RADIO & TELEVISION

FORMERLY SHORT WAVE & TELEVISION

NEW 2½ METER TRANSCEIVER TALKS 2 WAYS

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World-Wide Radio Review

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2-Band "Portable" Loop Receiver

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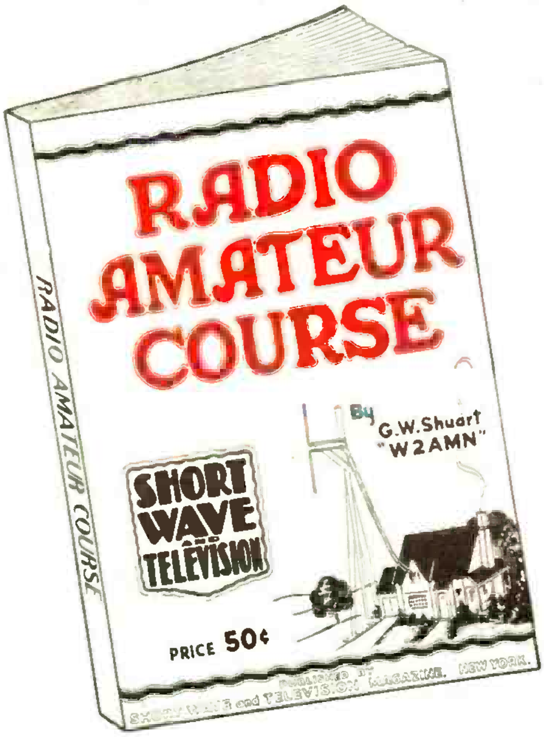
AUG. 1939



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The Popular Radio Magazine

HUGO GERNSBACK, Editor
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August — 1939
Vol. X No. 4

How to Build the LT-6 "Loktal" All-Wave Receiver

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In the September Issue

"Looking Ahead in Radio!"—J. R. Poppele, Chief Engineer, Station WOR, Newark, N. J.

A Switch-Type "Ham" Transmitter for All Bands—Herman Yellin, W2AJL

2-Band Portable A.C.-D.C. Receiver: Uses New Single-Ended Metal Tubes and Reverse Feed-Back—M. Harvey Gernsback

A 1-Tube "All-Wave" Pre-Selector—Harry D. Hooton, W8KPX

Building a "Low-Cost" Television Receiver with Small C-R Tube

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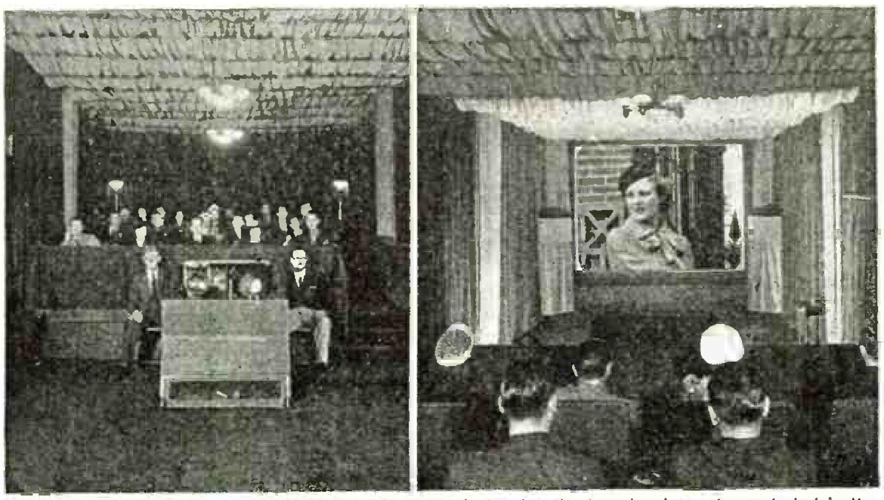
U.S. Sees "Screen Size" Television

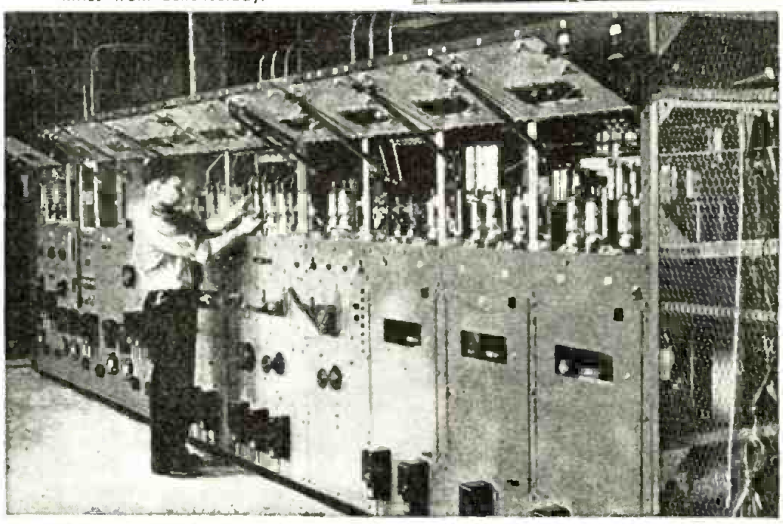


The Baird television system, used for the past few years in London theaters, has been demonstrated in the United States. The apparatus shown above projects a television image on a 9 x 12 foot screen with motion picture brilliance. The projector, with spare channel, is placed about 25 feet from the screen. The audience sees a picture which has remarkable fidelity and detail.

