-12 m.
Thurs.-Sat., 7 a. m.-12 m.

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

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

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

6079 kc. DJM
-X- 49.35 meters
REICHS-RUNDFUNK-GESELLSCHAFT,
BERLIN, GERMANY
Tests irregularly

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

6070 kc. ★YV5RMO
-B- 49.42 meters
MARACAIBO, VENEZUELA
5:15-9 p. m.

6070 kc. VE9CS
-B- 49.42 meters
VANCOUVER, B. C., CANADA
Fri., 12:30-1:45 a. m.; Sun., 12 noon-12 midnight

6065 kc. HIX
-B- 49.46 meters
SANTO DOMINGO
DOMINICAN REPUBLIC
Tues., and Fri., 8-10 p. m.; Sun., 7:45-10:40 a. m., 3-5 p. m.; Sat., 10:40-11:40 p. m.

6060 kc. OXY
-B- 49.50 meters
SKAMLEBOAEK, DENMARK
1-6:30 p. m.; also 11 a. m.-12 n. Sunday

6060 kc. ★W8XAL
-B- 49.50 meters
CROSLEY RADIO CORP.
CINCINNATI, OHIO
7:30 a. m.-6 p. m.; 11 p. m.-1 a. m.
Relays WLW

6060 kc. VQ7LO
-B- 49.50 meters
NAIROBI, KENYA, AFRICA
Mon., Wed., Fri., 5:45-6:15 a. m., 11 a. m.-2 p. m.
Tues., 3-4 a. m., 11 a. m.-2 p. m., Thurs., 8-9 a. m., 11 a. m.-2 p. m., Sat., 11 a. m.-3 p. m., Sun., 10:50 a. m.-2 p. m.

6060 kc. W3XAU
-B- 49.50 meters
NEWTOWN SQUARE, PA.
Relays WCAU, Philadelphia
8 p. m.-11 p. m.

6050 kc. ★GSA
-B- 49.59 meters
BRITISH BROADCAST. CORP.
DAVENTRY, ENGLAND
See "When To Listen In" Col.

6040 kc. W1XAL
-B- 49.67 meters
BOSTON, MASS.
Very irregular

6040 kc. YDB
-B- 49.67 meters
N.I.R.O.M.
SOERABAIA, JAVA
10:40 p.m.-1:40 a.m., 5:40-9:40 a.m.

6025 kc. CQN
-B- 49.79 meters
MACAO, CHINA
Mon., Fri., 7-9 a. m.

6020 kc. ★DJC
-B- 49.83 meters
BROADCASTING HOUSE, BERLIN
12 N.-4:30 p. m., 5:30-10:45 p. m.

6012 kc. ZHI
-B- 49.9 meters
RADIO SERVICE CO., 20 ORCHARD RD., SINGAPORE, MALAYA
Mon., Wed., Thurs., 5:40-8:10 a. m.; Sat., 12:10-1:10 a. m., 10:40 p. m.-1:10 a. m. (Sunday)

6010 kc. ★COC
-B- 49.92 meters
P.O. BOX 98
HAVANA, CUBA
Daily 9:30-11 a.m., 4-6 p.m.
Sat. also at 11:30 p.m.

6000 kc. ★XEBT
-B- 50 meters
MEXICO CITY, MEX.
P. O. Box 79-44
7 p. m.-1 a. m.

6000 kc. EAJ25
-B- 50 meters
BARCELONA RADIO CLUB, BARCELONA, SPAIN
3:30-4:30 p. m., Saturday

6000 kc. RW59
-B- 50 meters
MOSCOW, U. S. S. R.
4-6 p. m., daily

5990 kc. YV4RC
-B- 50.25 meters
CARACAS VENEZUELA
7:30-9:30 p. m.

5970 kc. HJ2ABC
-B- 50.27 meters
CUCUTA, COL.
11 a. m.-12 n.; 6-9 p. m.

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

5940 kc. TGX
-B- 50.5 meters
SR. M. NOVALES,
GUATEMALA CITY, GUAT.
Daily except Sun., 8-10 a.m., 1-2:30 p.m., 8 p.m.-12m.

5930 kc. HJ4ABE
-B- 50.6 meters
MEDELLIN, COLOMBIA
Mon., 7-11 p. m.; Tues., Thurs., Sat., 6:30-8:00 p. m.; Wed. and Fri., 7:30-11:00 p. m.

5880 kc. HJ2ABA
-B- 51.02 meters
TUNJA, COL.
1-2 p. m., 7:30-10 p. m.

5853 kc. WOB
-C- 51.25 meters
LAWRENCEVILLE, N. J.
Calls Bermuda, nights

5792 kc. OA4AC
-B- 51.8 meters
RADIO DUSA
LIMA, PERU
Irregularly 9-11:30 p.m.

5614 kc. HCK
-B- 52.5 meters
QUITO, ECUADOR, S. A.

5660 kc. HJ5ABC
-B- 53 meters
CALI, COLOMBIA
11 a. m.-12 N.
Tues. and Thurs. 8-10 p. m.
Sun. 12 N.-1 p. m.

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

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

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

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

4752 kc. WOO
-C- 63.1 meters
OCEAN GATE, N. J.
Calls ships irregularly

4752 kc. WOY
-C- 63.1 meters
LAWRENCEVILLE, N. J.

4320 kc. GDB
-C- 69.44 meters
RUGBY, ENGLAND
Tests, 8-11 p. m.

4273 kc. RW15
-B- 70.20 meters
KHABAROVSK, SIBERIA, U. S. S. R.
Daily, 3-9 a. m.

4272 kc. WOO
-C- 70.22 meters
OCEAN GATE, N. J.
Calls ships irregularly

4272 kc. WOY
-C- 70.22 meters
LAWRENCEVILLE, N. J.

4107 kc. HCJB
-B- 73 meters
QUITO, ECUADOR
7:14-10:15 p. m., except Monday

4098 kc. WND
-C- 73.21 meters
HIALEAH, FLORIDA
Calls Bahama Isles

3600 kc. CT2AJ
-B- 83.5 meters
PONTA DELGADA, SAO MIGUEL, AZORES
Wed. and Sat. 5-7 p. m.

3490 kc. PK1WK
-B- 85.96 meters
BANDOENG, JAVA
Daily except Fri., 4:30-5:30 a. m.

(Time given is Eastern Standard Time)

Television Stations

2000-2100 kc.

W2XDR—Long Island City, N.Y.
W8XAN—Jackson, Mich.
W9XK—Iowa City, Ia.
W9XAK—Manhattan, Kansas.
W9XAO—Chicago, Ill.
W6XAH—Bakersfield, Calif.

2750-2850 kc.

W3XAK—Portable
W9XAP—Chicago, Ill.
W2XBS—Bellmore, N.Y.
W6XS—Los Angeles, Calif.
W9XAL—Kansas City, Mo.
W9XG—W. Lafayette, Ind.
W2XAB—New York, N.Y.

42000-56000, 60000-86000 kc.

W2XAX—New York, N.Y.
W6XAO—Los Angeles. Calif.
W9XD—Milwauke, Wis.
W2XBT—Portable
W2XF—New York. N.Y.
W3XE—Philadelphia, Pa.
W3XAD—Camden, N. J.
W10XX—Portable & Mobile (Vicinity of Camden)
W2XDR—Long Island City, N.Y.
W8XAN—Jackson, Mich.
W9XE—Chicago, Ill.
W9XAT—Portable
W2XD—New York, N.Y.
W2XAG—Portable
W1XG—Boston, Mass.

Police Radio Alarm Stations

CGZ	Vancouver, B.C.	2452 kc.
CJW	St. Johns, N.B.	2416 kc.
CJZ	Verdeen, Que.	2452 kc.
KGHG	Las Vegas, Nev.	2474 kc.
KGHK	Palo Alto, Cal.	1674 kc.
KGHM	Reno, Nev.	2474 kc.
KGHO	Des Moines, Iowa	1682 kc.
KGHX	Santa Ana, Cal.	2430 kc.
KGHY	Whittier, Cal.	1712 kc.
KGHZ	Little Rock, Ark.	2406 kc.
KGJX	Pasadena, Cal.	1712 kc.
KGLX	Albuquerque, N.M.	2414 kc.
KGOZ	Cedar Rapids, Iowa	2466 kc.
KGPA	Seattle, Wash.	2414 kc.
KGPC	St. Louis, Mo.	1706 kc.
KGPD	San Francisco, Cal.	1674 kc.
KGPE	Kansas City, Mo.	2422 kc.
KGPG	Vallejo, Cal.	2422 kc.
KGPH	Oklahoma City, Okla.	2450 kc.
KGPI	Omaha, Neb.	2466 kc.
KGPJ	Beaumont, Tex.	1712 kc.
KGPK	Sioux City, Iowa	2466 kc.
KGPL	Los Angeles, Cal.	1712 kc.
KGPM	San Jose, Cal.	1674 kc.
KGPN	Davenport, Iowa	2466 kc.
KGPO	Tulsa, Okla.	2450 kc.
KGPP	Portland, Ore.	2442 kc.
KGPQ	Honolulu, T.H.	2450 kc.
KGPR	Minneapolis, Minn.	2430 kc.
KGPS	Bakersfield, Cal.	2414 kc.
KGPW	Salt Lake City, Utah	2406 kc.
KGPX	Denver, Colo.	2442 kc.
KGPY	Baton Rouge, La.	1574 kc.
KGPZ	Wichita, Kans.	2450 kc.
KGZA	Fresno, Calif.	2414 kc.
KGZB	Houston, Tex.	1712 kc.
KGZC	Topeka, Kans.	2422 kc.
KGZD	San Diego, Cal.	2490 kc.
KGZE	San Antonio, Tex.	2482 kc.
KGZF	Chanute. Kans.	2450 kc.
KGZG	Des Moines. Iowa	2466 kc.
KGZH	Klamath Falls, Ore.	2382 kc.
KGZI	Wichita Falls, Tex.	2458 kc.
KGZJ	Phoenix, Ariz.	2430 kc.
KGZL	Shreveport, La.	1712 kc.
KGZM	El Paso, Tex.	2414 kc.
KGZN	Tacoma, Wash.	2414 kc.
KGZO	Santa Barbara, Cal.	2414 kc.
KGZP	Coffeyville, Kans.	2450 kc.
KGZQ	Waco, Tex.	1712 kc.
KGZR	Salem, Ore.	2442 kc.
KGZS	McAlester, Okla.	2458 kc.
KGZT	Santa Cruz, Cal.	1674 kc.
KGZU	Lincoln, Neb.	2490 kc.
KGZW	Lubbock, Tex.	2458 kc.
KGZX	Albuquerque, N.Mex.	2414 kc.
KSW	Berkeley, Cal.	1658 kc.
KVP	Dallas, Tex.	1712 kc.
VYR	Montreal, Can.	1712 kc.
VYW	Winnipeg, Man.	2416 kc.
WCK	Belle Island, Mich.	2414 kc.
WEY	Boston, Mass.	1558 kc.
WKDT	Detroit, Mich.	1558 kc.
WKDU	Cincinnati, Ohio	1706 kc.
WMDZ	Indianapolis, Ind.	2442 kc.
WMJ	Buffalo. N.Y.	2422 kc.
WMO	Highland Park, Mich.	2414 kc.
WMP	Framingham, Mass.	1666 kc.
WPDA	Tulare, Cal.	2414 kc.
WPDB	Chicago, Ill.	1712 kc.
WPDC	Chicago, Ill.	1712 kc.
WPDD	Chicago, Ill.	1712 kc.
WPDE	Louisville, Ky.	2442 kc.
WPDF	Flint, Mich.	2466 kc.
WPDG	Youngstown, Ohio	2458 kc.
WPDH	Richmond, Ind.	2442 kc.
WPDI	Columbus, Ohio	2430 kc.
WPDK	Milwaukee, Wis.	2450 kc.
WPDL	Lansing, Mich.	2442 kc.
WPDM	Dayton, Ohio	2430 kc.
WPDN	Auburn, N.Y.	2382 kc.
WPDO	Akron, Ohio	2458 kc.
WPDP	Philadelphia, Pa.	2474 kc.
WPDR	Rochester, N.Y.	2382 kc.
WPDS	St. Paul, Minn.	2430 kc.
WPDT	Kokomo, Ind.	2490 kc.
WPDU	Pittsburgh, Pa.	1712 kc.
WPDV	Charlotte, N.C.	2458 kc.
WPDW	Washington, D.C.	2422 kc.
WPDX	Detroit, Mich.	2414 kc.
WPDY	Atlanta, Ga.	2414 kc.
WPDZ	Fort Wayne Ind.	2490 kc.
WPEA	Syracuse, N.Y.	2382 kc.
WPEB	Grand Rapids, Mich.	2442 kc.
WPEC	Memphis, Tenn.	2466 kc.
WPED	Arlington, Mass.	1712 kc.
WPEE	New York, N.Y.	2450 kc.
WPEF	New York, N.Y.	2450 kc.
WPEG	New York, N.Y.	2450 kc.
WPEH	Somerville, Mass.	1712 kc.
WPEI	E. Providence, R.I.	1712 kc.
WPEK	New Orleans, La.	2430 kc.
WPEL	W. Bridgewater, Mass.	1666 kc.
WPEM	Woonsocket, R.I.	2466 kc.
WPEP	Arlington, Mass.	1712 kc.
WPES	Saginaw, Mich.	2442 kc.
WPET	Lexington, Ky.	1706 kc.
WPEW	Northampton, Mass.	1666 kc.
WPFA	Newton, Mass.	1712 kc.
WPFC	Muskegon, Mich.	2442 kc.
WPFE	Reading, Pa.	2442 kc.
WPFG	Jacksonville, Fla.	2442 kc.
WPFH	Baltimore, Md.	2414 kc.
WPFI	Columbus, Ga.	2414 kc.
WPFJ	Hammond, Ind.	1712 kc.
WPFK	Hackensack, N.J.	2430 kc.
WPFL	Gary, Ind.	2470 kc.
WPFM	Birmingham, Ala.	2382 kc.
WPFN	Fairhaven, Mass.	1712 kc.
WPFO	Knoxville, Ten.	2474 kc.
WPFP	Clarksburg, W. Va.	2490 kc.
WPFQ	Swathmore, Pa.	2474 kc.
WPFR	Johnson City, Tenn.	2470 kc.
WPFS	Asheville, N.C.	2474 kc.
WPFU	Portland, Me.	2422 kc.
WPFV	Pawtucket, R.I.	2466 kc.
WPFX	Palm Beach, Fla.	2442 kc.
WPFZ	Miami, Fla.	2442 kc.
WPGA	Bay City, Mich.	2466 kc.
WPGB	Port Huron, Mich.	2466 kc.
WPGC	S. Schenectady, N.Y.	1658 kc.
WPGD	Rockford, Ill.	2458 kc.
WPGF	Providence, R.I.	1712 kc.
WPGG	Findlay, Ohio	1682 kc.
WPGH	Albany, N.Y.	2414 kc.
WPGI	Portsmouth, Ohio	2430 kc.
WPGJ	Utica, N.Y.	2414 kc.
WPGK	Cranston, R.I.	2466 kc.
WPGL	Binghamton, N.Y.	2442 kc.
WPGN	South Bend, Ind.	2490 kc.
WPGO	Huntington, N.Y.	2490 kc.
WPGS	Mineola, N.Y.	2490 kc.
WPGU	Boston, Mass.	1712 kc.
WPGW	Mobile, Ala.	2382 kc.
WRBH	Cleveland, Ohio	2458 kc.
WRDQ	Toledo, Ohio	2474 kc.
WRDR	GrossePt.Village, Mich.	2414 kc.
WRDS	E. Lansing, Mich.	1666 kc.

When to Listen In

By M. Harvey Gernsback

Daventry

• The Daventry schedule for December is as follows. Trans. 1, 3-5 a.m. on GSD and either GSB or GSF. (After Dec. 16, 3:30-5:30 a.m.) Trans. 2, 6-7:30 a.m., (except Sunday) on GSF and either GSG or GSE; 7:30-9 a.m. daily on GSB and either GSF or GSE. Trans. 3, 9:15-10:45 on GSE and GSC; 10:45 a.m.-12:15 p.m. on GSC and GSA; 12:15-12:45 p.m. on GSD and GSA. Trans. 4, 1-3 p.m. on GSD and GSB; 3-5:45 p.m., on GSB and GSA Trans 5, 6-8 p.m. on GSC and GSA.

Rome

• I2RO, at Rome, Italy, has resumed broadcasting. Two separate transmitters will shortly be available for broadcasting the programs. At present a program beamed toward North America is sent out on Mon., Wed., and Fri. on a wavelength of 30.67 meters. Other wave lengths avialable are 48.7, 42.98 and their old wave of 25.4 meters. The time of this trans. is from 6:30-8 p.m. It is likely that a shift will he made to one of the higher wave lengths since the first broadcasts were not heard at all in this country.

Panama

• A new broadcasting station at Panama City, Panama, in Central America will shortly go on the air. It will operate on 6040 Kc. (49.67 meters). It will be located at the Miramar Club and will broadcast concerts from the club.

Sydney

• The schedule of VK2ME at Sydney, Australia, from December, January and February is: Sundays only, 1-3 a.m. and 5-11 a.m.

December 9th the program will be dedicated to Canada; between 2:15 and 3:00 a.m. and also from 6:30 to 7:30 a.m.

PRF5

The address of PRF5 is: Mr. Salles Filho, Director of the Brazilian Official Broadcasting Program, Rio de Janeiro, Brazil.

Holland

Our old friend PCJ at Eindhoven, Holland, which has been silent for nearly three years is definitely back on the air again. It operates irregularly on two wave

(*Continued on page* 575)

SHORT WAVE LEAGUE

HONORARY MEMBERS

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

Executive Secretary

A Logical Argument for "No-Code" Exams. on 5 Meters

Editor, SHORT WAVE CRAFT:

● I WOULD like to voice my humble opinion, in regard to the controversy over the "no-code" test below 5 meters, through your magazine SHORT WAVE CRAFT, which has been of great value to me, whose hobby is short-wave radio.

The reason for this letter is the unsportsmanlike manner a few of those people, who wish the code test continued, have answered those of us who agree with the negative.

In one article, we who do not want a code test on this frequency, are called, "gas-bag artists." How naive! In answering him, and I could think of a lot of adjectives to call him by; everyone who uses voice transmission, whether it be the amateur or commercial station, is a "gas-bag artist," according to his adolescent point of view. I might ask him if whenever he uses the public telephone, he would rather use the organs nature provided him with for speech, or whether he would dah dah dit dah, dit dit dit, dah dah dah, in that fashion? Hi.

Another chap calls us "brainless" and mentions laziness in his article, and "*Why don't we get down to work and learn the code?*"

In answer to the lack of brain-power idea of his, I might humbly state that I am a technician in the medical field. Myself and the two physicians and surgeons I work for are very much interested in 56 mc. transmission. These doctors have no use for code, will never use it. One of these doctors is an Ear, Eye, Nose, and Throat specialist, and is interested in voice transmission in connection with his work, as well as for a hobby. Why impose upon these people, and others that have no desire for c.w., something that they do not want or need on this frequency?