Inside 10 K.W. Television Station

Programs from here will be transmitted through the General Electric's television studio in Schenectady, new G. E. Station in the Helderberg Hills. Below—Main control board of the 10 kw. Helderberg television transmitter, located at Indian Ladder, 12 miles from Schenectady.

It is planned to broadcast motion picture films as a considerable portion of the Schenectady station's programs. Below—J. W. Downie is seen inserting movie film into the film television projector. Sound films, of course, will be used for these transmissions.



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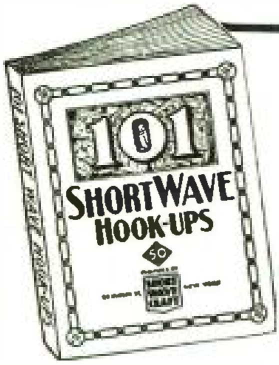

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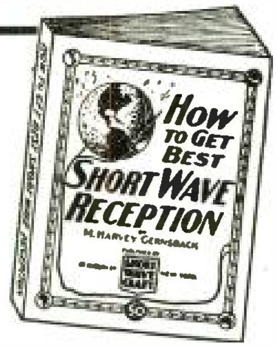

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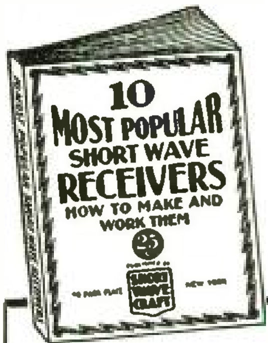

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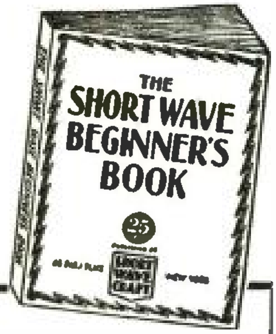

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RADIO & TELEVISION

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Beyond the Last Wave Bands

D. L. Webster,
Professor of Physics, Stanford University

Dr. David L. Webster, Professor of Physics, Stanford University, California.

● SUPPOSE a radio broadcasting station were remodeled, and your receiver also were remodeled to go with it, so that instead of transmitting and receiving radio waves in the ordinary broadcast range they operated with much shorter waves, even shorter than what are now listed as short-wave bands. What would we find? Would the transmitting station and the receiver then work as well as they do now? Or, perhaps, would they work even better? Or would we find them neither better nor worse, but different? And how could such a change be made? Would it be effected by the new tube called the *Klystron*, of which you may have read? These are the questions I propose to answer briefly.

In the ordinary short-wave bands, we hear of such spectacular distances covered with very moderate power, as to raise hopes of still longer distances at still shorter wavelengths. A definite limit to such hopes can be seen, however, when we recall that radio waves belong to a general class which also includes light. In fact, *light may be regarded as simply radio waves of extremely short wave length*, far shorter than any waves we usually think of under the name of radio. For light, our eyes are very sensitive receivers; but, if the station substituted light for its radio waves, it would be lost to all who are beyond its horizon. Somewhere in the spectrum, therefore, between these radio waves and light, long-distance transmission must cease.

There is room for many changes, between the last wave bands now in use and light. The last wave band listed in my morning newspaper has a frequency of nearly 18 megacycles, which implies a wavelength of 17 meters, or 55 feet. Light, however, has wavelengths shorter than a thousandth part of a millimeter, which is about one twenty-five thousandth of an inch. From shortwave radio to light, therefore, the wavelength is reduced and the frequency is increased by a factor of more than a million. Considering these frequencies on a scale like that of a piano, *this is a jump of more than 20 octaves*—an interval about twice as long as from the lowest audible frequency to the highest.

The loss of long-distance transmission must occur somewhere in this long interval; and it does occur very near the beginning of the interval, just beyond the present short-wave bands. Long distance transmission depends on the presence of ions, or electrically charged atoms, in the rarified air 100 or 200 miles above the earth, where the sunlight still contains its ionizing rays. This layer of ionized air, called the *ionosphere*, acts on radio waves almost like a great spherical mirror surrounding the whole earth. Waves that start from a broadcasting station and go horizontally or at a low angle eventually reach this mirror-like layer and are reflected back to the earth, usually somewhere beyond the horizon. Then they may be reflected by the ground and make a second trip to the ionosphere and then come down again still farther away.

All this, however, depends on the ability of the waves, when they reach the ionosphere, to shake the ions up and down and make them send out the new waves which we call reflections. When the frequency is raised too high, the ions refuse to be shaken far enough to make strong reflected waves, and it is then that long-distance transmission ceases. The exact limit at which this occurs is very changeable with the conditions of the atmosphere, but is usually at a wavelength of 10 or 20 meters, just at the end of the short-wave broadcast bands now in use.

Why, then, do we want *shorter* waves? For at least two reasons. *One is for television.* Any broadcasting station must send out waves of more than just one frequency. Station KGO, for example, is now sending waves of its listed frequency, 790 kilocycles, and also waves of frequencies higher and lower, differing from it by amounts equal to the frequencies of the sounds in the program being transmitted. Since these sound frequencies are all less than a very few kilocycles, the frequencies of the radio waves are all within a band less than ten kilocycles wide.

For television, on the other hand, we need a band having a width of *at least* a thousand kilocycles, or a whole megacycle. For technical reasons it would not be fair to ask any transmitter or receiver to work well at all the frequencies between one and two megacycles at once, nor even on all between two and three. But if it runs at 50 megacycles, for example, it may well handle the whole range from 50 to 51 at once. So it is to such frequencies that we must resort for *television*. And a 50-megacycle frequency makes the wavelength only 6 meters—shorter than the wavelength at which the ionosphere stops reflecting.

Television, therefore, does not now promise long-distance transmission. Instead, when you see by television, you see no farther than by direct vision with a telescope. The differences between television and vision with a telescope are not in the distance attained, but rather those which result from the difference in wavelength between the 5- or 10-meter waves of television and the microscopic waves of light.

The most obvious of these differences concerns the manner in which the waves are used. Less obvious, but equally important, is the fact that light usually travels in straight rays, while radio waves can easily spread around obstacles, such as houses and hills. The very short waves used for tele-

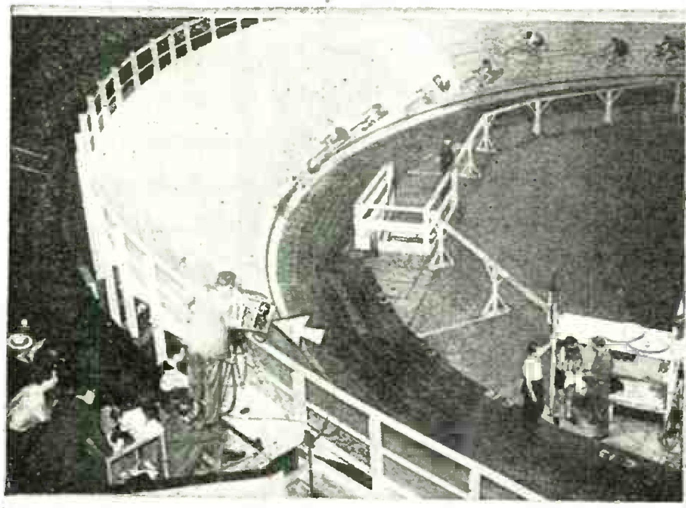
(Continued on page 229)

Thirtieth of a series of "Guest" Editorials

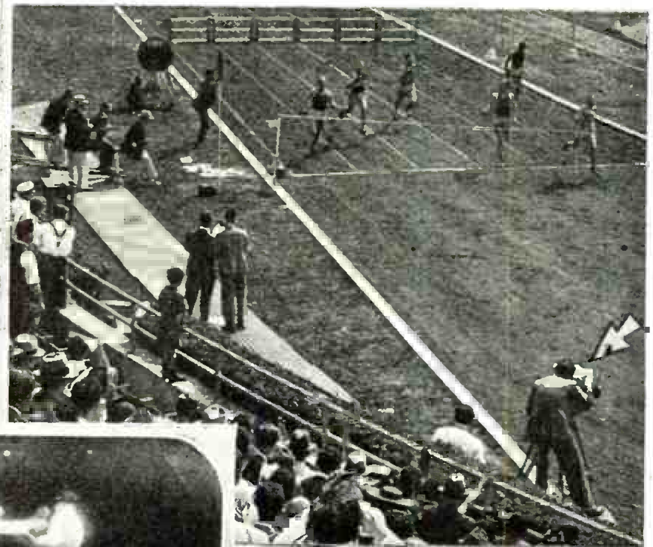
Now

Television Brings *Sports* To Your Home

Television camera (arrow, above) normally focused on the home-plate during this college baseball game—the first ball game to be visually aired in America. Although the movement of the ball was sometimes visible, the camera was too far from the field and the players were excessively small.

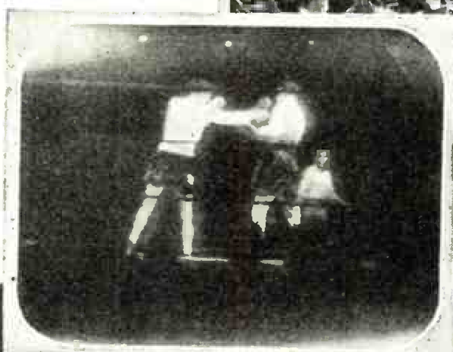


American televiewers got their first glimpse of a 6-day bicycle race when the NBC television camera (arrow, above) was placed beside the track in Madison Square Garden, New York. This was the history-making telecast in which standard telephone lines linked the television truck in the Garden basement to the transmitter about a mile away.

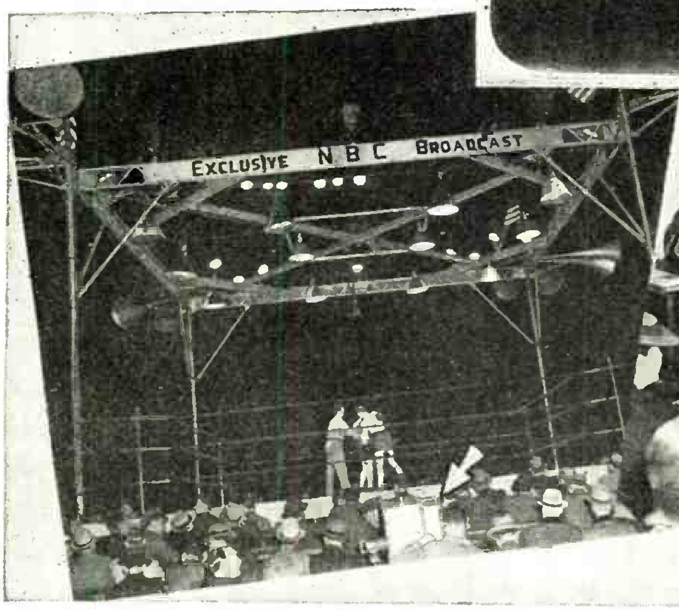


Above—The first telecast of a field meet. The foot races were picked up by the NBC-RCA television camera, shown by the arrow above.