Now, if persons of a high enough order of intelligence to go through six to eight years of medical school and to pass the state medical board examinations, are not possessed with sufficient gray matter to learn twenty-six characters of the alphabet, in the approved manner and speed, then may Providence provide for our coming generations. Certainly amateur radio would profit by an addition to its ranks of this type of person. So you see, sir, the argument that we cannot learn the code is weak and unsupported. I believe as one article so aptly put it, "It is like believing in the future of the horse." It is an *antiquated form of communication!*

Consider for the moment, which would be the better action for the commission to adopt: (1) Abolishing the code test below 5 meters, and opening the field to persons who are interested in "voice transmission" only, who will bring new thoughts and ideas into the field, or (2) continuing to impose a code test on this frequency and thereby slamming the door of amateur radio in the faces of worthy persons? I would like to know the motivation in entering amateur radio of some of these persons of the affirmative that insist in covering their lack of knowledge of the subject by calling us names.

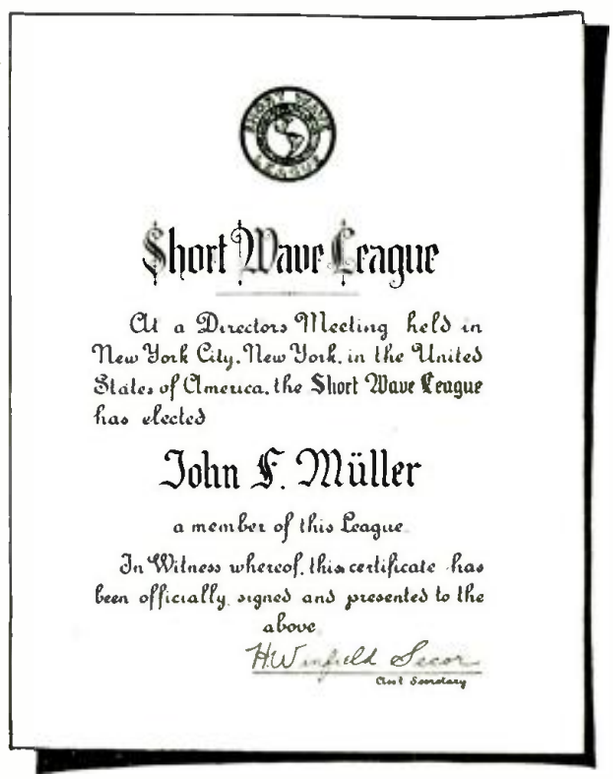
In regard to the "laziness" this same person speaks of: Would you sir, or anyone, call a person that labors on the average of 15 to 17 hours a day, 7 days a week, 52 weeks a year for the good of their community, lazy?!

Honestly, such opinions as some have advanced, who are in favor of the code test, make me boil, if I may use that expression. But then, we should consider the source.

I do not object to a constructive criticism on this or any subject, but when someone of an opposite opinion raises such feeble arguments as have been mentioned, might I humbly suggest for them to do a little research on the *other side of the fence!* I highly recommend the article in SHORT WAVE CRAFT by Mr. J. A. Worcester, W2GAU. Also the article by Mr. Paul Lomaster in the August 1934 issue of SHORT WAVE CRAFT. They are very fine articles and regardless of whether you agree with them or not, they are worth a few moments of your time.

Might I offer a small straw vote, taken by myself in this city, of a few persons who are interested in this subject. I contacted eleven men who are going to take their amateur license examination the next time it is offered in this territory. Out of these eleven men there are only two that cannot send and receive the code at the required "ten per." Ten of these men will build 5 meter transceivers, which they are particularly interested in. All of these men are in favor of a no code test below 5 meters. I also contacted eight amateurs who have their "tickets" (licenses), one of these men holds a first-class commercial license, the other, I believe, is shortly to have an N in front of his call. All were in favor of a no-code test with the exception of one amateur who just received his ticket and is not on the air as yet. I

(*Continued on page* 569)



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

See page 576 how to obtain certificate.

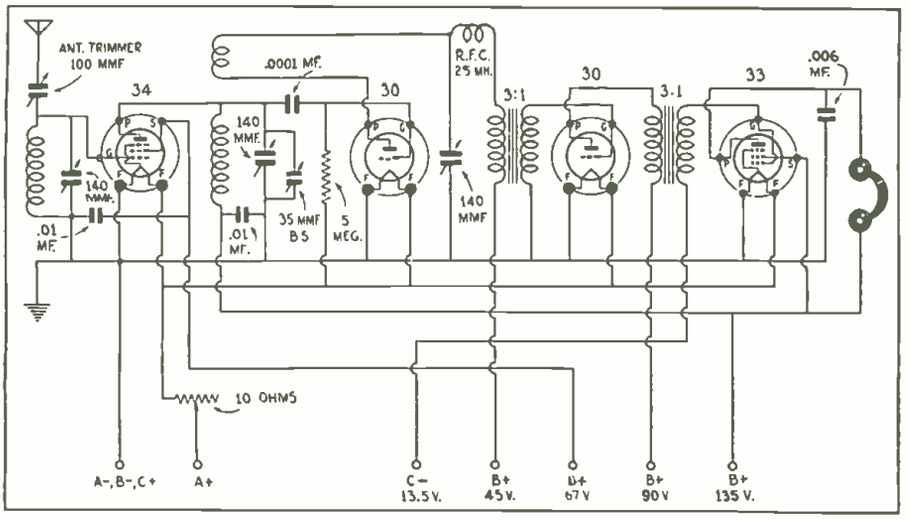
Get Your Button

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

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

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

• • • Short Wave



Above is diagram of 4-tube battery operated T.R.F. receiver. Note—bottom views of sockets are shown in these diagrams.

T.R.F. BATTERY RECEIVER

C. B. Ray, Shelbyville, Tenn.

(Q) Please publish a diagram of a 4-tube battery receiver using 2-volt tubes, with variable condensers to band-spread. I had thought of using one 32, two 30's and one 33. If you think some other line-up of tubes best please print what you think the best.

(A) A receiver using a line-up similar to the one you desire should give excellent service. However, the R.F. tube for best results should be a 34. The set, consisting of a 34 T.R.F. amplifier, a 30 regenerative detector, another 30 as the first stage of audio, and a 33 operating as the power output tube, should be capable of working a speaker with fairly good volume on the various foreign stations. Band-spread is accomplished by connecting a small condenser in parallel with the detector tuning condenser, the small condenser being used for band-spread tuning and the smaller one for band setting. No band-spread condenser is necessary in the R.F. stage because it is rather broad in tuning. If the two condensers were ganged, however, it would be necessary to have band-spread condensers in each stage.

OBTAINING OPERATOR'S LICENSE

John Smith, Norfolk, Va.

(Q) I am a boy of 14 and have taken SHORT WAVE CRAFT magazine for several months. I am especially interested in phone transmitting, and am thinking of making a transmitter. But is there any special age you have to be to have a transmitter, and where do I apply for a transmitting license? What does the examination consist of?

(A) There is no special age requirement in obtaining an operator's license. The examination consists of a code test of 10 words per minute, five letters to the word, and a technical examination covering the construction of a modern transmitter and receiver, together with various questions regarding the laws governing radio amateur operation. You should apply to the Customs House, Boston, Mass., for the examination.

ADDING AMPLIFIER TO 2-TUBE SUPER

Harry S. Wimer, Ellwood City, Pa.

(Q) I have built the 2-tube superhet that was described in the December 1933 issue and would like to know how I could add a 42 tube to it for a little more power output—do you think it would work O.K. with one 42 in the final? I have the 42 tube and the six prong socket.

(A) You should undoubtedly experience excellent speaker performance with the *Victor 2-tube Superhet* described in the December 1933 issue, with the addition of a 42 pentode power amplifier. It is not a very difficult job to add a 42 to the above set and if you follow the accompanying diagram you should have no trouble.

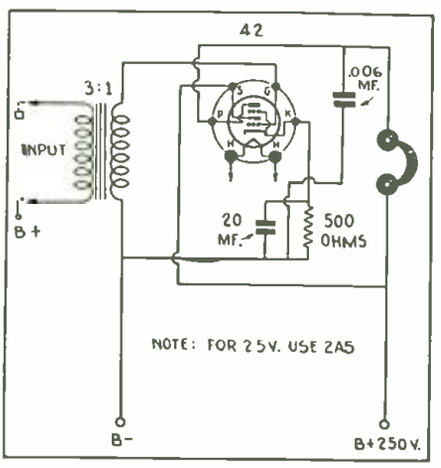


Diagram of type 42 amplifier.

EDITED BY GEORGE

● **Because of the amount of work involved in the drawing of diagrams and the compilation of data, we are forced to charge 25c each for letters that are answered directly through the mail. This fee includes only hand-drawn schematic drawings. We cannot furnish "picture-layouts" or "full-sized" working drawings. Letters not accompanied by 25c will be answered in turn on this page. The 25c remit-**

BATTERY-OPERATED TRANSMITTER

D. C. Blake, Redwood, Miss.

(Q) At your future convenience would you please publish the diagram of such a transmitter as I will try to outline below:

First, it shall use only the 2-volt battery tubes, for oscillator and amplifier, these because of their low current consumption, or the 6.3 volt tubes. Second, it shall not require over 180 volts of "B." Third, crystal-control and ability to work on the 80, 40, and 20 meter bands. Fourth, it shall have an output of at least 8 watts from the last amplifier stage. Such a diagram, for the construction of a transmitter, would be of great benefit to many others who have no A.C. supply available.

(A) On page 596 of our February 1934 issue, there appears an article by Bernard Montgomery, (W2AJD) describing a very efficient battery-operated transmitter. The title of the article is *"650 miles on 1½ watts."* We believe that you will find this article very interesting.

ALL-WAVE AIR-SCOUT

Leo Stern, Jr., New York City, N.Y.

Q) What are the values of the two electrolytic condensers used in the *"All-Wave Air-Scout"?*

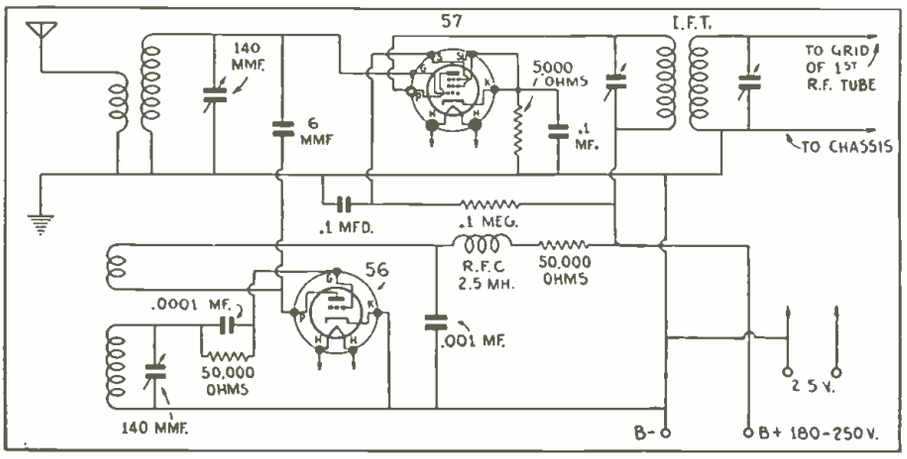
(A) As stated in the article describing the *All-Wave Air-Scout* on page 117 of the August issue, you will find that the two electrolytic condensers have a capacity rating of 8 mf. each.

2-TUBE CONVERTER

P. Hoerner, E. McKeesport, Pa.

(Q) I am now using a short-wave converter with 2-tubes, type 24 and 27. I had European stations, with favorable weather, like locals. I would like to change to type 57 and 56 tubes. Will you please publish a diagram of a converter using these tubes?

(A) We are pleased to print a diagram of a converter using a 57 first detector, and a 56 oscillator. However, we do not believe there will be a tremendous amount of improvement over your present converter, which uses a 24 detector and a 27 oscillator.



2-Tube Superheterodyne Converter using type 56 and 57 tubes.

QUESTION BOX

W. SHUART, W2AMN

tance may be made in the form of stamps or coin.

Special problems involving considerable research will be quoted upon request. We cannot offer opinions as to the relative merits of commercial instruments.

Correspondents are requested to write or print their names and addresses clearly. Hundreds of letters remain unanswered because of incomplete or illegible addresses.

LOW-POWER TRANSMITTER

W. Stillwell, Albuquerque, N. Mex.

(Q) I intend to become an amateur in the near future and would like to have you print a diagram for a 2A5 crystal-controlled oscillator with 2A5 amplifier. About what would the input be with 350 volts on the plate of the oscillator tube and 500 on the plate of the amplifier tube?

(A) A transmitter using two 2A5's, one as a crystal-controlled oscillator and the other as a "high MU" R.F. neutralized amplifier, should give very fine results. You will notice in the diagram which we have printed, that the two grids have been connected together in order to make the 2A5 amplifier a high MU tube. When connected in this manner no fixed bias is necessary. The grids are returned through a fixed resistor. However it is not advisable to place more than 300 volts on the plate. The plate current of the final amplifier under load should not exceed 50 milliamperes for best results.

BEST ANTENNA

P. Bixler, Jr., Westminster, Md.

(Q) Please send me information or put it in *Short Wave Question Box*, the best kind of antenna to use with the National S.W. 3 A.C.

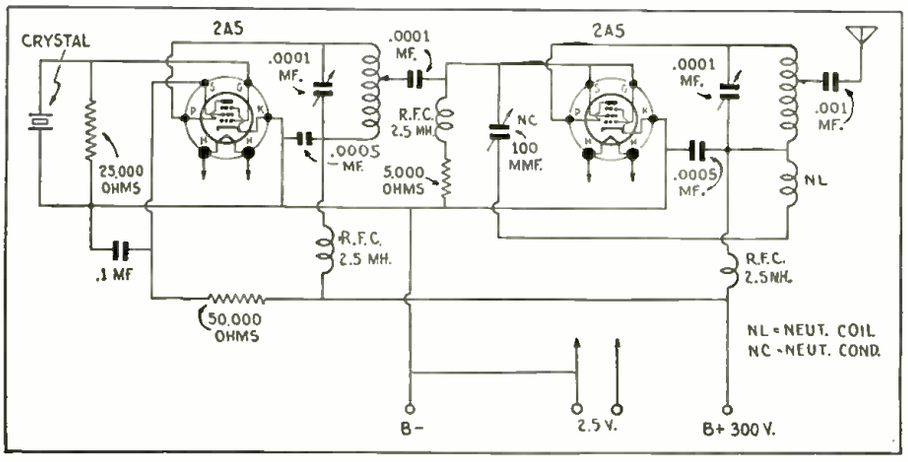
(A) This is really a hard question to answer, inasmuch as various locations will require different types of antennas. In our October 1934 issue, on page 344, we gave complete information covering five or six different types of antennas. We suggest that you read this article carefully and choose the antenna which will best suit your purpose. If you have the room and facilities the inverted "V" antenna will undoubtedly give best results.

BEST AMPLIFIER TUBE

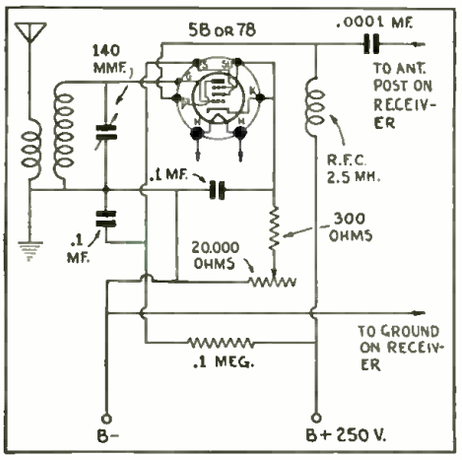
A. H. Gustafson, Philadelphia, Pa.

(Q) In the *Question Box* of your September issue you show a 3-tube A.C. set using a 224 tube as detector, with two stages of 227 audio. Would you please let me know the correct B+ voltage for this receiver as same was now shown. Would 180 volts be satisfactory? Also could a stage of audio be added to the *53 Twinplex* shown some months ago. Would it be possible to use another 53 tube as two stages of audio or a one stage of 227 audio.

(A) The B voltage for the receiver described in the *Question Box* of our September issue can be from 180 to 250. The 53 could be added and form a 2-stage resistance-coupled audio amplifier. However, this would provide three stages in the set and trouble would probably be experienced from feed-back. We believe it would be much more satisfactory if you were to use a single 27 in addition in the amplification already shown in the diagram.



Crystal-controlled MOPA transmitter using 2A5 tubes.



T.R.F. amplifier using 58 or 78 tubes.

R. F. STAGE FOR HAM-BAND "PEE WEE"

B. M. Burch, Denver, Colo.

(Q) Will you please print in your *Question Box* a circuit for an R.F. amplifier for the "Ham-Band Pee Wee" 2-Tube Receiver described in the November 1933 issue of SHORT WAVE CRAFT, using a type 58 tube.

(A) With the addition of a tuned R.F. stage the "Ham-Band Pee Wee," which was described in the November 1933 issue, should give excellent performance. Bandspread will not be needed in the tuned R.F. stage as R.F. stages usually tune rather broad and no critical adjustment is necessary. We are pleased to print the diagram at left and trust you will have no trouble in getting it to work.

MODULATED OSCILLATOR

Walter Stewart, Fanwood, N. J.

(Q) Can a modulator using two 227's as speech amplifiers and a 245 push-pull modulator be used with the R.T. Push-Pull Amateur CW Transmitter? If so, please print a 4-tube modulator that can be used. The filament supply is 2¼ volts and the plate supply is 790 volts.

(A) Under no condition should any of our readers attempt to use a modulated oscillator for phone transmission. The new regulations require that the signal should be free of frequency modulation and this is impossible with a modulator oscillator. The above requirements of course only apply to the 160, 80, and 20 meter phone bands. Modulated oscillators are permitted on 5 and 10 meter bands and on all frequencies higher than 110 megacycles. We believe if you intend to operate on the low-frequency bands that you should by all means use an MOPA (master-oscillator power-amplifier) with at least one buffer stage between the oscillator and the modulated amplifier.

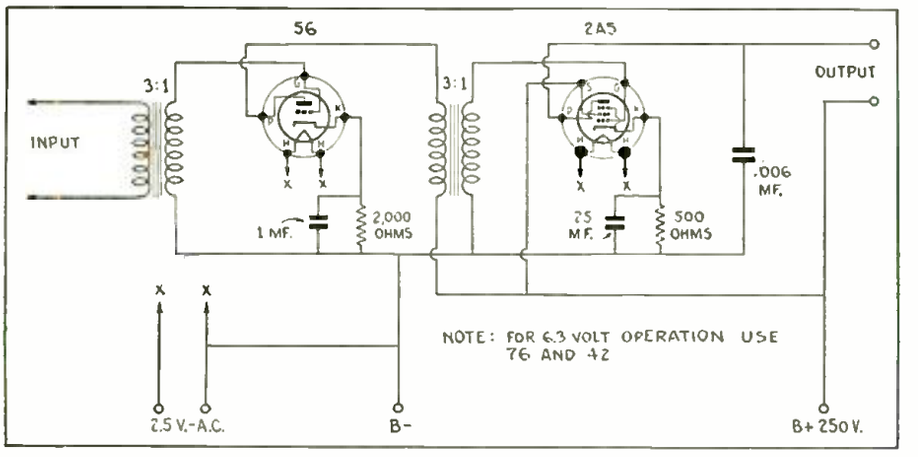


Diagram of 2-stage amplifier which can be added to any short-wave or broadcast receiver.

2-STAGE AUDIO AMPLIFIER

Vincent Ekman, Ironwood, Mich.

(Q) Please publish in the *Question Box*, a circuit of a 56 transformer coupled to a 2A5 audio output tube.

(A) An audio amplifier consisting of a 56 transformer-coupled to a 2A5 pentode should make a very fine general purpose audio amplifier unit and can be used in conjunction with any type of short-wave receiver where speaker volume is required. We suggest that our readers save this diagram for future reference.

A trip to the local radio dealer's shop produced a couple of old battery-model broadcast receivers and two "B" eliminators for less than $2.00. When buying the receivers pick out ones with good variable condensers as these are used in the RF end. The chokes from the "B" eliminators were of the double type in one frame and these were connected in parallel, one unit being used as the filter choke in the power supply. The eliminators also yielded enough fixed condensers to connect in series across each side of the filter choke. Use at least three condensers in series for each filter capacity and use the same size condensers for all three. This then gives us three condensers in series across each side of the filter choke. One of the "B" eliminator transformers is taken apart and three 2½ volt secondaries of number 18 wire wound on, one for the oscillator and speech amplifier filaments and one for the buffer and one for the final RF amplifier.

Bleeder Resistance

Various resistors were series-connected as a *bleeder*, giving a total of about 40,000 ohms. Try to get a combination so that 200 to 300 volts can be tapped off for the speech amplifier and oscillator. Lacking the bleeder arrangement use several of the compression type carbon resistances from old "B" eliminators, in series and adjust for proper voltage. These will run hot so keep your fingers off of them as much as possible. Two switches are used on the power-pack, one as the main switch for the 110 volt line, which turns on the heater filaments, and one switch which turns on the main power supply. The latter is used for send and receive work. If a faster method of operating the transmitter is wanted (the 83 takes a few seconds to warm up) place the second switch in the high voltage negative lead, and have the high voltage transformer run all the time along with the heater type tubes. This method was used for awhile, but most amateurs could not come back as quick so the present method is used, thus allowing the electric light meter more time off.

A small pilot light connected to the 2½ volt filaments completes the power supply.

So far the only new parts purchased are the power transformer and an 83 tube. Next we will take a look at what's on shelf number 2.

The Meters Used

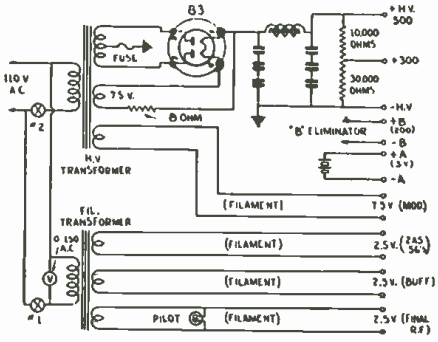
The first thing that strikes the eye is the panel with the two meters on. The right hand one is an 0-150 volt AC to measure line voltage; it was used only because it was at hand and could just as well have been omitted. The other is a very much needed piece of apparatus and is a 0-30 and 0-300 D.C. milliammeter. A range of 0-150 M.A. would be just as good if not better for this work, but use whatever you have. None of the readings will be over 100 mills (M.A.) and the lowest will be about 15 mills. A short piece of cord with a speaker plug on the end is used to plug the meter into the various circuits through the different jacks shown mounted on the front of the chassis units. If you are lucky your two battery sets will have some jacks on, which should of course be used. The jacks are wired in the circuit so that normally the circuit is closed through the jack springs but on inserting the plug the current then flows through the plug and so through the meter. Watch your jack connections so that the meter will read in the same direction for each jack. In the photo the left jack is in the modulator plate circuit, while the right-hand jack is for the single-button mike. The two 250 modulators are in parallel, using Heising system of modulation. The modulation choke is obtained from one of the "B" eliminators. If only the single-button carbon mike is to be used, then one stage of speech amplification using a 56 tube will be all the AF needed. This is transformer coupled to the modulator, using A.F. transformers from the battery receivers.

Microphone Transformer

One transformer should be taken apart and a new primary wound on, consisting

A Low-Power Transmitter

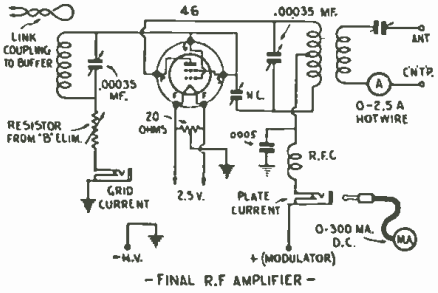
(*Continued from page* 535)



-POWER SUPPLY-

Complete power supply diagram showing the connections of the filament and plate transformers.

of 200 to 400 turns of No. 30 enameled wire. This is the *mike* transformer for the single button mike. If a condenser mike is to be used put on another stage of resistance coupled A.F. ahead of the present 56 stage, using another 56 tube. This, together with the two stage preamplifier in the condenser mike, will give enough "gain" for this work. The beginner is advised to start out with the carbon mike and then progress to the condenser, if the need for better quality is felt. The carbon mike used here is one from a cradle type telephone unit and has very good quality, reports more often indicating a "double-button" mike, rather than just a single button. One of the variable carbon resistances is used as the bias resistor for the modulator and the



- FINAL R.F AMPLIFIER -

Above is the final, modulated amplifier using a 46 as a high mu triode.

by-pass condensers are taken from the "B" eliminators. For safety, use two fixed condensers in series for each by pass unit. If you are short on cash use only one modulator and when you are more "flush" slip in the other one. If one modulator is used run it at about 50 ma. idle, swinging up to about 90 ma. on the peaks. This is not according to Hoyle but gives good modulation and the quality is always reported as being good. When using both modulators, run the total plate current at about 80 ma., reaching 90 to 100 ma. on the peaks. This gives good modulation along with very good quality.

For this unit we have had to buy new, only the 250s, the 56 and perhaps the meter, if you do not already have one. That completes the second shelf so now let's step up to the third and see what it contains.

Oscillator Stage

To the right of the chassis is mounted the variable condenser, inductance, 2A5 tube and crystal of the oscillator stage. The jack below the dial being for the oscillator plate current. To the left is the variable condenser, inductance and 46 tube of the buffer stage. Its plate current jack is mounted just below the condenser dial. Between the two dials may be seen the small neutralizing condenser of the buffer stage. In the rear of the chassis a small variable condenser and inductance coil are mounted to tune the grid circuit of the 46, as link coupling is used throughout the R.F. (radio frequency) portion of the transmitter. The various resistors and by-pass condensers are mounted below deck out of sight together with most of the wiring. The various tuning inductances for these two stages are wound on two inch diameter forms and were obtained from one of the battery sets. Each one is cut down to about 45 turns and all are mounted at right angles to each other. The oscillator is run with about 250 volts on the plate, while the buffer has the full 500 volts from the power supply.

If you buy your crystal from an amateur, have him test it out for you to make sure it operates properly. The 2A5 or use a 47 if you have one handy, and the 46 will be purchased new for this unit along with the crystal.

Now let's take a look at the top shelf. It contains a single 46 as the final modulated R.F. amplifier. The left-hand variable condenser tunes an inductance similar to those used on the third deck. Next comes the neutralizing condenser and then the final tank condenser. Its inductance is on a three inch tube using No. 18 enameled wire slightly space wound. On the front of the chassis is mounted a variable resistor (from the "B" eliminator) which is used as the bias resistor on the 46. Two jacks are seen, one in the grid circuit and one in the plate circuit of the 46. The right hand knob of the upper deck is the antenna variable condenser, which is series connected with the antenna inductance (25 turns close wound on a three inch form) together with the hot wire radiation ammeter. This meter is not needed unless you feel like having one, as a small flashlight bulb connected to two or three turns of wire is used mostly for tuning up the outfit. This completes the transmitter and as you have seen the cash outlay for parts was kept at a minimum.

General Hints

The grid current of the final stage should run 15 ma. or more and the plate current should he kept below 75 ma. if you want your tube to last. The black rack frame, measuring 36x16x9, is constructed of 1x2 white pine and is given a coat of black house paint. Use only one coat and it will leave a dull finish which is a very pleasing contrast to the clear lacquered chassis bases.

Diagrams for the various hookups comprising the transmitter may be obtained from past issues of SHORT WAVE CRAFT.

The condenser "mike" is a home-made unit, the head being made out of a horn-type loud speaker unit and using a 5c Hershey bar tinfoil as the diaphragm. (.006 inch thick aluminum foil is usual.) The base is from a horn type loud speaker and is of cast metal construction with a plate on the bottom fastened to the case by screws. On this plate has been mounted the two 30 type tubes together with the necessary resistors and condensers to make up the pre-amplifier. A shielded

(*Continued on page* 564)

The Short-Wave Fan's "DX-ER"

(*Continued from page 525*)

"De-Henried" Wiring

small value. This procedure changes what would be normally a fairly long line electrically into one in which the distributed constants can be neglected. The actual construction merely consists of an additional insulated wire wound about the one to be *de-henried* with a pitch of about one turn per inch in order to insure intimate coupling, and grounded at the high potential end as indicated in the schematic diagram. Anyone doubting the effectiveness of this construction can try the following experiment with an ordinary regenerative receiver. Take the plug-in coil covering say 60 to 120 meters and starting from the ground end interwind an additional winding having about 6 turns less than the original winding. It will be noted that when both ends of this winding are left open the frequency coverage of the coil is unchanged; while when the high potential end of this auxiliary winding is grounded the frequency coverage of the coil is determined by the portion of the winding which is not interwound with the auxiliary winding. In other words the interwound turns effectively cancel out the turns of the original winding with which they are interwound.

The Circuit

Before considering the actual constructional details of the receiver incorporating the above discussed features, it might be advisable to review briefly the details of the schematic diagram as shown in Fig. 1, It will be noted that three tubes are employed: a 58 as an R.F. amplifier, a 57 as a regenerative detector, and a 56 as a resistance coupled audio amplifier. The primary of the antenna input coil L1 has both terminals normally ungrounded so that a doublet type of antenna can be employed if desired. A triple binding post strip is provided permitting the use of an ordinary antenna by connecting one of the above terminals to the ground terminal, the remaining terminal being connected to the antenna. It will be noted that L2 is tapped to provide the neutralizing circuit in conjunction with C4. Neutralization is necessary due to the high gain circuits producing sufficient feedback through the grid-plate capacities, with their associated wiring, to cause oscillations when in resonance. The condenser, C-4, is adjusted initially to counterbalance this effect and once adjusted needs no further attention. C3 is the trimming condenser employed to maintain the two circuits in resonance. The high potential leads joining L2 with the grid of the R.F. amplifier tube and C2 are *de-henried* as indicated.

Electron-Coupled Detector

Electron coupling is employed in the detector stage due to its greater stability and simplicity. It will be noted that the plate output and grid input leads are also de-henried in the manner indicated. The usual procedure of varying the screen-grid voltage for regeneration control is incorporated in this receiver. The audio amplifier is entirely conventional and no detailed discussion of this part of the circuit is necessary. A dry electrolytic condenser of high capacity is used at C13 since it costs only slightly more than an ordinary .5 mfd paper condenser and is much more effective in preventing degenerative feedback. A 56 tube is employed as it provides adequate volume for headphone reception and its low plate current does not affect the sensitivity of the earphones.

Chassis and Layout

The receiver is constructed on a 14 gauge aluminum chassis measuring 10"x6¼"x2". On top of the chassis are mounted the dual .000025 mf. tuning condenser and accompanying airplane dial, and the two tube and coil shields. The location of these components can be determined by an inspection of

the photographs. At the rear of the chassis are mounted the triple binding post assembly, the twin speaker jack and the power cable socket. The remaining parts are mounted underneath the chassis and their location can be determined from the photographs. The R.F. stage is isolated from the remainder of the receiver by the aluminum shield plate shown. As a further precaution against feedback the various ground connections are made to individual bus-bar circuits as indicated. The ground bus for the R.F. section runs from the ground binding post to the rotor of the trimming condenser, C3. The detector circuit bus runs from the B— terminal of the power socket, which is grounded to the chassis, to the rear of the tuning condenser. This bus forms a three-sided square as indicated in the photographs. The remainder of the wiring is self-explanatory as the various fixed condensers and resistors are connected directly to the required points by means of their pigtails.

Eliminating Hum

In order to provide hum-free operation, the grid condenser and leak combination, C8, R2, is mounted directly on the detector screen-grid clip and enclosed by the cap of the tube shield. This cap should be lined around the sides and top with light cardboard in order to prevent possible grounds. In the interests of a low hum-level, it is also necessary to ground one of the heater lines to the chassis as indicated in the schematic diagram. The winding data for the coils are given in table forms.

In connecting up the receiver, be sure to ground one of the doublet coil terminals if an ordinary antenna is used. The power supply should, of course, be well filtered if complete freedom from hum is to be experienced. When tuning the receiver, the trimming condenser should be set at the point where oscillations are most easily produced. If this point happens to be one of the extremes of the condenser, some readjustment of the turns on L2 will be necessary. The neutralizing condenser, C4, had best be adjusted when employing the 49 meter coils. If it is possible to produce oscillations with the potentiometer completely retarded at some settings of the other two controls, the setting of C4 should be increased until this is impossible.

Results were very good. On the 19 meter band, FYA, DJB, GSF, and PRADO were received; on the 25 meter band FYA, GSD, GSE, and DJD were received; while on 30 meters DJA, GSB, GSC, and YV3RC were logged. No attempt was made to log the Australians. All of the shortwave "best-bets" were received on 49 meters. It is possible to receive 20 meter amateur phone stations with the 19 meter coil and on this band were heard HI7G in San Domingo, X1G in Mexico, CM2WZ, CM6XS in Cuba, K4SA in Porto Rico, and numerous 6's and 7's in the States. A few other Spanish-speaking stations were not identified.

It should be remembered that the 19 meter band is generally best in the morning, the 25 meter band best in the early afternoon, the 30 meter band late in the afternoon till dark, and the 49 meter band after dark. In spite of the above generalities some of the best reception is had at other times than those indicated above. For instance, PRADO in Riobamba, Ecuador, was heard on 19 meters at 6:30 in the evening broadcasting a special program for the Ecuadorian colony in France; while HJ2ABC in Columbia was heard on 49 meters at 11 o'clock in the morning. DX reception on 20 meters is generally best in the early evening.

Parts Required

L1, L2—See text for winding details. 19, 25, and 30 meter coils wound on Hammarlund CF-5-M Midget isolantite coil forms. 49 meter coils wound on Hammarlund CF-5 isolantite coil forms.

L3, L4—See text for winding details. See above for forms.

L5, L6—Hammarlund midget 2.3 mh. R.F. chokes.

C1, C2—Condenser, two gang 25 mmf. per section, equipped with Mycalex or Isolantite insulation.

C3—Hammarlund MC-35-S Midget isolantite condenser.
C4—Hammarlund Equalizer, 3-35 mmf.
C5, C6, C7—Aerovox .001 mf. mica condenser.
C8—Aerovox .0001 mf. mica condenser.
C9, C12—Aerovox .0005 mf. mica condenser.
C10—Aerovox .5 mf. tubular by-pass condenser, 400 DCWV.
C11—Aerovox .01 mf. tubular by-pass condenser, 400 DCWV.
C13—Aerovox 25 mf., 25 volt dry electrolytic condenser.
R1—Metallized resistor, 500 ohms, 1 watt.
R2—Metallized resistor, 1 megohm, ½ watt.
R3—Electrad 50,000 ohms potentiometer, type 205.
R4—Metallized resistor, 50,000 ohms, ½ watt.
R5—Metallized resistor, 5,000 ohms, ½ watt.
R6, R7—Metallized resistor, 250,000 ohms, 1 watt.
R8—Metallized resistor, 2,000 ohms, 1 watt.
1—Aluminum chassis, 10" by 6¼" by 2", 14 gauge. Blan. (Korrol)
1—Crowe Tuning Unit, type 123, airplane dial.
2—Hammarlund 5-prong isolantite condensers, type S-5.
2—ICA 5-prong wafer sockets.
2—ICA 6-prong wafer sockets.
1—Na-Ald triple binding post strip.
1—Na-Ald twin speaker jack.
1—Na-Ald 5-prong connectorald plug.
2—Hammarlund tube shields, type TS-50.
2—Shield cans 3" dia. by 3" height, Blan.
Miscellaneous wire and hardware.

COIL DATA

Antenna Coil

L1	L2*
19 M. 6 T. No. 26 DSC.	11¾ T. No. 20 En. Tap at 3½.
25 M. 7 T. No. 26 DSC.	16¼ T. No. 20 En. Tap at 5.
30 M. 9 T. No. 30 DSC.	19¾ T. No. 20 En. Tap at 5.
49 M. 13 T. No. 26 DSC.	26 T. No. 20 En. Tap at 7.

Detector Coil

L3**	L4*
19 M 6¾ T. No. 26 DSC.	9¾ T. No. 20 En. Tap at 2.
25 M. 8¾ T. No. 26 DSC.	12¾ T. No. 20 En. Tap at 2.
30 M. 10¾ T. No. 26 DSC.	14¾ T. No. 20 En. Tap at 2.
49 M. 16 T. No. 30 DSC.	21 T. No. 20 En. Tap at 2.

*Spaced to occupy 1" on 1" dia. form except 49 meter coil, which occupies 1½" on 1½" dia. form.
**Interwound with L4. M—Meters.

"5 METER NEWS"

● MANY of our fans, who are interested in ultra high frequency transmission and reception, will undoubtedly be glad to learn that Arthur Lynch, of noise reducing antenna fame, has installed a 5 meter transmitter on the roof of the Hotel New Yorker and some very remarkable work is being done. The transmitter is a duplicate of the "long line" transmitter, described in the October, 1934 issue of SHORT WAVE CRAFT, and is laying down an R9 signal all over the Metropolitan area in New York and New Jersey. He is also using the new receiver described in the November, 1934 issue of SHORT WAVE CRAFT and reports that the performance of the receiver and transmitter leaves practically nothing to be desired. The most interesting part of this new station, is that Mr. Lynch intends to develop a 5 meter "chain," taking in Washington, Baltimore, Philadelphia, Hartford, W. Hartford, and Malden, Mass. This will be really an accomplishment and from present indications there is every possibility of it being accomplished in great style. Reports on signal strength in various locations will be appreciated and communications (post card will do) should be sent to W2AMN in care of this magazine. We hope to have more complete information and pictures next month.—W2AMN.