At the right is reproduced exactly what television fight fans saw during the Baer-Nova fight. This is reproduced from a photograph taken of the image appearing on a 12" cathode-ray tube.



Below is the set-up at the ringside. The arrow points to the television "camera." It could not be placed in a more advantageous position as the management insisted that it be set up where it could not block any spectator's view of the ring.



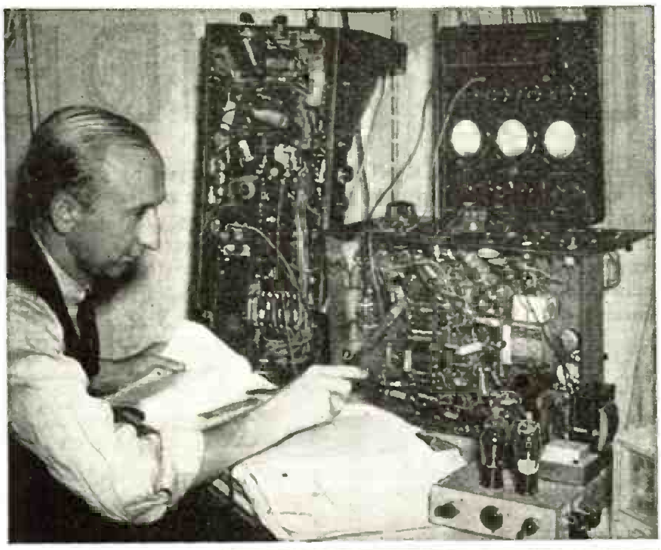
Below is a group of televiewers in a dealer's store watching the image of the Baer-Nova fight. Note intense interest.

Television Programs

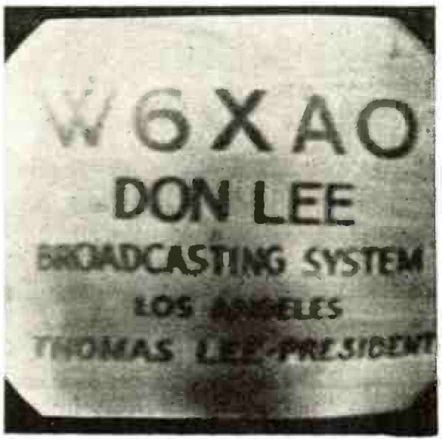
Received at 22 Miles on Home-Made Set

Richard W. Emery

California experimenter picks up telecasts regularly in home



Roger A. Howell, of Long Beach, Calif., who for several years was the only amateur "looker-in" of the Don Lee Los Angeles television station, W6XAO. He has been honored for his work in television by the Hollywood Television Society.



At 22 miles, this is a fair sample of what the more distant television fans in the Los Angeles area are able to pick up from W6XAO.

FOR seven years the Don Lee Broadcasting System has been operating its experimental television station, W6XAO, in Los Angeles. Meanwhile, San Francisco has done comparatively little to prepare for television broadcasts, although San Francisco's several precipitous hills give her the advantage of natural high elevations for transmitters.

Away back in the early days of these experimental television broadcasts at Los Angeles, there were no amateur lookers-in. Now there are a considerable number—but just how many, the station itself would like to know. Amateurs are enthusiastic over results they have seen. The number of *lookers-in* is rapidly increasing. Los Angeles and other cities within a 25-mile radius offer a population of some 3,000,000 potential television fans.

The necessity of building a set especially to receive the Los Angeles station's broadcasts has discouraged a great many interested spectators. With the expected adoption of RMA standards by Don Lee, no doubt the amateurs will spring up like "mushrooms" after a Spring shower.

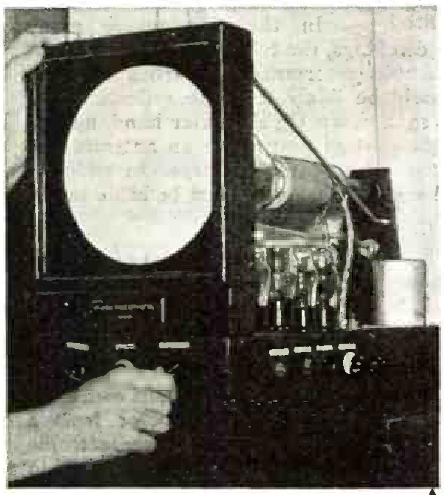
Station W6XAO has been transmitting its visual program on 45,000 kilocycles and its audio program on 49,750. The station is on the air every night from Tuesday through Friday with an hour's show. from 7:30 to 8:30 o'clock; and from 7:00 to 8:00 o'clock on Mondays and Saturdays with movie films. Lookers-in find an interesting and entertaining assortment of live camera pick-ups made in the studio. There are world news reports, sport casts, a continued serial play, musical entertainers, tap dancers, lecturers on television and a great many other features.

Because of the experimental factors involved, the station has welcomed all comments by amateurs who have tuned in and watched the programs. The first amateur television experimenter to tune in regularly was Roger A. Howell, Long Beach radio service specialist, who built a set six years ago and gave Don Lee the good news that the telecasts were coming in at Long Beach, 22 air miles from the transmitter. Howell has continually changed his equipment, improving it as television progressed, and has kept the station advised of reception in Long Beach. For several years he was the only outside looker-in on the Los Angeles television broadcasts.

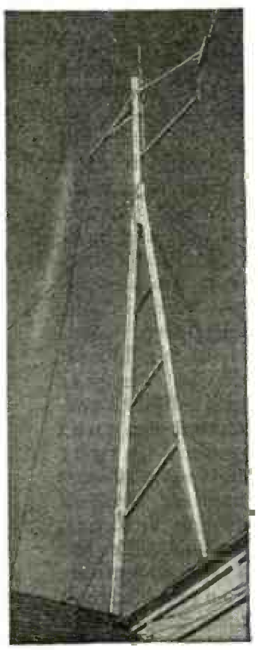
Gradually, through interest of the Hollywood Television Society, additional sets were built and put in operation. The society meets regularly. It has recognized Howell's contribution to television by giving him its first citation to honorary membership, an honor later awarded to Dr. Lee de Forest of Los Angeles, Dr. R. D. Lemert of Hollywood and Harry R. Lubcke, director of television for the Don Lee Broadcasting System.

Howell has been operating his receiving set at his home in Long Beach, and his nightly guest-list attests the great interest which the public now has in television. He has had as many as thirty visitors in one evening, to see one of the television programs. In his set a nine-inch tube is used in the receiver, which gives a picture 6½ by 7½ inches when masked down.

The principal problem in television in the Los Angeles area at present is that of power. The television broadcasts are made on 1000 watts and, around the outskirts of the metropolitan (*Continued on page* 234)



Mr. Howell's home-built television receiver. The nine-inch field is cut to about 6½ inches by 7½ inches when masked down.



Left—Mr. Howell's dipole antenna rises 70 ft. above the ground.

Below: 10-second exposure, at 3 feet of W6XAO announcer, made at distance of 22 miles, on Roger Howell's receiver.

WORLD WIDE

TELEVISION OUTLETS are to be installed in every apartment of a new building being erected at 20 Park Avenue, New York City, according to the builder's plans. A modification of the RCA multi-wave antenna system (the antennaplex) is being considered.

The basic system has been used for several years in many locations, including Rockefeller Center, but this will be the first time that the television adaptations have been actually tested in the field.

At the left is the artist's conception of how the wiring system will be arranged to supply programs throughout the building, which will be the first apartment house in the United States to be wired for television programs.

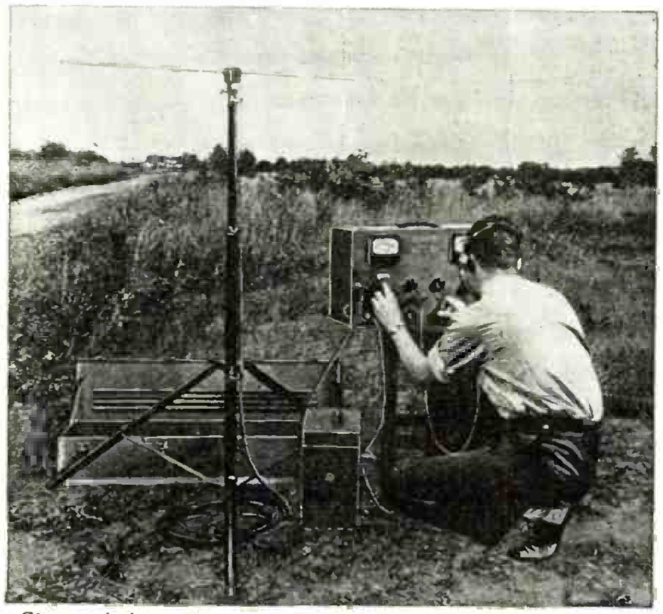
In the city, where many families live in multiple dwellings, the television antenna problem has been of considerable importance. Numerous antennas erected on the roof would be likely to cause reflections, or other interference with each other. On the other hand, no one tenant wishes to bear the cost of putting up an antenna and then permit others to tap off it without charge. In addition, as high level signals are essential, tap-offs must be made in the most efficient manner possible.

A FLUORESCENT SCREEN on the dashboard of a motor car will show a panoramic view of the road ahead, according to Courtney Atwood, New Zealand insurance official. Mr. Atwood states that about a mile of the road will be visible, says a report by *United Press.*

16 ALL-ELECTRONIC instruments, each with its own loudspeaker and all controlled by the conductor from a central control panel, make up the Cracraft All-Electronic band illustrated below. This is the first band of its type in America. The 16 illuminated controls are divided into four groups, each under the supervision of a group master control.

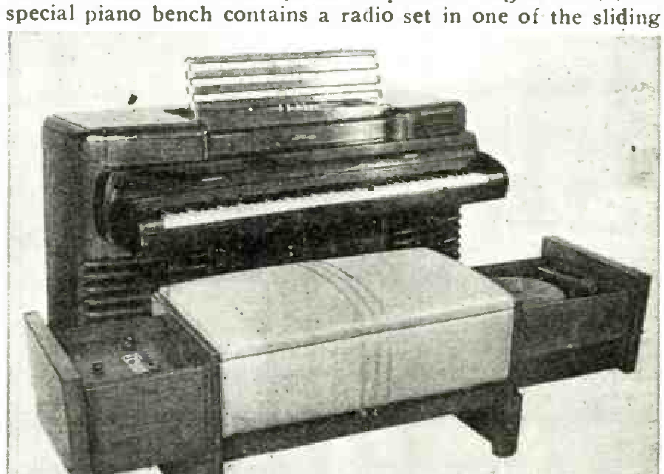
A separate master control regulates the volume of the entire orchestra. The conductor can set the volume of each instrument individually, highlighting, at will, soloists and individual band sections. The apparatus used in the smaller instruments is a 10-watt Clarion amplifier with a 10-inch permanent magnet speaker. Larger units use a 20-watt amplifier with a 12-inch speaker. Each amplifier has a special remote control circuit connected to the conductor's board.