A Variable Wavelength Antenna

(*Continued from page* 534)

Natural wavelength in meters	Length of wire in feet
10	8.25
20	16.50
30	24.75
40	33.0
50	41.25
60	49.50
70	57.75
80	60.0

The free end of the aerial wire is provided with two egg-type insulators, a coiled spring and another insulator, to which is attached the hauling rope or line which passes over the top pulley—fixed to the usual wireless pole at the far end of the garden—down the pole, round the lower pulley and thence back to the house where it is secured, within easy reach.

With the aerial extended to 14 feet—equivalent to a natural wavelength of 16.8 metres by the formulae given—the Empire transmitter for the African zone was picked up at fair loudspeaker strength but subject to fading. Extending the aerial another 9 feet gave a length of 23 feet, corresponding to a natural wavelength of 27.6 meters. The same transmission was tuned in again and found to be louder, with fading not so deep, the volume dropping to a comfortable loudspeaker strength, while the peak strength between fades was much greater than ever obtained before. Experiments on other parts of the waveband have shown that reception is improved by adjusting the length of the aerial.—*World Radio.*

(In this article the author referring to "natural wavelength" means the greatest wavelength at which a grounded antenna will function. In his meter-to-feet conversion he uses 3.3 as a factor instead of 3.28. These calculations are near enough for "receiving" purposes but will not serve for computing dimensions of transmitting antennas.—Editor)

"5 in 3" A.C.-D.C. Set

(*Continued from page* 539)

Coil Data

Range	No. Turns	Size Wire	Space between Windings	No. Turns	Size Wire
15 to 25 meters	3¾	25 DSC	3/16 in.	7¾	25 DSC
23 to 45 meters	7¾	25 DSC	1/8 in.	8¾	25 DSC
42 to 90 meters	16¾	25 DSC	1/8 in.	9¾	25 DSC
85 to 200 meters	39¾	30 DSC	1/8 in.	11¾	30 DSC

Ribbed coil forms used: dia.=1¼ inches.

List of Parts

1—Chassis as illustrated (Fultone V).
1—Cabinet with speaker grill (optional).
1—140 mmf. variable condenser (Hammarlund, Fultone).
1—Vernier dial (Crowe).
1—Loud speaker.
1—Tone Filter (or 750 ohm filter choke).
2—7 prong wafer sockets.
1—5 prong wafer sockets.
1—4 prong coil socket (see text).
1—Set of coils as described.
1—350 ohm line cord.
1—50,000 ohm potentiometer.
1—Switch.
1—R.F. choke. 2.5 M.H. (Hammarlund; National).
1—Electrolytic condenser, 8—8 mf. 175 volts 5—5 mf. 35 volts Aerovox)
2—.1 tubular condenser.
3—.01 tubular condenser.
1—.5 tubular condenser.
1—.0055 mica condenser.
1—.002 mica condenser.
1—.0003 mica condenser.
1—.00015 mica condenser.
1—5 meg resistor.
2—750,000 ohm resistor.
1—150,000 ohm resistor.
1— 45,000 ohm resistor.
2— 40,000 ohm resistor.
1— 3,000 ohm resistor.
1— 2,000 ohm resistor.
2— 500 ohm resistor.
1—Speaker twin jack.
2—Knobs.
2—Screen grid clips.

Note: Parts made by other manufacturers than those specified may be used, provided they are of good quality and possess the same electrical characteristics.

Ultra Short Waves Extend Telephone Lines

(*Continued from page 518*)

make it possible to secure an optical path across the bay. Furthermore, Provincetown is fairly accessible by motor car around the Cape and is already provided with wire circuits, so that the radio link need not be completely depended upon. This location is thus a good proving ground for this new type of telephone circuit.

Accordingly, the radio link has been established across the bay, as indicated on the map, and extended at Green Harbor by wire to Boston, to form a direct Boston-Provincetown toll circuit. At Boston and at Provincetown the circuit appears at a jack in the switchboad alongside the jacks of other toll circuits. The insertion of a cord into the jack starts the radio transmitter at that end of the radio link. The receivers at both ends are kept in constant operation while the circuit is available for traffic. Ringing is accomplished by sending a 1000 cycle tone interrupted at 20 cycles over the radio circuit. Since the radio transmitter requires less than one second to start, the operator may ring immediately after inserting the cord. Privacy equipment, similar to that used on the transatlantic short wave channels, in installed.

The receiver is started and stopped by the operation of a key at the local test board. The power supply is arranged so that when the receiver is in operation, current is also applied to some of the filaments of the transmitter. Provision is also made for testing the overall operation of the transmitter and receiver at each end from the local test board. A tone is generated which modulates the transmitter, and if both transmitter and receiver are operating properly, a sidetone will be produced in the local receiver which can be heard by the test board operator.

The transmitter, developed by R. W. Friis and L. M. Klenk under the supervision of N. F. Schlaack, is crystal controlled, and is capable of delivering 15 watts of carrier power which can be completely modulated. A block schematic for the Green Harbor transmitter is shown in Figure 1. The Provincetown transmitter is the same except that the output frequency is 63 megacycles. A quartz crystal oscillator is followed by two harmonic generators, a push-pull modulating amplifier, and a push-pull power amplifier. Modulation is accomplished by supplying audio-frequency modulating power to the plate and screen of the modulating amplifier and to the screens of the second harmonic generator and the power amplifier.

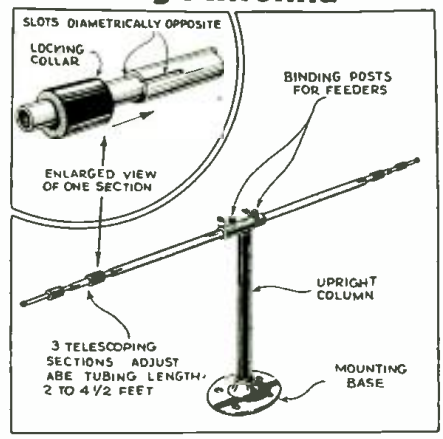
Two rectifiers employing hot-cathode mercury-vapor tubes supply plate and screen potentials for all tubes. Grid bias potentials are obtained from cathode resistors and grid leaks. Grid and plate circuits of each stage are shielded from each other to prevent extraneous coupling and interstage feedback. The transmitter operates entirely on standard commercial 110-volt, 60-cycle current.

The radio receivers, developed by G. Rodwin and C. H. Swannack under the direction of F. A. Polkinghorn, also operate from a 110-volt, 60-cycle circuit, and are of the double detection type. A block schematic is shown in Figure 2. To make unattended operation possible, a crystal oscillator is used as a source of beating frequency. A single-stage harmonic generator produces sufficient voltage of the eighth harmonic of the crystal frequency for satisfactory operation of the detector. The intermediate frequency amplifier consists of three stages of amplification at 1600 kilocycles, and has a band width of approximately 50 kilocycles. A small

amount of automatic volume control is provided to compensate for slight variations in received voltage caused by variation in humidity and other factors.

The receiving and transmitting antennas are identical and are mounted on 100-foot poles 50 feet apart. Horizontal exciter and reflector elements are supported on standard cross-arms. Four pairs of half-wave exciter elements, each comprising two half-wavelength conductors, are spaced one-half wavelength apart in a vertical plane on one side of the pole. Reflector elements are similarly arranged on the opposite side of the pole, the spacing between exciters and reflectors being one-quarter wavelength. The transmitter and receiver are each mounted in a metal container suitable for mounting on the antenna poles at a later date. At the present time they are installed in a small building located between the transmitting and receiving antennas. The mechanical design of the transmitters and the station layout were made by M. E. Fultz and J. L. Mathison. The system was put into trial service early in July.—*Bell Laboratories Record.*

2.5 to 5 Meter Telescoping Antenna



The adjustable 2.5 to 5 meter telescopic antenna can be used either vertically or horizontally. No. 237.

● HERE is an interesting antenna assembly designed for portable transmission and reception on the ultra high frequencies. It is adjustable in length from 4 to 9 feet taking in the 2½ and 5 meter amateur bands. It is a dipole affair so constructed that it can be conveniently mounted either on the running board or the side of the automobile. The illustration clearly shows the method by which the two telescoping sections (there are three parts to each section) can be adjusted and locked in place, making a sure and positive contact at the joint. The mounting standard of this new American Radio Hardware Co. antenna is 13 inches over all, and has a 3¾ inch cast iron base plate, into which the one inch wooden mounting bar is screwed. Thus the base plate can be left mounted permanently and the antenna screwed into place when being used and taken down when not in use.

Cold Cathode Tube Demonstrated!

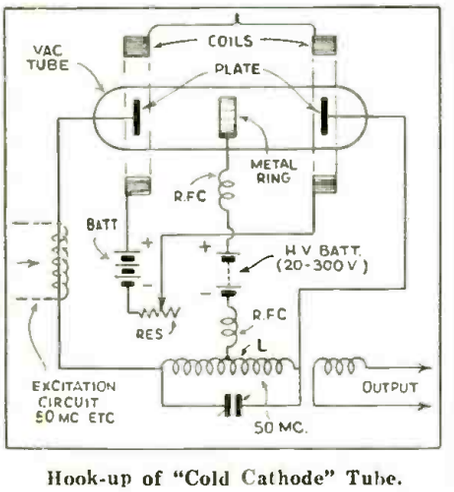
(*Continued from page 521*)

electrostatic field draws them to the alternately, positively charged cathodes. The strength of these several fields can be adjusted to allow an electron to be shuttled back and forth between the cathodes any desired number of times before it is finally drawn out of circulation at the anode. The high velocity electron striking the cathode causes the emission of from 2 to 8 secondary electrons, the number of secondary units depending upon the velocity of the impact electron and thus upon the amplitude of the voltage, which is applied to the cathode. Each emitted secondary also causes the emission of more secondary electrons, the process being rapidly cumulative and gives rise to a tremendous amplification of current.

Condition for Maximum Output

The anode attraction which causes electrons to leave the vicinity of the cathode and which increases its velocity as it approaches the plane of the anode also decelerates its velocity as it leaves the anode plane, and approaches the second cathode which is charged positively so as to attract it. The resultant velocity may not be sufficient to cause emission from the second cathode but in order to insure this emission, additional energy must be imparted to it. This energy is obtained from that stored in the resonant circuit shown in the diagram. The high frequency supply is of the order of 50 megacycles and should be loosely coupled to the tuned circuit in order to apply from 25 to 90 volts across the cathode terminals. One hundred volts or more can be applied to the anode depending upon the desired output.

The Electron Multiplier as a high-frequency self-excited oscillator.



Hook-up of "Cold Cathode" Tube.

Maximum current output is obtained when the anode voltage is just sufficient to allow an electron to travel from one cathode to another during one half of the high frequency excitation cycle. The external magnetic field can be then done away with, if the cathodes are properly curved instead of being plane. This curvature can be calculated so as to focus the electrons automatically for specified anode and cathode voltages. This would eliminate the D.C. supply for the magnetic focusing.

All-Electric All-Wave Set

(*Continued from page* 538)

The nucleus of this set is a special circuit built around the new high gain 6F7 tube. Originally designed for superheterodyne use, this tube is readily adapted to other services. It is in reality two tubes in one bulb, i.e., an RF pentode and a medium mu triode. Used in conjunction with types 76 and 12Z3 tubes, we have 4-tube performance from three tubes.

Inspection of the circuit diagram reveals the use of the RF pentode section of the 6F7 as a screen-grid regenerative detector, the output of which is resistance coupled to the triode section of the same tube which serves as the first audio amplifier stage. Resistance coupling is again employed to the second stage which uses a type 76 tube. A 12Z3 tube functions as a half wave rectifier, and the filaments of all tubes are connected in series as in the usual A.C.-D.C. arrangement. The result is a screen-grid regenerative detector, two stage audio amplifier, rectifier and complete built-in power supply. No external power pack or batteries are necessary.

C1 is the usual antenna series condenser having a capacity range of about 6-70 mmf. Grid leak-condenser detection is used, values of 5,000,000 ohms and 0.0001 mf, respectively being satisfactory. The large value of grid leak results in a high level of sensitivity. Feed-back occurs between the coils L1 and L2 both of which are wound upon the same form. Regeneration is controlled by means of the potentiometer R2 which varies the screen-grid voltage of the detector section of the 6F7 tube.

The plate resistance of the RF pentode section of the 6F7 is quite high, hence it is necessary to use a large value of plate resistor in order to take full advantage of the high gain possibilities of this tube. A value in the neighborhood of 200,000 ohms is quite satisfactory. The mica condenser C5 (.0001 mf.) by-passes the RF currents around the audio amplifier. The audio frequency component of the detector's output is coupled into the triode section of the 6F7 by means of the coupling condenser C6 (.01 mf.) and the grid resistor R3 (3,000,000 ohms). The audio amplifier section utilizes grid leak bias which is satisfactory in this case. A type 76 tube serves as the second audio frequency amplifier stage. This tube is superior to the older type 37, due to its somewhat greater amplification factor. The resistor R7 furnishes the bias for this stage. The headphones or magnetic speaker connect directly in the plate circuit of the 76 tube.

$20.00 PRIZE MONTHLY FOR "BEST" 1-TUBE SET

Or other short-wave set article accepted and published. Send diagram first or set if you prefer.

Sets must be sent PREPAID and should be CAREFULLY PACKED in a WOODEN box!

The closing date for each contest is sixty days preceding date of issue (Jan. 1 for the March issue, etc.). In the event of a "tie" an equal prize will be paid to each contestant so tying.

The judges will be the editors of SHORT WAVE CRAFT, and George Shuart and Clifford E. Denton, who will also serve on the examining board. Their findings will be final.

Address your entries to:
Editor,
SHORT WAVE CRAFT,
99-101 Hudson St.,
New York City.

Transceiver of Improved Design

(*Continued from page 538*)

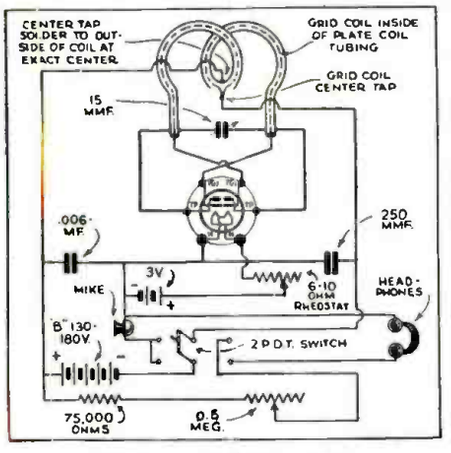
coil. With the microphone held upright in normal operating position, the lamp will light brightly. The intensity of the light will vary when the microphone is spoken into and it will go out completely when the microphone is laid flat.

A double-pole, double-throw switch is employed to make the necessary circuit change from "transmit" to "receive." The rheostat should be set at the point where best operation occurs. If turned up too far, the life of the tube will, of course, be considerably shortened.

The 500,000 ohm variable resistor is used to adjust the grid bias for reception. Its setting will be fairly critical, but once found, will require but little change.

The midget tuning condenser should be mounted as near the tank coil as possible, with the tube socket close by. Leads should be short and direct. The tuning dial should be coupled to the tank condenser by means of an insulated rod, in order to reduce the effect of hand capacity. By-pass condensers should be connected directly to minus filament terminal of the tube socket.

Either of two types of antenna systems may be used with the Knight Transceiver. A single wire vertical antenna may be connected direct to the tank coil at a point not to exceed one half inch on either



Hook-up of Transceiver

side of the center tap. This antenna may vary in length, but should always be an even multiple of a quarter wave. Roughly speaking, this means that the antenna may be 8 feet, 16 feet, 24 feet, etc.

The most successful type of antenna is the PICKARD system using two quarter wave rods center-fed and link-coupled to the tank. The tank coupling coil may consist of one or two turns of wire coupled within 2" or 3" of the tank coil. The transmission line may be cut any length. The coupling coil at the antenna should approximately match the tank coupling coil. This type of antenna is much more efficient than a single wire system in both transmitting and receiving.

To check the reception, the D.P.D.T. switch should be set on the "receive" side, and the rheostat turned up to a point where the tube seems to attain its normal filament brilliancy. The variable resistor should then be set at the point where the characteristic rushing noise of a super-regenerative receiver is loudest. The dial should then be turned slowly until a point is reached where the hissing ceases or diminishes. This quiet point indicates that a station has been tuned in. The variable resistor should then be adjusted to a point of maximum response.

Essential Parts for "Breadboard" Transceiver

L—5 turns—1" outside diameter of ⅛" copper tubing.

L1—Grid coil on inside of plate coil tubing—use hook-up wire.

1 ft.—3/16 copper tubing
1—15 mmf. Hammarlund Star cond.
1—Isolantite 6-prong socket
1—.006 Knight Mica Condenser
1—.00025 Knight Mica Condenser
1—10-ohm rheostat
1—DPDT Knife switch
1—75,000-ohm ½ watt Knight resistor
1—500,000-ohm potentiometer
1—Insulated coupling
1—Insulated shaft
1—3" Vernier dial
2—Knobs
2—"Output" Binding posts
2—"Input" Binding posts
1—"Input" Binding post
1—"Input" Binding post
1—25 ft. roll hookup wire

Accessories

2—F704—Dry cells
1—F4705—Single button hand mike
1—F1915—Headphones
1—F517 —Raytheon 19 tube
3—F707 —"B" Batteries

15 to 2000 Meter Receiver

(*Continued from page* 538)

This also is a decided advantage inasmuch as a tremendous increase in sensitivity is gained by the use of this R.F. stage together with an increase in the signal to background noise ratio. The beautiful airplane dial is calibrated for ease of tuning in finding stations and has a 12:1 ratio. The cabinet is of walnut and includes a full-sized dynamic speaker. The tubes used are a 6D6 in the tuned R.F. stage, a 6A7 as pentagrid converter, two 6D6 tubes in the two-stage I.F. amplifier, a 75 as second detector, A.V.C., and first stage of audio feeding the 42 power output pentode. The rectifier is an 83 V. Under test all the foreign broadcast stations were brought in with full speaker volume. A close study of this set shows that this set is really efficiently designed and sound in every respect.

Over Mountains on 5 Meters!

(*Continued from page* 521)

(George W. Shuart) located in Ramsey, N. J. Perfect communication can be held at any time between W2AMN and either of the other two stations. Several ranges of mountains existing between High Point Park and Ramsey *have absolutely no effect* on the signals W2AMN receiving an R8 report from High Point! Between W2HBW and W2AMN, there is located mountain ranges as high as 1500 feet and perfect communication can be held at any time, with an R6 report at either end. The transmitter at Walden is an M.O.P.A. using a *matched-impedance* antenna system for transmission and reception. The transmitter at Ramsey is the same one that was described on the October issue of SHORT WAVE CRAFT, using the "long lines." For reception a vertical 8-foot antenna is used, located some 50 feet above the ground, with the lead-in being taken *from the top!* The observations and test between the above three stations have proved absolutely that it is possible to "get through" mountainous areas, with ultra high frequency transmitters and with reliable communication. All work so far has been done on 5 meters, but in the near future higher frequencies will be tried to determine whether or not the same holds true.

Automatic Band-Spread!

(*Continued from page* 521)

pearance of the tuning scale with this *automatic band-spread* is shown in the drawing. This feature could be arranged to automatically throw in the band-spread feature at any other crowded point along the dial, as the manufacturer might find desirable after a thorough test on his particular set. This feature can, of course, be easily put into service by experimenters also.

Modern 100-Watt Transmitter

(*Continued from page* 536)

is tapped about one-third of the way up from the bottom, this section providing neutralizing voltage (through C3) for the amplifier section of the 2B6 when the latter is used as a straight amplifier on the crystal's fundamental frequency.

Since neutralization is unnecessary when the second 2B6 section operates as a frequency doubler, and the neutralizing condenser C3 becomes undesirable, the coil L2 is wound on a 5-prong form, and C3 can be removed from the circuit merely by cutting the link to the fifth pin. For instance, suppose an 80-meter crystal is used. For 80-meter operation the second 2B6 section acts as a straight buffer and must be neutralized, and therefore C3 is left in the circuit with the stock coil unchanged. For 40-meter operation with the same crystal, a 40-meter coil is used for L2, with the link removed to remove C3. The correct adjustment of the latter for 80-meter neutralization is thus left undisturbed and there is none of the usual mess of returning the exciter unit when shifting from one band to another.

How Excitation Is Varied

Variable excitation of the amplifier section of V1 is made possible by R3, which merely controls the grid bias. R2 is a fixed limiting resistor to prevent the tube from losing all its bias if R1 is accidentally turned all out. This is a simple and effective control and works beautifully.

Both L1 and L2 are wound on receiving forms and can be pushed in and pulled out of their sockets in a jiffy. The arrangement of the parts of the exciter is shown in a close-up photograph, and is simplicity itself. The 2B6 sits in the center of the chassis, with the crystal, L1 and C1 at its right, C3 directly behind it, and L2, C2 and R3 to its left. Individual milliammeters are used for the oscillator and amplifier units of the 2B6.

The two little stand-off insulators on the left bridge directly to a corresponding pair on the power-amplifier, just above.

It might be mentioned in passing that this oscillator-amplifier unit by itself is an excellent low-power transmitter, with an output of 7 to 10 watts. The single tube constitutes a full M.O.P.A., and the signals on the air have that steady-as-a-rock, piercing note characteristic of a well-built crystal-controlled job. Many amateurs are buying this unit as a starter, and intend to build up the whole outfit, piece by piece. Incidentally, all the units of this transmitter, including the rack itself, are available separately.

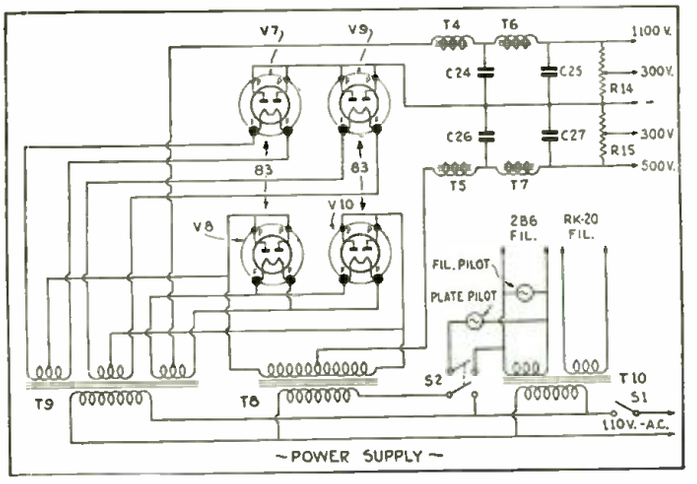


Diagram of the power supply which uses a bridge rectifier and furnishes complete power for the transmitter.

RK-20 Tubes Used

The power amplifier, link coupled to the buffer amplifier, uses two of the new Raytheon RK-20 power pentodes in push-pull. These tubes require no neutralization and lend themselves beautifully to economical, simple suppressor-grid modulation for phone. The grid coil L3 is wound on a small plug-in form, like L1 and L2, while the plate tank L4 is a heavy inductor wound on an accurately threaded bakelite form. The tuning condensers C7 and C8 are of the split stator type. The screen, suppressor and filament circuits are all adequately filtered by suitable condensers and R.F. chokes.

A two-position switch allows quick changing from C.W. to phone. For telegraph operation the suppressors are returned directly to filament, and for phone are run to the secondary of the modulating transformer in the modulator unit.

Meters: Meters are provided for reading grid, screen and plate current. These are permanently in the circuit and require no juggling of plugs or other loose connectors.

The tubular envelopes of the RK-20's, with the plate connections at the top, permit a perfectly balanced and symmetrical layout of parts, following the actual electrical circuit almost exactly.

The antenna coupling unit makes use of the Collins universal impedance matching idea, and allows the use of double-wire feeders with half-wave Hertz antennas. An additional coupling coil, permitting the use of single wire systems, is available as an accessory. This is truly a universal coupling device, yet is very easy to adjust. The coils L5 and L6 are fixed in place, being arranged with clips for variation of their inductance as different antenna systems require. A 0-2½ ampere meter is furnished.

This coupling system has another advantage in that it suppresses harmonics very successfully, something that ordinary coupling arrangements do not do at all.

The modulator unit, mounted on the rack directly below the exciter, is a self-contained three-stage resistance-capacity coupled amplifier, with its own power-pack. The crystal microphone (which is recommended for its quality and simplicity) is connected across the grid circuit of V4, a 57, operating as a voltage amplifier. This works into V5, a 2B6, operating with the two triode sections in cascade. The grid potentiometer R9 is the gain control. The power pack is of usual construction, using

(*Continued on page* 565)

Above is the "Les-tet" exciter unit providing crystal oscillator and "buffer" stage with a single 2B6 tube.

A Direct-Reading Condenser Tester

(*Continued from page* 534)

is a standard balanced bridge circuit and is applicable for testing all large and small capacity values. The theory is to balance an A.C. voltage across a known capacity to where this voltage is the same as that across the condenser being tested. The balance is then obtained by rotating a dial until no sound is heard in the headphone. When there is a balance, no A.C. current will flow through the 'phone and, of course, there will be no sound.

The circuit works as follows: The 110-volt A.C. line voltage of any frequency between 25 and 80 cycles is applied to the secondary side of a standard audio transformer of any ratio between 4 to 1 and 6 to 1. The reduced voltage from the other winding is connected to the outside terminals of a 20,000-ohm potentiometer. The voltage drop between the variable contact arm of the potentiometer and each outside terminal is then applied to a known capacity (by means of a switch) and an unknown capacity respectively. The voltage drop across any section of the potentiometer can be made equal to the voltage drop across the condenser by adjusting the potentiometer knob until no sound is heard in the 'phone. The setting of the knob (or dial) will then be at a point on the dial (Fig. 2) which will show the value of the unknown capacity.

The 20,000-ohm potentiometer specified on the accompanying parts list comes equipped with a switch which, however, is not needed. The removal of a small screw according to the printed directions accompanying the potentiometer nullifies the effect of the switch. It is very important to use the exact potentiometer specified. Otherwise the scale (Fig. 2) will not indicate accurately and the entire circuit will be valueless.

There is one precaution which should be observed in connecting the circuit. This is to be sure that terminal "A" on the potentiometer connects to terminal No. 3. Incidentally this will mean that terminal "C" must connect to terminal No. 5 and to the blade of S1.

Mounting the Scale and Knob

Any rheostat knob or volume control knob for a one-quarter inch shaft may be used with the potentiometer. A notch, scratch or other form of indicator point should be provided to serve as a reference mark. This will allow the scale to be read with reference to the position of the knob.

It is recommended that the scale (Fig. 2) be mounted on your panel in the following manner: Punch out the center one-quarter inch hole so it will fit over the shaft of the potentiometer. Obtain a sheet of isinglass or celluloid from a dealer handling automobile-top repair parts. This should be the same size or slightly larger than the scale of Fig. 2. Next, cut a hole in the center so that it fits over the potentiometer shaft. Then place the isinglass over the scale so that it may be protected from scratches, etc.

There is only one definite way in which the knob should be mounted. This is important. First, turn the shaft of the potentiometer all the way to the left, that is, counter-clockwise. Set the reference notch or mark of the knob exactly on "short" and tighten the set-screw so the knob will rotate the shaft. This done, rotate the knob all the way to the right, which should make the notch or pointer of the knob fall opposite the "open" position on the scale.

It is important to adjust both knob and scale so the pointer indicates the divisions of the scale accurately. For this reason it is recommended that final fastening of the scale to the panel with four screws should be the last step.

Using the Direct Reading Bridge Circuit

The function of S1 is to connect known values of capacity across one arm of the bridge. While these capacities bear a definite relation to the unknown capacity, we do not use their actual values in determining the condition of an unknown unit. It is much easier and less confusing to use a simple multiplier value. This circuit has been so worked out that four multiplier values are employed. The first is .1, the second .01, the third .001 and the fourth .0001. (Note that these values do not represent capacity values—they are multiplier values only.) The position of S1 determines the multiplier value used. Therefore, it would be a good plan to mark the knob S1 so that you will always know the value of the multiplier regardless of the position of the switch.

To use this device connect terminals 1 and 2 of Fig. 1 to the 110-volt A.C. line. Connect the 'phone to terminals 7 and 8. Connect the test leads to terminals 3 and 4. Then connect a .5 mf. condenser to the leads. This will allow you to check the operation of the circuit.

Set S1 to the .1 multiple position. This will connect 5 mf. of known capacity into the circuit. thus multiplying the scale by .1 (one-tenth). Rotate the knob until no signal is heard in the 'phone. The reference mark will be at approximately 5, proving that the actual capacity is .5, since the 5 on the scale is multiplied by .1 (one-tenth).

To check the .5 mf. capacity further, set switch S1 to the .01 multiplier position. This will connect .5 mf. of known capacity into the circuit multiplying the scale by .01 (one-hundredth). Rotate the knob again until no signal is heard in the 'phone. The reference mark now will be at approximately 50, again proving that the actual capacity is .5, since the 50 on the scale is multiplied by .01.

Likewise, we can again check the .5 mf. condenser by turning S1 to the .001 multiplier position. No signal will now be heard at approximately 500. As we multiply this by .0001, we move the decimal point over three places to the left, giving us .5 mf. again for the capacity.

The "no signal" point can also be obtained at a position to the left of the 500 with S1 turned to the .0001 multiplier position. However, as this is off the scale it should be disregarded.

This same procedure is to be followed in determining the condition of practically any type of doubtful condenser. It is only necessary to connect the condenser to 3 and 4. Once the condenser is connected to 3 and 4 simply rotate the potentiometer knob for balance and read the value of the condenser on the scale of Fig. 2.

Tests Which Prove Opens and Shorts

Condenser *shorts* and *opens* can easily be indicated with this circuit. To prove this, short-circuit terminals 3 and 4. No sound will now be heard when the knob is turned all the way to the left. To prove an open-circuit, remove both (or one) leads from terminals 3 and 4. Note that the no signal point will now occur with the knob turned all the way to the right. Both operations just described represent conditions of shorts and opens.

Leaky condensers may be detected by noting that a complete dying-out of the signal in the 'phone will not take place although there will be a minimum sound point on the dial. In order to understand what this means, try connecting a 1000-ohm resistance (or more) across terminals 3 and 4 while a good condenser under test also remains connected. The effect described above will be readily recognized.

Electrolytic Condenser Tests

Electrolytic condensers are easily tested with this circuit. As before, the con-

denser to be tested is connected between terminals 3 and 4. Make certain that terminal 3 is connected to the negative lead (can) of the condenser. A high D.C. voltage source is connected between terminals 11 and 12, observing the polarity as shown in Fig. 1. If no high D.C. voltage from an A.C. power or B eliminator is available a single 45-volt battery may be used. A high-range milliammeter is now connected between 9 and 10. As a precaution, the 6 to 10-ohm rheostat should be turned all the way to the right so as to put a short circuit across 9 and 10. This is done to protect the meter in case of a complete short in the electrolytic condenser. The initial current is quite high and when operating current is developed, the rheostat can be turned to the off position, provided the condenser is not shorted. If there is a complete short, the condenser should be discarded.

A complete short will be evident after the condenser has been in the circuit a few minutes since the current will not reduce to less than 10 milliamperes. The leakage current through a normal electrolytic condenser should not be more than .25 milliamperes per microfarad of capacity, or not more than 2 ma. for an 8 mfd. condenser.

Percentage of Accuracy

In checking the capacity of one known capacity by four positions of S1 you will probably note that all readings will not agree exactly. This is to be expected because as most servicemen realize commercial condensers as well as numerous other parts are manufactured with a plus or minus tolerance of 10 per cent from the specified value. This, of course, is more than ample for most jobs where a tolerance of twenty to fifty per cent from rated values can exist without materially decreasing efficiency. Therefore, in checking condensers, always consider all measurements as approximate.

The highest degree of accuracy is obtained when the "no sound" point on the potentiometer occurs near point 50 on the dial. Therefore, it is advisable to use the multiplier position of S1 that comes closest to making the "no sound" point occur near 50.

Special Data Sheets Available

This condenser tester may also be used to test resistors and other small receiver parts for value, shorts and opens. It is also possible to test transformers for ratio between windings and to tell if windings are shorted or open. However, space here does not permit giving detailed directions for work of this kind. We will gladly send complete data sheets for the tester including a special scale (Fig. 2).

(Note: If you desire these Data Sheets and Special Scale, write and ask for DATA No. 502. Address your request to—SERVICE DEPT., SHORT WAVE CRAFT, 99-101 Hudson St., New York City.

Parts You Will Need for Making the Condenser Tester

1—Panel 7 x 9 inches.
12—Binding posts.
1—Non-shorting 1-gang 5-point switch (S1).
6—1 mf. condensers (C1, C2, C3, C4, C5 and C6).
1—.5 mfd. condenser (C7).
1—.05 mfd. condenser (C8).
1—.005 mfd. condenser (C9).
1—No. RP102—20,000-ohm potentiometer with A.C. switch. Yaxley.
1—6 or 10-ohm rheostat (R1).
1—A.F. transformer (any ratio between 4 to 1 and 6 to 1). (T1).
1—30-henry choke (T2).
1—Set headphones with band.
1—Set test leads with clips.
1—Portable carrying case—8 x 14 inches (1 inch space for 'phones and leads).
—*Courtesy "The I.R.C. Servicer."*

They Are Televising in Berlin!

(*Continued from page 519*)

line scanning, this calls for the transmission of one million points of light per second; to attain this highly desirable form of "high fidelity" television transmission, a band 500,000 cycles wide would be necessary and this will only be possible by using ultra short waves for broadcasting the television images. If such a high-grade transmission light-spot frequency should be used, we should require a band extending from 200 to 240 meters which is out of the question, as this would block out a goodly part of our present broadcasting stations. In ultra high frequencies we could obtain a ½-megacycle channel by using a band extending from 4.96 to 5 meter.

The way in which this particular German system works is as follows: The scene is photographed with the usual "sound-camera," either outside or from within the television pick-up car with its large windows; the film is then developed, fixed, washed, and dried in approximately 1 minute, then passed through a regular motion picture projector which has a Nipkow scanning disc and a photo-cell arranged in front of the moving film.* As the film passes by the scanning disc with its many holes, it causes progressive spots of light, line by line, to be impressed on the photo-cell. The variations in the photo-cell current are then passed through a sensitive high-frequency amplifier of 8 to 9 stages, which are then caused to modulate a short-wave radio transmitter.

It is interesting to note that there are two different types of receiving apparatus available. The one here shown and intended for "home" use, projects the image on a screen measuring about 8" by 10". A public theater or hall receiver and projector is capable of exhibiting a television picture about 10 by 12 feet. Thanks to the very clever way in which this television system has been developed so that both sound track and image are scanned at the transmitting station simultaneously, positive synchronism is assured at all times between image and voice. The "home" type television receiver uses the so-called cathode ray or Braun tube.

All we know in this country about recent television transmission and reception is a few meager reports emerging from the secret laboratories of two or three of the large radio corporations, which state that wonderful images have been reproduced in the laboratory by means of cathode ray tubes. The unofficial story of American television is that one of the large radio corporations is about to build a series of ultra short-wave (about 3 to 7 meters) television transmitting stations in the larger cities and which, owing to the quasi-optical (line-of-sight) properties of these ultra short waves, will only have a short range of 50 miles radius. When, and if, these stations are built and put into operation sometime within the next two to five years, then we are supposed to have practical television. Too bad we could not have proceeded the way we were going a couple of years ago with our mechanical scanning systems, so that we could have had some enjoyment receiving the television images which could and should have been transmitted to us during the ensuing dead period of over two years, since the Columbia Broadcasting System and several others went "off the air" with their television transmission. We would undoubtedly have seen a great improvement in the received image by this time, if television had been kept "alive." One of the surprises that awaits some of the "cathode-ray" enthusiasts for television reception, is the fact that we undoubtedly are going to have a whole flock of mechanical scanning systems also, which experimenters are going to build

*To transmit "talking" movies it would seem necessary to scan the image and voice sections of the film "separately" with 2 Nipkon discs and photo-cells; the outgoing wave being doubly modulated. At the receiver, two tuning circuits would then be used to pick up the respective voice and image components of the wave and send them through their respective amplifiers to loud-speaker and image projector (scanner and neon tube, etc.)—Editor.

for the fun and instruction they get out of it, and just because the scanning speed is stepped up to 150 or 200 lines there is no reason at all, according to one of our leading American television and radio engineers, that mechanical scanning cannot be adapted to meet this speed. Another thought is that some form of vibrating scanner, operated by electrical tuning forks or otherwise, will undoubtedly be devised to accomplish the same purpose as the cathode tube, which requires quite elaborate auxiliary apparatus to fulfill its functions as a television scanner. Not only are the cathode tubes liable to be fairly expensive to start with, but at the present time their life is very short, and at times they are said to be quite erratic in their action. The great asset of the cathode tube for television is the fact that the cathode ray within the tube can move at almost infinite speed and it therefore lends itself ideally to high scanning speeds such as 180 lines or more. The ray is caused to move across the fluorescent screen at lightning speed and moves progressively up and down the screen, so as to "paint" the picture or moving image (not a "still" picture), thanks to specially designed oscillators. The currents from these oscillators act through magnet coils or static plates on the cathode beam, and it moves back and forth in response to the oscillating fields.

A Low-Power Transmitter

(*Continued from page* 548)

cable connects this mike to the speech amplifier, using a plug and socket arrangement on the rear of the modulator unit.