TELEVISION'S SERVICE range is surveyed by use of the new ultra-high frequency field intensity meter. This apparatus, which is used on signals from all stations operating in the band from 20 to 125 mc. (15 to 2.4 meters) not only provides accurate indications of signal strength but enables records to be made automatically, and provides data on the amount of interference, as well.



Shown below, this new RCA instrument is portable and can be carried to any location. It is believed that it will increase knowledge about service from high frequency stations as well as aiding in the selection of suitable sites for television and other ultra short wave antennas.

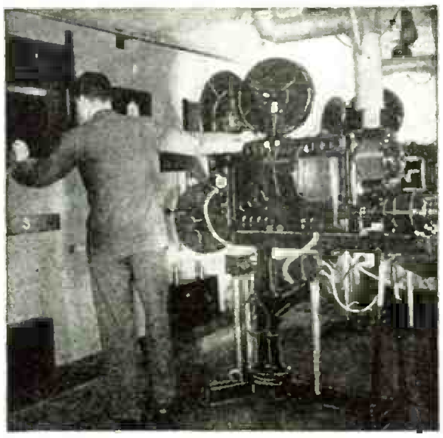
AN ELECTRICAL PIANO, which also receives radio programs and plays phonograph records, has been developed by the engineers of RCA and the Story & Clark Piano Company. This instrument—the Storytone—can have its volume stepped up at least equal to that of the largest concert grand piano, but when stepped down, it gives a harpsichord effect. In addition to the usual "damper" and "soft" pedals, it is equipped with a "swell" pedal to produce organ effects. A special piano bench contains a radio set in one of the sliding drawers, and a phonograph in the other. The piano may be played as an accompaniment to either of these.



The mechanical vibrations of the piano strings induce electrical vibrations in magnetic pick-ups, and these are amplified.

RADIO DIGEST

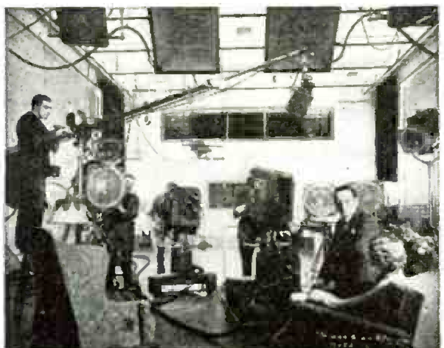
FILM SCANNING at first provided 90% of the program material being radiated by the National Broadcasting Company. Experimental television programs there were of two types — studio pick-ups (with live talent) and motion picture film. The accompanying picture is concerned with the latter. Film is placed in the projection machine (right) and run off exactly as it might be in any motion picture theatre. However, instead of showing up as an enlarged image, the film is focussed on the mosaic screen of an Iconoscope "camera."



Opposite the projection machine, on the other side of the wall and unseen in this photograph, is the Iconoscope "camera." Virtually identical with those used in the television studio, it picks up the optical picture and transforms it to electrical impulses.

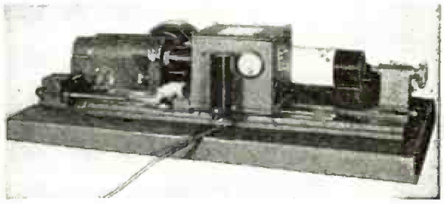
In effect, the motion picture projection machine functions in television exactly as a studio. Television transmission, from the moment the image is picked up in the Iconoscope tube, is the same for both live talent and "canned."

STUDIO LIGHTING has been revolutionized by engineers working under William C. Eddy, staff television expert, according to O. B. Hanson, Vice-President and Chief Engineer of NBC. Shown at the left is a lighting system which was used in early NBC television broadcasts. At the top of the picture are the "broads" and "scoops"; at the left, "suns"; and at the right, "rifles" and "spots." These are types of light sources long used in theatrical and motion picture work.



The new lighting units, shown in the lower picture were designed for television studio use. They give better illumination with less heat and greater economy of current, and they can be remotely controlled. In addition to the big ceiling lights, which may be swung to a wide variety of positions, are lightweight "dollies," each of which bears several lamps to furnish the "modeling" illumination. Less than two feet high, these "dolly" lights may be placed in front of the television camera, where they will not be picked up by its lens.

TABLOID SIZE newspaper pages are received on the new Finch equipment, which has a speed of 20 square inches per minute or 8 full pages an hour, according to Fred Ehlert, Information Chief of the Finch organization. Specifications of the apparatus, the receiver of which is shown at top right with the transmitter below, are as follows: Number of lines per inch, 100; width of useful copy, 10 inches; number of lines per minute, 200; length of page, maximum, 17 inches; continuous feed of paper, 200 feet.