PARTS LIST FOR WOEHR TRANSMITTER

Crystal Oscillator

1—50,000 ohm resistor. Aerovox.
1—40,000 ohm resistor. Aerovox.
1—.00035 mf. variable condenser.
1—.0005 fixed mica condenser. Aerovox.
1—.01 mica condenser. Aerovox.
1—closed circuit jack. I.C.A.
1—crystal and holder (frequency depending upon band). Bliley.
1—2A5 tube, RCA Radiotron.

Buffer Stage

1—10,000 ohm fixed resistor. 50 watts.
1—20 ohm center tap resistor. Aerovox.
1—.0001 mf. variable condenser. Aerovox.
1—.00035 mf. variable condenser.
1—.0005 fixed mica condenser. Aerovox.
1—50 mmf. midget condenser. National.
1—R.F. choke 2.5 to 5 mh. National.
1—closed circuit jack. I.C.A.
1—relay optional.
1—type 46 RCA Radiotron.

Final Amplifier

2—.00035 mf. variable condensers.
1—50 mmf. nc. variable. National.
1—.005 mf. mica condenser. Aerovox.
1—R.F. choke, 2.5 to 5 mh. National.
1—closed circuit jack. I.C.A.
1—variable resistor. 5000 ohms at least. 30 watts.
1—46 RCA Radiotron.

Modulator Unit

3—.1 mf. by-pass condenser. Aerovox.
2—250,000 ohm resistors. Aerovox.
2—2000 ohm fixed resistors. Aerovox.
1—50,000 ohm fixed resistor. Aerovox.
1—A.F. transformer, 3:1.
1—30 henry modulator choke.
1—50 ohm center tap resistor. Aerovox.
1—5000 ohm variable resistor 75 watts.
1—2 mf. condenser. Aerovox.
1—closed circuit jack. I.C.A.
1—microphone transformer.
1—open circuit jack with filament control. I.C.A.
2—56 RCA Radiotrons and 2—250's, RCA Radiotron.

Power Supply

1—high voltage transformer with two 7½ volt windings 500-0-500.
1—filament transformer.
3—2.5 volt windings.
1—30,000 ohm resistor, 50 watts.
1—10,000 ohm resistor, 50 watts.
1—filter choke, 250 ma.
2—1000 volt 2 mf. condensers. Aerovox.

Pre-Amplifier for Condenser Mike

2—.1 meg. fixed resistors. Aerovox.
2—1 meg. fixed resistors. Aerovox.
1—25 meg. fixed resistor. Aerovox.
2—.006 mf. condensers. Aerovox.
2—type 30 RCA Radiotrons.
1—condenser microphone. Amperite.

100-Watt Transmitter

(*Continued from page* 559)

an 80 rectifier. To use phone instead of C.W., the operator merely shifts the switch on the power amplifier panel and snaps on the modulator power switch, after, of course, he has tuned the transmitter to one of the phone channels.

Power Supply Is "Heavy Duty"

The bottom-most unit is the *heavy-duty* "power supply," using four type 83 rectifier tubes in a bridge circuit, to give 1250 volts at 250 ma. and 550 volts at 200 ma. Two separate filament transformers are used: one for the 83 filaments and the other for the 2B6 in the exciter and the RK-20's in the power amplifier. The regulation is very good and the ripple voltage is exceptionally low. The filter condensers are of the oil impregnated type—not electrolytics.

At the bottom of the rack is a compartment for holding grid bias batteries.

Power connections between the various units are made by convenient plugs and cables. One unit can be pulled out of the rack for inspection, revision, etc., without disturbing any of the others in the slightest. The flexibility of the whole arrangement will greatly appeal to the amateur accustomed to the confusion and hay-wire aspect of bread-board layouts.

As far as actual operation is concerned, this new Lafayette transmitter leaves little to be desired. With as much as 120 watts of power available for C.W., and 30 to 40 watts on phone, DX is merely a matter of the band selected, the location and the operator's skill. The transmitter itself certainly does its stuff!

Lafayette Parts List—Oscillator and Amplifier

C1—100 mmf.
C2—100 mmf.
C3—25 mmf.
C4—.01 mf.
C5—.005 mf.
C6—.005 mf.
C7—130 mmf. each section (split sections).
C8—70 mmf. each section (split sections).
C9—.002 mf.
C10—.002 mf.
C11—.002 mf.
C12—.001 mf.
C13—.001 mf.
C14—480 mmf.
C15—220 mmf.
L1—Oscillator inductor ("plate" coil).
L2—Amplifier inductor (plate tank).
L3—Power amplifier grid inductor.
L4—Power amplifier plate tank.
L5, L6—Antenna impedance matching inductors.
R1—100,000 ohms.
R2—1000 ohms.
R3—5000 ohms.
R4—75 ohms, center tapped.
RF1, RF2, RF3—2.5 millihenry r.f. chokes.

Parts List—Modulator Unit

C16—5 mf.
C17—.5 mf.
C18—.5 mf.
C19—.1 mf.
C20—25 mf.
C21—.1 mf.
C22—8 mf.
C23—4 mf.
R5—5 megohms.
R6—5000 ohms.
R7—2 megohms.
R8—250,000 ohms.
R9—1 megohm potentiometer.
R10—100,000 ohms.
R11—10,000 ohms.
R12—750 ohms.
R13—10,000 ohms.
T1—Modulation transformer.
T2—Power supply transformer.
T3—30 henry filter choke.

Parts List—Power Supply

C24—2 mf.
C25—4 mf.
C26—4 mf.
C27—4 mf.
R14—50,000 ohms.
R15—25,000 ohms.
T4—Swinging chokes.
T5— " "
T6—Filter chokes.
T7— " "
T8—High voltage transformer.
T9—Rectifier filament transformer.
T10—2B6—RK20 filament transformer.

S. W. Scout News

(*Continued from page* 530)

Short Wave Scout Report of Herman Borchers, Greenfield, Mass.

The Australian station came in nicely; have heard VK3LR *day after day, with fine volume.* VK2ME is still broadcasting a special program to each state in the Union. On October 31 the program was dedicated to the District of Columbia.

LSX, 28.98 meters, Mont Grand, Argentine, was on the air October 13 from 4:15 to 4:30 p.m., E.S.T. Reception R7.

PRF5 Rio de Janeiro and GSC, London, are the outstanding stations on the 31 meter band. PRF5 is like a "local," using chimes as an identification and announcing in English, German, and three additional languages.

RNE, 25 meters, Moscow has been fair from 10 to 11 a.m.

HBL on 31.27 meters and HBP, 38.47 meters, Geneva, has been heard well Saturdays from 5:30 to 6:15 p.m. OER2 on 49.4 meters is on the air daily from 9.30 a.m. to 5 p.m.

Holland has a fine new station on 19.7 meters. The call letters are PCJ and it is on the air simultaneously with the station PHI, 25.75 meters. It is on the air daily from 7:30 to 10:30 a.m. and Saturdays and Sundays as late as 11:30 a.m. The announcements are made in five different languages, Dutch, French, English, German, and Spanish.

Report from Oliver Amlie, Phila., Pa.

Oct. 26, 50.06 meters HJ4ABC reception very clear and loud; clear night, cool, always good on Friday evening. Oct. 26, 49.34 meters, CP5 signals very clear, good reception. Oct. 26, 49.50 m., W3XAU signal very powerful and clear channel. Oct. 26, 48.78 m., YV3RC, signals very good. Oct. 26, 49.46 m., HIX, signals very good, clear, like locals. Oct. 26, 49.02, VE9GW, signals fair, fading at times, also CKRC, CRCP, all on same channel. Oct. 26, 49.10 m., VE9HX, signals very poor, can hardly hold. Oct. 26, 31.48 m., W2XAF, signals very poor at 7:30 p.m., fine at 10 p.m.

The above stations can be heard any Friday evening from 7 to 11 p.m. Oct. 27, reports from Australia are my best catches. The *Australian Radio Commission* has asked this post to give him some information on their stations: Oct. 27, VK3ME-VK3LR, 31.55 and 31.31 m. Both these stations came in fine from 6:45 a.m. till 7:45 a.m. First time I could get a line on VK3LR, letter for verification has been sent-in on this station, making 3 verifications from Australia for 1934. Signals from these stations were *loud-speaker* strength at this date, cool weather here, sky clear. Oct. 27 VK2ME-VK3ME, 31.28-31.55.

Trophy Contest Entry Rules

● THE rules for entries in the **SHORT WAVE SCOUT Trophy Content** have been amended and only 50 per cent of your list of stations submitted need be verified. If, for example, you send in a list of 100 stations with 50 verification cards, you will receive credit for the other 50 per cent or 100 stations total. The trophy will be awarded to the **SHORT WAVE SCOUT** who has logged the **greatest number** of short-wave stations during any 30 day period; (he must have at least 50 per cent veris) this period need not be for the immediate month preceding the closing date. The complete list of rules appeared in the August issue of this magazine.

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

Only commerical "phone" stations should be entered in your list, no "amateur" transmitters or "commercial code" stations. This contest will close every month on the first day of the month, by which time all entires must be in the editors' hands in New York City. Entries received after this date will be held over for the next month's contest. The next contest will close in New York City, January 1.

The judges of the contest will be the editors of **SHORT WAVE CRAFT**, and their findings will be final. Trophy awards will be made every month, at which time the trophy will be sent to the winner. Names of the contesting **SCOUTS** not winning a trophy will be listed in **Honorable Mention** each month. From this contest are excluded all employees and their families of **SHORT WAVE CRAFT** magazine. Address all entries to **SHORT WAVE SCOUT AWARD, 99-101 Hudson Street, New York City.**

"Economy 2" Battery Receiver

(*Continued from page 523*)

the tubes with A.C. it can be easily done as the tubes are designed to work on either current. However make sure that the voltage is correct! For the plate supply, "B" batteries are used although the set could be well operated with a good "B" eliminator. The batteries afford absolutely quiet operation and they are recommended. Three 45 volt units furnish the 135 volts and should last a very long time as the plate current drain of the set is very low, around 4 or 5 milliamperes.

When using small receivers a *good* antenna system should be used in order to obtain proper performance. The antenna should be at least 75 feet long and mounted as high in the air as possible and well out in the clear, away from surrounding objects. In the October issue there appeared a very complete article on antennas and it is recommended that some of the practical important hints there set forth be put into practice.

Operation

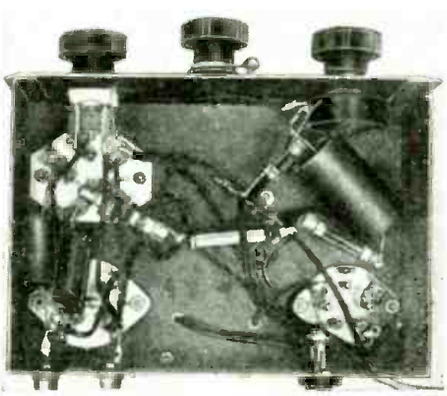
Tuning and operation of this two tube set is very simple and even the most inexperienced "Fan" should have no difficulty. Set the regeneration control so that the detector is oscillating—tune in a station—then "back-off" the regeneration control until the whistle disappears and the voice comes in clearly. For receiving code, of course, the detector will remain in oscillation at all times. Use a *good ground* connection on the set and when making connections do not use too much solder but make sure that every connection is firmly made. The values of all the parts are given together with a table showing the correct sizes of the plug-in coils; follow the diagram carefully and you will have a nifty little set.

Parts List for "Economy 2"

1—140 mmf. tuning condenser, Hammarlund.
1—100 mmf. mica condenser, Aerovox.
2—.0005 mf. mica condenser, Aerovox.
1—.001 mf. mica condenser, Aerovox.
2—1 mf. by-pass condenser, Aerovox.
1—.1 mf. by-pass condenser, Aerovox.
1—2 meg. half watt grid leak.
1—½ meg. half watt grid-leak.
1—50,000 ohm potentiometer, Electrad.
1—R.F. choke 2.5 mh. (approx.) Hammarlund.
1—National Impedaformer (type, S-101).
1—4-prong Isolantite socket, Hammarlund.
1—5 prong Isolantite socket, Hammarlund.
1—5 prong wafer socket, Na-Ald.
1—National vernier dial.
Knobs, binding posts, etc.
1—set of Hammarlund plug-in coils, 17-270 meters—see coil table for data.
1—midget variable antenna trimmer, Hammarlund, 25 mmf. (air dielectric) type APC.
2—type 15 tubes, Sylvania.
3—45 volt "B" batteries, Burgess.
3—No. 6 dry cells, Burgess.

Coil Data "Economy 2"

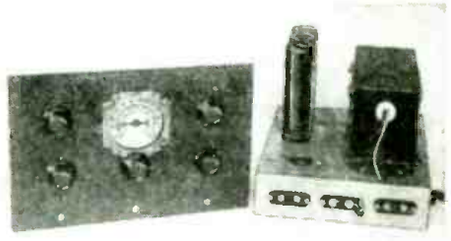
	GRID COIL			TICKLER		
Band	Turns	Wire No.	Length of Winding	Turns	Wire No.
17-41	9	14 tinned	1¼ in.	4	28 DSC
33-75	18	18 tinned	1½ in.	6	28 DSC
66-150	38	22 tinned	1⅝ in.	11	28 DSC
135-270	80	28 enameled	1⅜ in.	16	28 DSC



Bottom View of Receiver.

5 Tube Set Works Loud Speaker

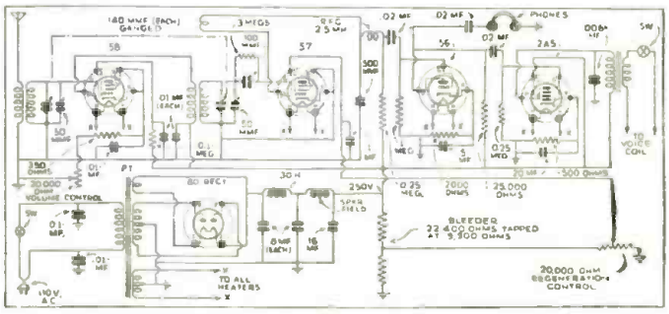
● THIS 5-tube short-wave receiver has one dial control; the two tuned stages are ganged. A 58 is used in the tuned R.F. stage, 57 as regenerative detector and a 56 first audio feeding a 2A5 pentode output amplifier, with a 280 rectifier. Resistance coupling is used in the audio stages and provides excellent quality together with sufficient volume to operate the dynamic speaker to full output. Regeneration in the detector circuit of the "Supertone 5" is obtained by the plate feed-back method and is controlled by a 20,000-ohm potentiometer. Inductive coupling is used between the R.F. amplifier and regenerative detector in order to obtain the greatest amount of gain and highest degree of selectivity. Three winding coils are used in this position. Two-winding coils are necessary for the R.F. stage, one winding is used for the antenna coupled coil, the other for the tuned grid circuit. A very simple arrangement is used to allow headphone reception if one does not wish to have the speaker going. A switch is connected in series with the voice coil and dynamic speaker and by opening this circuit and plugging in the headphones at the back of the chassis the operator has a 3-tube headphone job, inasmuch as the headphones are connected in the plate circuit of the first stage of audio. Extra precaution is taken in the power supply to reduce hum and other noises to a minimum. A double-section filter is used with 32 mf. of filter condenser. Two by-pass condensers are used in the primary of the power transformer to prevent any noise from coming in over the line. The diagram is shown and clearly indicates the connections and values of the different parts.



Appearance of "Supertone 5"

No. 244 (Refer to No. when inquiring about this set.)

In the photograph shown above, the power supply is the separate unit to the right.



Hook-up of "Supertone 5"

S. W. League

(Continued from page 545)

also contacted twelve people, who at present are enthusiastic S.W.L.'s and are potential amateurs. Four of these are professional people, four are radio-service men, two are women and the remaining two are young chaps about 19 years of age. All but two were sufficiently well versed on the subject to offer an opinion. One of these two, after having the subject explained, thought that the no-code test below 5 meters was "quite sensible." The other party was undecided but "rather favored the idea of a *no-code* test." All the others agree that the adoption of a no-code test below 5 meters would be a sensible and logical thing to do.

In regard to what I have said about those who are for a code test on this frequency, I have no personal animosity against any of them, my bone of contention being that we should not be called "gas-bag artists," "lazy," etc., etc. I do not believe any *constructive* thought was behind these statements and I am sure that if they will only look *ahead*, not a week or a year, they will see some good and commendable points in the advocation of a no-code test below 5 meters.

With television only a step in the future toward perfection the possibilities of transferring energy over the *ultra short waves*, and many other probabilities unthought of at this time, I think it would be to the Federal commission's credit *if they abolished the code test on this frequency* and opened the field to those of us who are interested in *voice transmission* only. Then too, as Mr. Paul Lomaster has said, the commercial interest in this band is by no means a ghost, but rather a real honest-to-goodness threat to the amateur, and if they do not occupy this band more so than in the past, the amateur is going to find himself *out in the cold*, as far as the 5 meter band is concerned.

In organization there is power! Might I suggest to those that are vitally interested in this subject to join the SHORT WAVE LEAGUE, which is I believe in favor of a no-code exam., and of which I soon hope to become a member.

Thanking you again, I remain
73 to all (including the opposition). Hi.

J. DONALD SHIRER,
2131 Olive Ave.,
Lakewood, Ohio.

S. W. Scout Award

(Continued from page 531)

W3XAU—49.50 M.—Broadcasting Co., Philadelphia, Pa., U.S.A.

W2XAD—19.56 M.—National Broadcasting Co., Schenectady, N.Y., U.S.A.

W2XAF—31.48 M.—National Broadcasting Co., Schenectady, N.Y., U.S.A.

W3XAL—16.87 M.—National Broadcasting Co., Inc., R.C.A. Building, New York, U.S.A.

WEF—31.0 M.—Radio Corp. of America, 66 Broad St., New York, U.S.A.

CJRX—25.60 M.—James Richardson & Sons, Ltd., Winnipeg, Manitoba, Canada.

CJRO—48.85 M.—James Richardson & Sons, Ltd., Winnipeg, Manitoba, Canada.

VE9GW—49.22 M.—Bowmanville, Ontario, Canada.

CGA8—62.0 M.—Canadian Marconi Co., Drummondville, Quebec, Canada.

CGA4—32.15 M.—Canadian Marconi Co., Drummondville, Quebec, Canada.

VE9HX—49.1 M.—Maritime Broadcasting Co., Ltd., Halifax, Nova Scotia.

Coupling Doublet Aerial

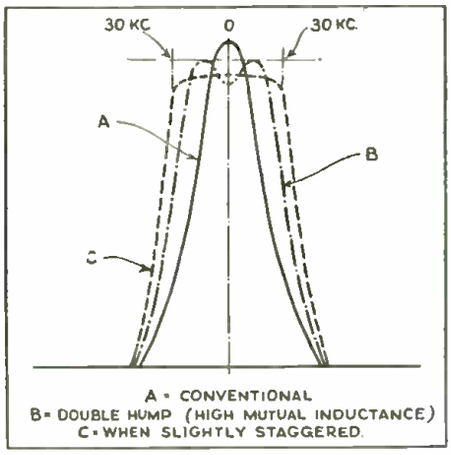
(Continued from page 523)

are on the market. The lead-in should not be run too close to sources of noise than necessary and one should avoid very sharp bends in bringing the lead-in from the antenna. Where it is necessary to change the direction of the lead-in it is suggested that a well rounded out corner be used because of the losses effected by sharp angular bends.—Henry Mike Kiertscher.

Superhet Uses Acorn Tubes

(*Continued from page 527*)

if the tuned circuits are staggered slightly, a very satisfactory selectivity curve is obtained. For comparison between this amplifier and the usual run of "IF" amplifiers, refer to the drawings. The frequency of the amplifier has to be quite high in order to reduce selectivity. In this case we used around 1500 kc. The transformers used are the midget variety made by the Miller Coil Co., and originally they were tuned to 465 kc. Sufficient turns were removed in order to make them tune to 1500 kc. Around 25 feet of wire was removed. Other types may require varying amounts. In order to get close coupling the hack-saw was brought into play. The section of wood dowel between the two coils in the transformer was sawed out and the two remaining sections glued together.



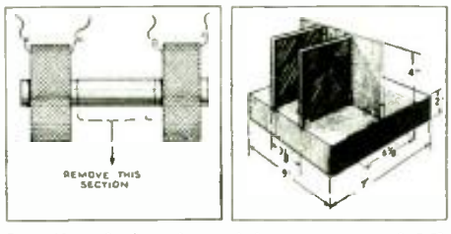
Selectivity Curves of "IF" Amplifier.

Tubes Used

Due to the 955 "Acorn" tubes having 6.3 volt filaments, for convenience the amplifier also uses the 6.3 volt tubes. The first amplifier is a 6D6 and the second "IF" amplifier uses a 6F7. This tube having two sets of elements comes in real handy and saves an extra tube. The screen-grid portion is used for the "IF" stage and the triode portion for the second detector. In this tube it is necessary that two resistors be connected in the cathode circuit, in order to obtain different values of bias for the two stages. Make sure that it is connected as shown in the diagram and that the same values are used. Then there will be no trouble and the results will be just as good as two separate tubes. The second detector is resistance-capacity coupled to the pentode audio stage, which uses a 42 pentode. With this line-up the full three watts of output power can be obtained on the average 5-meter signal.

Aligning the "IF" stages of this set is not at all difficult, due to their being very broad in tuning, although in order to get the best quality signal it is necessary to use care in *offsetting* the tuning. This can be done quite easily by listening to a station while adjusting the condensers, although an oscilloscope would be very beneficial in obtaining the optimum adjustment.

(*Continued on page 573*)



Details of chassis and how center of I.F. transformer core is sawed out.

The 4 ESSENTIAL SHORT WAVE BOOKS

'ROUND THE WORLD FANS USE THESE GREAT SHORT WAVE BOOKS

These great books contain everything on short waves that is really worth knowing—they are books which have been most enthusiastically welcomed by short-wave fans. The cost of the books is extremely low in comparison with the valuable material which they contain.

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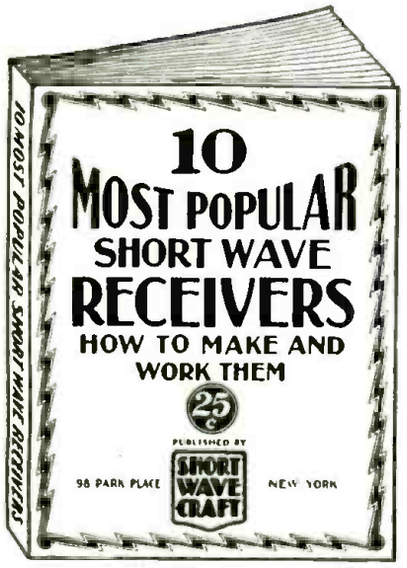
Ten Most Popular Short Wave Receivers. How to Make and Work Them



This new volume is a revelation to those who wish to build their own short wave receivers. The editors of SHORT WAVE CRAFT have selected ten outstanding short wave receivers and these are described in the new volume. Each receiver is fully illustrated with a complete layout, pictorial representation, photographs of the set complete, hookup and all worthwhile specifications. Everything from the simplest one tube set to a 5-tube T. R. F. receiver is presented. Complete lists of parts are given to make each set complete. You are shown how to operate the receiver to its maximum efficiency.

CONTENTS

40 PAGES
OVER 75 ILLUSTRATIONS

IMPORTANT

THERE IS NO DUPLICATION BETWEEN THIS BOOK AND OUR OTHER VOLUME—"HOW TO BUILD AND OPERATE SHORT WAVE RECEIVERS." ALL THE MATERIAL PUBLISHED IN THE NEW BOOK HAS NEVER APPEARED IN ANY BOOK BEFORE.

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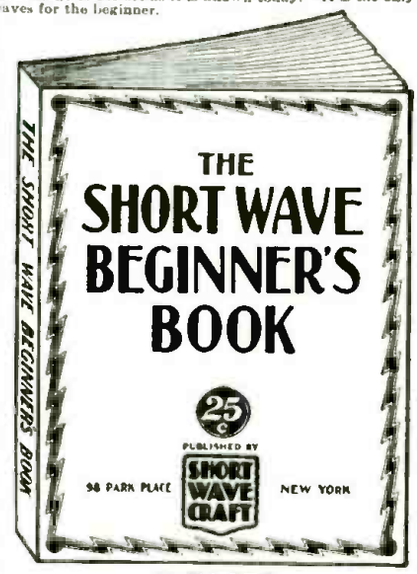
The Short Wave Beginner's Book

Here is a book that will solve your short wave problems—leading you in easy stages from the simplest fundamentals to the present stage of the art as it is known today. It is the only low-priced reference book on short waves for the beginner.

The book is profusely illustrated with all sorts of photos, explanations and everything worth while knowing about short waves—the book is not "technical." It has no mathematics, no "high-faluting" language and no technical jargon. You are shown how to interpret a diagram and a few simple sets are also given to show you how to go about it in making them.

It abounds with many illustrations, photographs, simple charts, hookups, etc., all in simple language. It also gives you a tremendous amount of very important information which you usually do not find in other books, such as time conversion tables, all about aerials, noise elimination, how to get verification cards from foreign stations, all about radio tubes, data on coil winding and dozens of other subjects.



Partial List of Contents

40 PAGES
OVER 75 ILLUSTRATIONS

25c

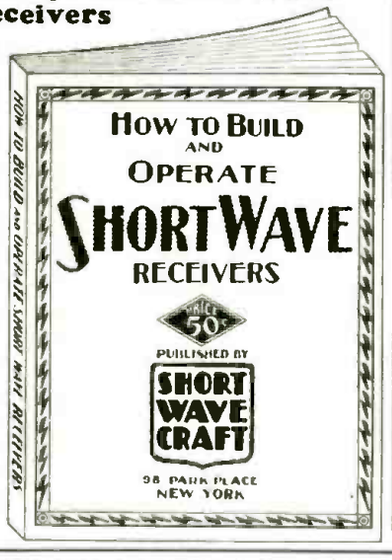
How to Build and Operate Short Wave Receivers

is the best and most up-to-date book on the subject. It is edited and prepared by the editors of SHORT WAVE CRAFT, and contains a wealth of material on the building and operation, not only of typical short-wave receivers, but short-wave converters as well. Dozens of short-wave sets are found in this book, which contains hundreds of illustrations; actual photographs of sets built, hookups and diagrams galore.

The book comes with a heavy colored cover, and is printed throughout on first-class paper. No expense has been spared to make this the outstanding volume of its kind. The book measures 7½x10 inches.

This book is sold only at such a ridiculously low price because it is our aim to put this valuable work into the hands of every short-wave enthusiast.

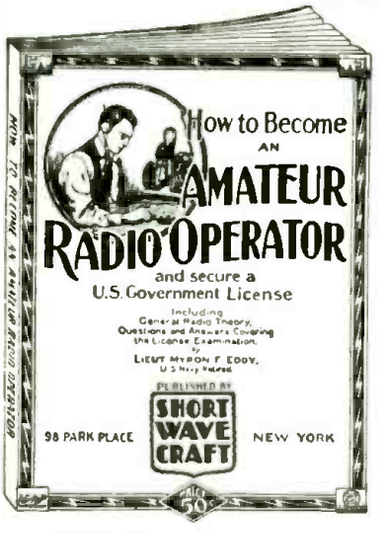
We know that if you are at all interested in short waves you will not wish to do without this book. It is a most important and timely radio publication.



Over 150 Illustrations
72 Pages 7x10 Inches

50c

How to Become an Amateur Radio Operator



We chose Lieut. Myron F. Eddy to write this book because his long years of experience in the amateur field have made him pre-eminent in this line. For many years he was instructor of radio telegraphy at the R.C.A. Institute. He is a member of the I.R.E. (Institute of Radio Engineers), also the Veteran Wireless Operators' Association.

If you intend to become a licensed code operator, if you wish to take up phone work eventually, if you wish to prepare yourself for this important subject—this is the book you must get.

Partial List of Contents

Over 150 Illustrations
72 Pages 7x10 Inches

50c

All the books shown on this page are published exclusively by

SHORT WAVE CRAFT
99-101 Hudson Street,
New York, N. Y.

CLIP—MAIL

SHORT WAVE CRAFT SW-1-35
99-101 Hudson Street, New York, N. Y.

Gentlemen: I enclose herewith my remittance for the amount of $.....for which you are to send me, postpaid, the books checked below.

( ) Ten Most Popular Short Wave Receivers. How to Make and Work Them....25c each
( ) The Short Wave Beginner's Book.....25c each
( ) How to Build and Operate Short Wave Receivers.....50c each
( ) How to Become an Amateur Radio Operator.....50c each

Name.....
Address.....
City.....State.....

(Send remittance in form of check or money order. If letter contains cash or unused U. S. Postage Stamps, register it.)

These Books are Authentic For All Short Wave Work and LOW in Price

COUPON TODAY!

Acorn Tube Superhet

(Continued from page 571)

Parts List for 5-Meter Super

2—100 mmf. mica condensers, Aerovox.
1—.001 mf. mica condenser, Aerovox.
2—.004 mf. mica condenser, Aerovox.
1—.02 mf. by-pass condenser, Aerovox.
9—.1 mf. by-pass condensers, Aerovox.
1—2 mf. by-pass condensers, Aerovox.
1—4 mf. condenser, Aerovox.
1—20 mf. electrolytic condenser, Aerovox.
1—2 megohm half-watt grid-leak.
2—50,000 ohm half-watt resistors.
2—100,000 ohm half-watt resistor.
2—300 ohm half-watt resistor.
1—75,000 ohm one-watt resistor.
1—2000 ohm half-watt resistor.
1—250,000 ohm half-watt resistor.
1—500 ohm, 2-watt resistor.
1—25,000 ohm potentiometer with switch, Electrad.
1—SE 90 National condenser (remodeled; see text).
1—18 mmf. National condenser, with plates removed to make 10 mmf.
3—465 kc. I.F. transformers remodeled as per description in text (Miller).
Sufficient National Victron insulation to construct two 955 sockets and coil mountings.
2—6-prong wafer sockets, Na-Ald.
1—7-prong wafer socket, Na-Ald.
1—National Vernier dial.
1—National SW3 metal cabinet (black crystalline finish).
2—955 tubes RCA Radiotron.
1—6D6 tube, RCA Radiotron.
1—6F7 tube RCA Radiotron.
1—42 tube, RCA Radiotron.
1—special chassis with partitions to fit National Cabinet; Blan.
Special home-made coils; see coil table for data.

Coil Data

5-Meter Band

1st Detector coil—6 turns No. 16 tinned wire ½" inside diameter, length of coil 1¼".

Oscillator coil—7 turns No. 16 tinned wire ½" inside diameter, length of coil 1¼".

2.5-Meter Band.

1st Detector coil—4 turns No. 16 tinned wire ¼" inside diameter, length of coil 1¼".

Oscillator coil—5 turns No. 16 tinned wire ¼" inside diameter length of coil 1¼".

Short Waves Reduce Viper Poison

(Continued from page 520)

tively. Thus, there is a diminution of the toxic effect when the radiation is prolonged.

EXPERIMENT IV—Length of exposure, 80 minutes; distance of electrodes, 20 cm.; then another exposure of 30 minutes; distance of electrodes, 15 cm. (6 inches); dose injected, 1.1 cc.

Three subjects received this injection. One, weighing 19 grams, died between 12 and 13 hours later; the two others, weighing respectively 24 and 27 grams resisted the venom and survived. The control mice died between 5 and 6 hours after injection. There was thus, as in the case of experiment 3, a manifest reduction of the toxicity of the venom, but the antigenes of the venom no longer existed. And they did not reappear later, for the two subjects who recovered were unable to resist an injection of 1.1 cc. of pure venom given them 5 days later. Thus we may ascribe the augmentation of the toxic effect observed in Experiment 1, to the complete and very early disappearance of the antigenes.

EXPERIMENT V—Length of the exposure, 60 minutes; distance of the electrodes, 15 cm. (6 inches); dose injected 1.1 cc.

Three mice were inoculated with this solution. One, weighing 22 grams, died unexpectedly after 1 hour. 30 minutes; the other two presented the usual symptoms of venom poisoning, but resisted the attack.

In all the cases the hemorrhagic lesions (where blood breaks through wall of blood vessels) characteristic of the action of venom were present; thus the short waves, evidently do not modify the hemorrhagin (poisonous) content of the venom, but this constituent plays only a minor role in the mechanism of death as a result of the venom of the Asple Viper.

* * *

From these experiments and their results we may draw the following conclusions:

1. The first action of short waves on the venom of the Asple Viper is to destroy completely the antivenomous substances (antigenes) which cause the venom to appear more poisonous at first (Experiment 1)

2. The neurotoxin which is the primary cause of death in poisoning cases from a viper bite, is next affected by the short waves; for venom which has been sufficiently irradiated only kills one out of every four or five mice. (Experiments 4 and 5.)

3. The hemorrhagin of the venom is not modified at all, whether the subject dies or resists, which shows its relatively unimportant effect in the mechanism of death from Viper bite.

4. The various results show that the short waves produce upon the venom of the viper much the same effect as ultra-violet radiation, and have no effect with regard to transforming the venom into a vaccine.

Educational Programs on Short Waves

WILLIAM M. BARBER, Educational Director of Short-Wave Broadcast Station, WIXAL, owned and operated by the World-Wide Broadcasting Corporation, announces that beginning December 1 this station will devote its entire facilities to *educational, non-profit programs.* The programs will start Sunday, December 1, 7:30 p.m. and continue on Sundays, Tuesdays, and Thursdays of each week. If you like these programs write to William M. Barber, 11 Boyd St., Newton, Mass., for if the response warrants, daily programs will be given, starting with January.

CLASSIFIED

Advertisements are inserted at 5c per word to strictly amateurs, or 10c a word to manufacturers or dealers. Each word in a name and address is counted. Cash should accompany all orders. Copy for the February issue should reach us not later than December 5th

ACCESSORIES

GENERAL ELECTRIC BATTERY operated dynamotors 24/750 volt $25. (On 12 delivers 375) 500 cycle 500 watt alternators $7.50 List. Henry Kienzle, 501 East 84th Street, New York.

"HAM" OFFERS & WANTS

SALE OR SWAP, FADA AUTO "B" Eliminator 180 Volts—New—$5.00; Westinghouse 32-350 Volts, 80 mils motor generator new—$7.50. Kazmeroff, 606 W. 114 St., New York.

SELL CHEAP—PUSH PULL 3-band transmitter also 500-watt A.C. generator—W9IAJ Bellevue, Iowa, Route 1.

AC RECEIVER COMPLETE, TWO Tuber. Plenty DX, $5.00. Ted Conrad, Montrose, Mo.

TRADE 30-WATT TRANSMITTER for motorcycle. L. C. Odle, McKinney, Texas.

INSTRUCTION

GOVERNMENT GIVES FREE RADIO operators' training for service on aircraft, ships. Salary, expenses paid. Information booklet, how to qualify, apply, 20c. Continental, Box 341F, Indianapolis, Ind.

MISCELLANEOUS

AN EXCELLENT HOLIDAY PRESENT—Golden Gem Portable Adding Machine; Adds, Subtracts, Multiplies as accurately as $300 machines. Over 300,000 sold since 1904. Works automatically. Nickel plated—$8.95. Chrome Finish—$9.95. DeLuxe Model in plush-lined case—$11.29. Interesting literature sent on request. Write for discount to agents. Gold Shield Products Co., 98 Park Place, Dept. C., New York City.

OHM'S LAW CALCULATOR—Lightning Slide Rule; solves all problems of Voltage, Current and Resistance, Power, Wire Sizes, etc. Range: 1 micro-amp. to 1000 amps.; 1 micro-volt to 10,000 volts; 1 micro-ohm to 10 megohms; 1 micro-watt to 10 megawatts; wire sizes 0 to 36 B. & S. gauge. Introductory price $1.00 prepaid. The Dataprint Co., Box 322, Ramsey, N.J.

TEN PRACTICAL AND INEXPENSIVE changes converting Dodge 12-V, Ford T.A., Chevrolet Delco 6-V generators, into 100-500 watt capacity A.C. generators, or into 32-110 volt D.C. motor or generator. Dodge is 500-W. self-excited. All in one book illustrated with complete simplified instructions and drawings for only $1. AUTO-POWER, 414 S. Hoyne Ave., Chicago.

AGENTS WANTED FOR OUR Vest Pocket Soldering Iron. It is the smallest good iron made. 10 inches long and heats up in half the time. Does the work of irons twice its size. Will satisfy or money back. $1.00 brings sample. Gold Shield Products Co., 98 Park Place, Dept. C., New York City.

AGENTS WANTED FOR STOPpani Compass—Cost U.S. Government $30.00. Ideal for Radio Experimental Laboratory. Ruby, jeweled, solid bronze, 4 inches square, in hardwood case, sells for $4.50. Agent's price $2.50. Gold Shield Products Co., 98 Park Place, Dept. C., New York City.

AGENTS WANTED FOR HEALTH Ray Carbon Lamp. Pays for itself in a few treatments. List price with Screen and Goggles, $10.00—Your Cost $3.38. Interesting literature Free. Gold Shield Products Co., 98 Park Place, Dept. C., New York City.

SENSATIONAL AIR CONDITIONer. Looks like a radio. Sells on sight. Sample sent for $4.95. A. L. Diamond, 98 Park Place, New York.

QSL CARDS

QSL CARDS, NEAT, ATTRACtive, reasonably priced, samples free. Miller, Printer, Ambler, Pa.

QSL'S 75c A 100, 2 COLORS. SEND your order to W9DGH, 1816 5 Ave. N., Minneapolis, Minn.

SHORT WAVE COMPONENTS

"LO-LOSS COILS"—TALL FORMS, four colors, 10-200 meters—Set of four .50. Broadcast coils 250-550 meters—Set of Two .40. List of Accessories on request. Short Wave Accessories, 121 Derby St., Valley Stream, New York.