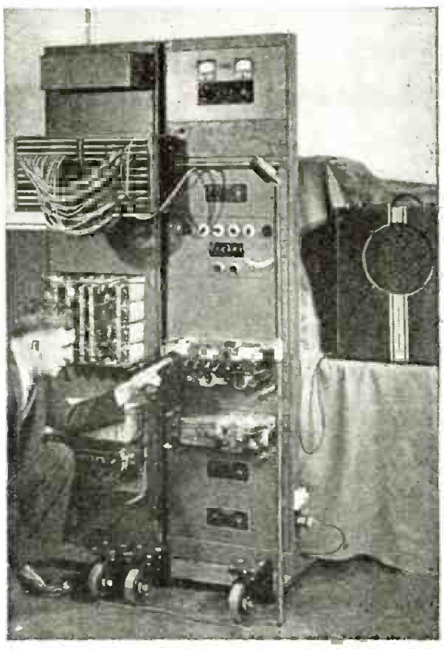
This apparatus utilizes the triple-scanning system described in a previous issue of RADIO & TELEVISION.

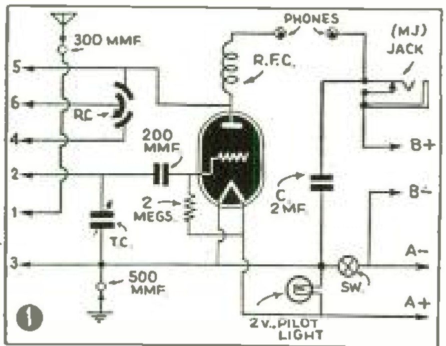
One of these new units is now shown in the All-America Cables, Inc., exhibit at the New York World's Fair. Black on white copy is produced by means of an electro-mechanical process on dry paper. It reproduces type and illustrations alike.

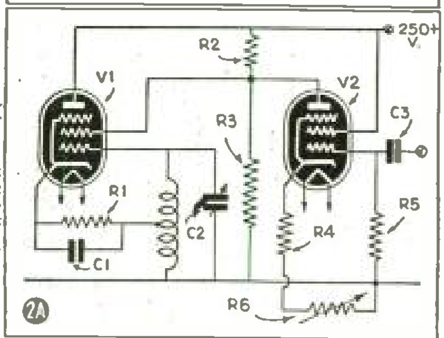
BALLS OF FIRE float in a cloud of royal purple gas in the sodium fountain shown below. William A. Gluesing is demonstrating how this apparatus operates in the "House of Magic" auditorium in the General Electric Building at the New York World's Fair. The capacity of the human body, brought near the electrodes of the tube, causes an electronic discharge which is manifested by a brilliant display of miniature "fireworks" within the glass envelope. The use of different gases will provide various other color effects.

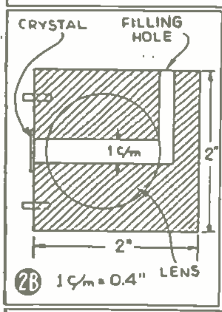
RE-CREATED SPEECH is produced by the apparatus shown in the photograph below. This machine analyzes human speech and breaks it into its essential parts—the buzz and the hiss—each of which has ten ranges

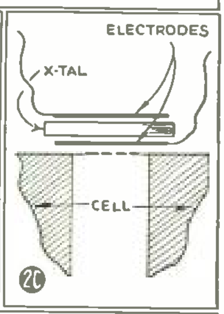
(Continued on page 234)

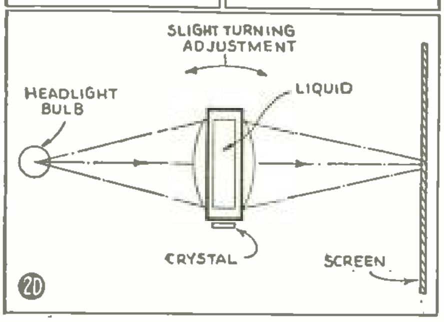


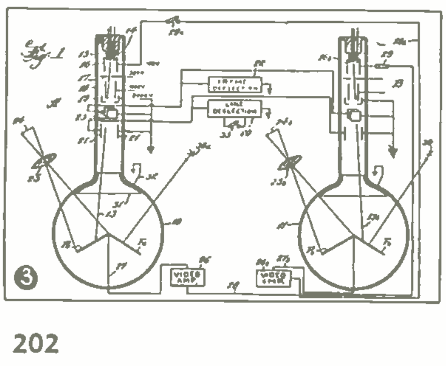












Coil Tester

1 A HANDY tester for checking home-made coils under actual working conditions is described in *Practical and Amateur Wireless* of England. The circuit of this apparatus is shown in Fig. 1.

As the diagram shows, the unit consists of a grid-leak detector having all points which were normally connected to a tuning coil, running instead to a series of separate leads brought out at the back of the cabinet, each of which has an alligator clip at its end. The numerical designations may be marked on the panel at the individual grommet holes through which the leads are taken. The tube used may be any of the standard detectors, but preferably of the high impedance type, and for most requirements should have a plate voltage of approximately 75. The meter jack, MJ, is a refinement which may be omitted if desired. However, if a meter is used, a visual indication may be had, as the plate current will fall when the tube oscillates.

Supersonic Light Relay

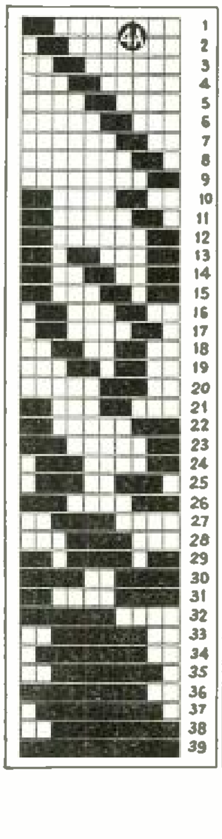
2 FIG. 2A, derived from *Television and Short Wave World* of England, shows the diagram of a modulated oscillator for use with a supersonic light relay. Designed originally for use in mechanical scanning television, it has several other applications.