PLUG-IN COILS, 15-210 METERS. Wound on 4-prong tube bases, .30 set. Long forms .50. Six-prong .75. Noel, 809 Alder, Scranton, Pa.

SENSITIVE POLICE AND AMAteur short-wave attachments. Work better than short-wave midgets. For 4-tube midgets, etc. $1.00 postpaid. Delft, Oakland, Calif.

SHORT WAVE RECEIVERS

IN STOCK—LOWEST WHOLEsale prices: Patterson PR-12 complete $82 prepaid; Silver 5C $74.70 prepaid. All other receivers, shortwave apparatus. Trade-in your receiver. Code machines rented. Write Henry Radio Shop, Butler, Mo.

SHORT WAVE RADIOS IN Leather Camera Cases. $8. Wm. Ballard, 14A Burnet, Sapulpa, Okla.

NEW TUBELESS 1850 MILE RAdio. Operates Speaker. Blueprint 17 others. 25c Coin. Setbuilders List Free. Modern Radiolabs, 151-A Liberty, San Francisco.

SHORT WAVE SUPPLIES

INSULATION, WIRE, VARNISHes, supplies, etc. Send 3c stamp for bulletin. AUTOPOWER, 414 S. Hoyne Ave., Chicago.

TRANSCEIVERS

TRANS-CEIVERS $3.95! HAM AD Friends, our Ad will be found this month on Page 566. Thank you. The Burks Radio Company.

TRANSMITTING EQUIPMENT

AMATEURS! COMPLETE LINE of inexpensive transmitters, monitors and receivers. Stamp for catalog. Centralliion Engineering Co., 461 Fourth Ave., New York.

20 WATT TRANSMITTERS $15; 10 watt fone transmitters $75; 6 Tube all wave superheterodynes $10; pre-selector $12. All complete—no extras to buy. Custombuilders, W2HNQ, 113 West 57th, N.Y.C.

Index to Advertisers

(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)

De Luxe Gothic RGH 4

(*Continued from page* 537)

carefully, making sure all connections are soldered firmly.

Antenna Connection: Although the doublet antenna is almost a necessity for short-wave reception, good results are obtainable on an ordinary antenna. Verifications have been received already by "fans," from all parts of the world, including New Zealand and Australia, all on the loud-speaker.

List of Parts

Coils

2—Sets of 6-prong coils (8 coils)
2—Thor R.F. chokes
1—NS44 plate choke (300 henry)
1—Thor power transformer 600V-40MA
1—Speaker for 2A5

Condensers

1—140 mmf., 2-gang condenser
1—25 mmf., midget condenser, variable
2—Thor 8 mf., 450V electrolytic condensers
4—.25 mf., 200 volt by-pass condensers
2—.25 mf., 300 volt by-pass condensers
1—.5 mf., 500 volt by-pass condensers
1—.02 mf., 300 volt by-pass condensers
1—.01 mf., 300 volt by-pass condensers
1—.002 mf., 300 300-volt by-pass cond.
1—.0003 mf., 300-volt by-pass condenser
1—.0001 mf., condenser (mica)

Resistors

1—15,000-ohm potentiometer with switch
1—15,000-ohm variable control
1—25,000-ohm one watt
1—5, megohm half watt
2—300,000-ohm half watt
1—40,000-ohm half watt
1—10,000-ohm half watt
1—350-ohm half watt
1—4,000-ohm half watt

Other Requirements

1—Thor RGH 5 chassis, coil shields, and panel
1—Crowe airplane dial, escutcheon plates and pilot light bracket
4—Knobs
2—58 tube shields
5—Wafer sockets
2—6-prong sockets
3—Binding posts
Resistor racks
Line cord and plug
No. 18 hookup wire
Solder and hardware

"When to Listen In"

(*Continued from page* 544)

lengths, 19.71 and 31.28 meters. The latter is the wave length which it formerly operated on. It has no regular schedule as yet, but frequently operates on 19.71 meters relaying the program of PHI.

Shanghai

• XGBD at Shanghai on 31.32 meters, which was mentioned several months ago in this column as being under construction has been heard testing recently during the early morning hours. Listeners who hear the station please send us reports.

Havana

• A new broadcasting station is reported at Havana, Cuba. The call letters are COH or COA. The station operates on approximately 31.8 meters. It is supposed to be on the air daily from 8:30-10:30 p.m. The address is 2B Street, Vedado, Havana, Cuba.

KDKA DX Club

May we again remind our listeners that the KDKA Short Wave Club broadcasts listening tips each Sunday morning from midnight to 12:30 a.m. on 980 Kc. This program is also radiated on W8XK, the short-wave station on 11870 kc. and 6140 kc. It is possible that this program may shift to Monday morning at the same hour.

Vienna

• OER2 at Vienna, Austria, on 6072 kc. is now on daily from 9 a.m.-5 p.m.

ALL SCHEDULES EASTERN STANDARD TIME.

• • • SHORT WAVE ESSENTIALS

FOR MEMBERS OF THE SHORT WAVE LEAGUE • • •

A FEW WORDS AS TO THE PURPOSE OF THE LEAGUE

The SHORT WAVE LEAGUE was founded in 1930. Honorary Directors are as follows:

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

The SHORT WAVE LEAGUE is a scientific membership organization for the promotion of the short wave art. There are no dues, no fees, no initiations, in connection with the LEAGUE. No one makes any money from it; no one derives any salary. The only income which the LEAGUE has is from its short wave essentials. **A pamplet setting forth the LEAGUE'S numerous aspirations and purposes will be sent to anyone on receipt of a 3c stamp to cover postage.**

FREE MEMBERSHIP CERTIFICATE

As soon as you are enrolled as a member, a beautiful certificate with the LEAGUE'S seal will be sent to you, providing 10c in stamps or coin is sent for mailing charges.

Members are entitled to preferential discounts when buying radio merchandise from numerous firms who have agreed to allow lower prices to all SHORT WAVE LEAGUE members.

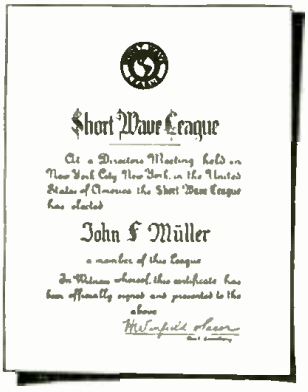


Illustration of engraved free membership certificate

SHORT WAVE ESSENTIALS LISTED HERE SOLD ONLY TO SHORT WAVE LEAGUE MEMBERS

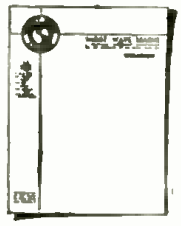
They cannot be bought by anyone unless he has already enrolled as one of the members of the SHORT WAVE LEAGUE or signs the blank on this page (which automatically enrolls him as a member, always provided that he is a short wave experimenter, a short wave fan, radio engineer, radio student, etc.).

Inasmuch as the LEAGUE is international, it makes no difference whether you are a citizen of the United States or any other country. The LEAGUE is open to all.

SHORT WAVE LEAGUE LETTERHEADS

A beautiful letterhead has been designed for members' correspondence. It is the official letterhead for all members. The letterhead is invaluable when it becomes necessary to deal with the radio industry, mail order houses, radio manufacturers, and the like; as many houses have offered to give members who write on the LEAGUE'S letterhead a preferential discount. The letterhead is also absolutely essential when writing for verification to radio stations either here or abroad. It automatically gives you a professional standing.

A—SHORT WAVE LEAGUE letterheads, per 100 ..... **50c**

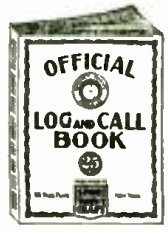


A—50c per 100

OFFICIAL SHORT WAVE LEAGUE LOG AND CALL MAGAZINE

Here is the finest book of its kind ever published. It contains the largest listing of short wave stations in the world, much larger in fact than the list published in SHORT WAVE CRAFT and other magazines. All experimental stations, no matter where located, are listed. A large section is provided where calls can be listed in a proper manner. This log section gives dial settings, time, date, call letters, location, and other information. Another section has squared-paper pages on which you can fill in your own frequency curve for your particular receiver. It helps you to find stations which otherwise you could never log. It is the only book of its kind published.

B—Official Log and Call Magazine ..... Prepaid **25c**



B—25c per copy

RADIO MAP OF THE WORLD AND STATION FINDER

The finest device of its kind published. The world's map on heavy board is divided into 23 sections, while the rotary disc shows you immediately the exact time in any foreign country. Invaluable in logging foreign stations. Also gives call letters assigned to all nations. Size 11"x22".

C—Radio Map of the World and Station Finder ..... Prepaid **25c**

GLOBE OF THE WORLD AND MAGNETIC COMPASS

This highly important essential is an ornament for every den or study. It is a globe, 6 in. in diameter, printed in fifteen colors, glazed in such a way that it can be washed. This globe helps you to intelligently log your foreign stations. Frame is of metal. Entire device substantially made, and will give an attractive appearance to every station, emphasizing the long-distance work of the operator.

D—Globe of the World ..... Prepaid **$1.25**

SHORT WAVE LEAGUE LAPEL BUTTON

This beautiful button is made in hard enamel in four colors, red, white, blue and gold. It measures three quarters of an inch in diameter. By wearing this button, other members will recognize you and it will give you a professional air. Made in bronze, gold filled, *not plated.* Must be seen to be appreciated.

E—SHORT WAVE LEAGUE lapel button ..... Prepaid **35c**

EE—SHORT WAVE LEAGUE lapel button, like the one described above but in solid gold ..... Prepaid **$2.00**

C—25c each

SHORT WAVE LEAGUE SEALS

These seals or stickers are executed in three colors and measure 1¼ in. in diameter, and are gummed on one side. They are used by members to affix to stationery, letterheads, envelopes, postal cards and the like. The seal signifies that you are a member of the SHORT WAVE LEAGUE. Sold in 25 lots or multiples only.

G—SHORT WAVE LEAGUE seals ..... per 25, Prepaid **15c**

SHORT WAVE MAP OF THE WORLD

This beautiful map, measuring 18x26 in. and printed in 18 colors is indispensable when hung in sight or placed "under the glass" on the table or wall of the short wave enthusiast. It contains a wealth of information such as distances to all parts of the world, political nature of the country in which a broadcast station is located, etc., and from the manner in which the map is blocked off gives the time in different parts of the world at a glance.

F—SHORT WAVE Map of the World ..... Prepaid **25c**

PLEASE NOTE THAT ABOVE ESSENTIALS ARE SOLD ONLY TO MEMBERS OF THE LEAGUE—NOT TO NON-MEMBERS.

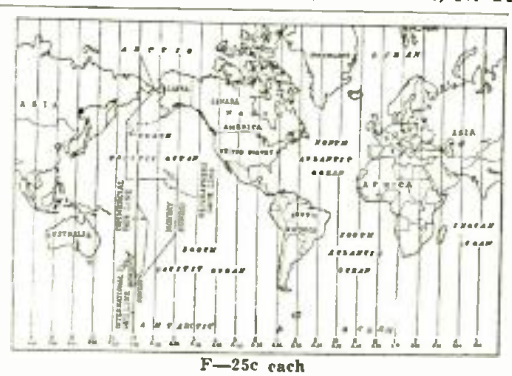
Send all orders for short wave essentials to SHORT WAVE LEAGUE, 99-101 Hudson Street, New York City.

If you do not wish to mutilate the magazine, you may copy either or both coupons on a sheet of paper.

D—$1.25 each

SHORT WAVE LEAGUE 99-101 Hudson St., New York, N. Y.

G—15c for 25



F—25c each

E—35c each

Application for Membership SHORT WAVE LEAGUE

SHORT WAVE LEAGUE 1-35
99-101 Hudson Street, New York, N. Y.

I, the undersigned, herewith desire to apply for membership in the SHORT WAVE LEAGUE. In joining the LEAGUE I understand that I am not assessed for membership and that there are no dues and no fees of any kind. I pledge myself to abide by all the rules and regulations of the SHORT WAVE LEAGUE, which rules you are to send to me on receipt of this application.

I consider myself belonging to the following class (put an X in correct space): Short Wave Experimenter ☐ Short Wave Fan ☐ Radio Engineer ☐ Student ☐

I own the following radio equipment:

Transmitting .....

Call Letters .....

Receiving .....

Name .....

Address .....

City and State .....

Country .....

I enclose 10c for postage and handling for my Membership Certificate.

SHORT WAVE LEAGUE, 99-101 Hudson Street, New York, N. Y.
Gentlemen:
I am already an enrolled member in the SHORT WAVE LEAGUE ☐
I am a new member and attach my application to this coupon ☐
Please send me the following short wave essentials as listed in this advertisement:

for which I enclose $ ..... herewith.
(The LEAGUE accepts money order, cash or new U. S. Stamps in any denomination. Register cash and stamps.)

Name .....
Address .....
City and State .....
Country .....

1-35

Have You Received
YOUR COPY?

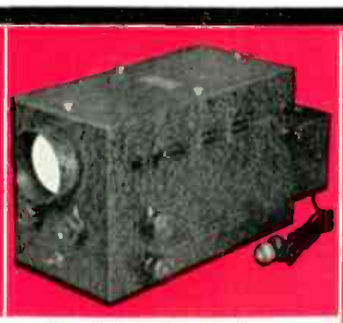
THE NEW NATIONAL CO. CATALOGUE

Waiting for You!

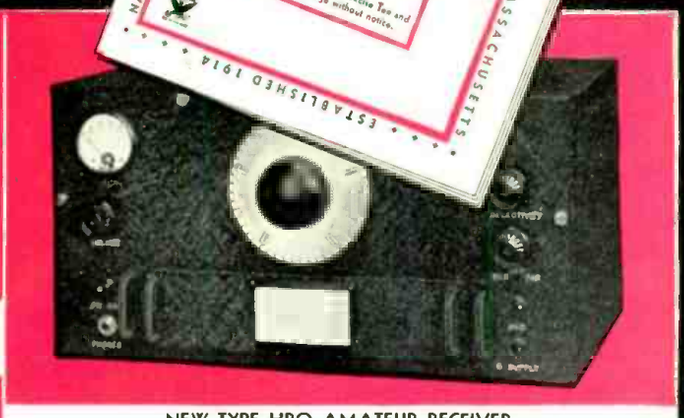
NEW RECEIVERS! NEW PARTS!

Ask Your NATIONAL Dealer or Use Coupon Below

NEW TR 56 MC TRANSCEIVER
A portable combination 5 meter receiver and transmitter (special booklet available). Uses two tubes.



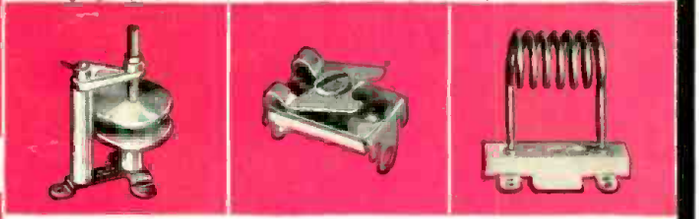
New Cathode Ray Oscilloscope
Provides instantaneous graphic picture of actual operating conditions in transmitter circuits. (Booklet available).



NEW TYPE HRO AMATEUR RECEIVER
Two stages of pre-selection, two air-tuned IF stages, calibrated band spread, automatic volume control, 4-gang condenser, micrometer dial, single signal filter, new ganged plug-in coils, vacuum tube voltmeter, and many other new features.

New TMS Transmitting Condenser
For low power use. Steatite-Isolantite insulation. Compact, inexpensive.

New TMC Transmitting Condenser
For power stages where peak voltages do not exceed 3000. Compact, rigid.

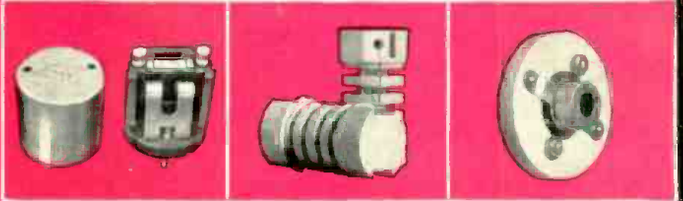


New NC 800 Neutralizing Condenser
For high voltage use, especially with RCA-800.

New M30 Mica Padding Condenser
Steatite mounting. Max. capacity 30 mmf.

New Type XR-9 Five-Meter Coil
Copper coil, air-spaced winding on Steatite base.

NEW PW PRECISION CONDENSER & MICROMETER DIAL UNIT
A new and entirely self-contained ganged condenser unit for high frequency receivers. Worm-gear drive 20-1 ratio. Full of new and advanced features.



New Type CH Crystal Holder
Holds crystal vertically. 2 forms, for transmitting or for resonator use.

New XT-8 Choke Coil Form
Steatite form for small choke coils and resistances

New TX-9 Shaft Coupling
Steatite insulation, for isolating circuits.

Illustrated above are just a few of the many new items shown in the new National Catalogue No. 240. National Radio Products include these and many other new items, and of course the well-known National Velvet Vernier Dials, Transmitting Condensers, Receiving Condensers, IF Transformers, RF Chokes, Sockets, Coil Forms, Coil Shields, Transformers, and HF Dielectrics.
Included also are the famous NATIONAL AGS and AGSX Receivers, the FB-7A and FB-XA Amateur Receivers, the SW-3 High Frequency Receiver, the PSK Preselector, the SRR 5 Meter Super-Regenerator Receiver, the HFC 5 Meter Converter—as well as the power units for operating these receivers. Call at your National Dealer's today for a free copy of this new catalogue, or send coupon below, enclosing 6c to cover mailing costs.

NATIONAL COMPANY, Inc., 61 Sherman Street, Malden, Mass.

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This dial was designed in keeping with the trend of the times, yet is not an airplane dial! It is a many-purpose dial that performs many functions. Now, Midwest guarantees that inexperienced persons can secure good foreign reception. Send for FREE miniature of actual rotating dial which clearly shows these outstanding advantages:

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2. Call letters of American Broadcast Stations printed on dial and illuminated;
3. Slow-Fast, Smooth-Acting Tuning;
4. Station Group Locator;
5. Simplified Tuning Guide Lights;
6. Automatic Select-O-Band Indicator;
7. Illuminated Pointer Indicator;
8. Silent Shadow Tuning—Improvement on Meter Tuning;
9. Centralized Tuning.

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Many exclusive features include: Micro-Tenuator...Fidel-A-Stat... Separate Audio Generator...Ceramic Coil Forms, etc. Only Midwest covers a tuning range of 9 to 2400 meters (33 Megacycles to 125 KC)—enabling you to easily and successfully tune in even low-powered foreign stations up to 12,000 miles away with crystal-clear, loud-speaker reception.

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This bigger, better, more powerful, clearer-toned, super selective, 16-tube radio gives you absolute realism—assures you of life-like, crystal-clear tone—unlike anything you have ever experienced before. You will hear one more octave—overtones—that cannot be brought in with ordinary radios. Now, hear every instrument, every voice, every shade and inflection of speech.

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