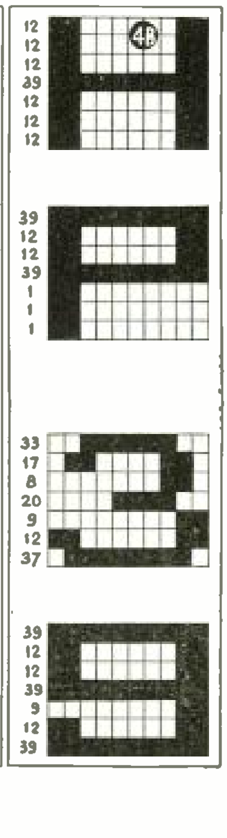
All values of parts shown in Fig. 2A are given in the following table:

RESISTORS: R1—1,000 ohms, 1 watt; R2—15,000 ohms, 3 watt (or two 30,000 ohms, 1 watt in parallel); R3—30,000 ohms, 1 watt; R4—250 ohms, 1 watt; R5—250,000 ohms, 1 watt; R6—5,000 ohms, W.W. volume control.

CONDENSERS: C1—.0003 mf. tubular; C2—midget variable; C3—0.1 mf. tubular; 10 turn C-T coil; 2—5-prong ceramic tube holders; 2—A.C. (Pen 5-pin Mazda or Premier) tubes.

Shown in Figs. 2B-C are plans of a supersonic cell to be used with this modulated oscillator. Fig. 2D shows how a light source may be assembled with the cell to produce a modulated light beam on a viewing screen. The crystal used in the light cell is specially cut for supersonic work and has a frequency of about 10 mc., though accuracy is not essential.





Two-Way Television

3 A NEW PATENT, granted to the Allen B. DuMont Laboratories of Upper Montclair, N. J., makes telephone television a step nearer, though it is still many years away. Mr. DuMont's invention provides a single cathode-ray tube at each station, for his new tube can be used both as pick-up and viewing device. A single beam of electrons in the tube can be caused to scan either a photosensitive or a fluorescent screen, depending upon whether the user wishes to transmit or receive an image.

One type of circuit is shown in Fig. 3. Modifications of this permit placement of the two plates side by side in a rectangular bulb, and in various other positions.

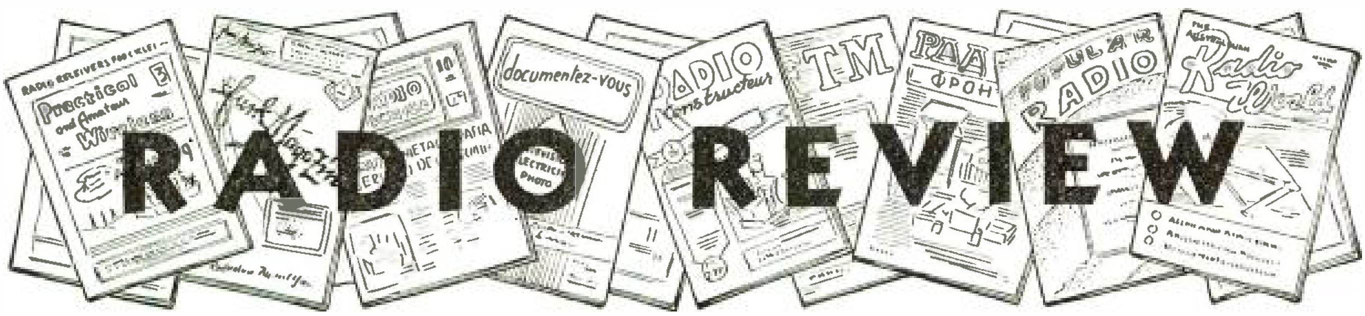
Radio Typewriter

4 FIGS. 4A and 4B, taken from *Le Haut Parleur* of France, show an ingenious system utilized in a teletypewriter. As Fig. 4A shows, there are 39 types of codings and each letter of the alphabet or numeral is made of a combination of seven of these assorted symbols. Fig. 4B illustrates that the letter "H," for example, is made of three Type 12 symbols, a Type 39 symbol, and three more Type 12 symbols. Letter "I," for example, would be made of seven Type 5 symbols.

Radio can be used for this transmission very easily. The transmitter, modulated with seven frequency bands, will actuate a series of relays, causing a key to make an impression wherever the modulating frequencies are suppressed. Suppression is automatic, as the typewriting machine at the transmitter perforates the tape which runs between seven pairs of points, each of which controls one of the bands. When the contacts close through a perforation, the frequency they regulate is suppressed.

New "Footless" Tube

5 IN AMERICA we have our metal tubes, glass tubes, metal-glass tubes, loktals and acorns, but now Great Britain comes out with something new — the Tungsram "Footless" Valve. As shown in Fig. 5A, the tube has a locating stem similar to our metal and M-G tubes. However, the positioning of pins on the 8-prong



base is somewhat different from that utilized over here. Also, the heater is mounted horizontally and the grids and plates surround it. Connections are brought out near the edge of the tube and are so spaced as to provide minimum capacity. The sub-base is provided with shields for the plate and grid leads, and the whole tube plugs into a special tube base. The conventional glass foot has been completely eliminated, and surface leakage across the pins has also been reduced to, it is claimed, 1/10 to 1/15 of that of the usual tube. Both *Television and Short Wave World* and *Wireless World* of Britain have detailed descriptions of the new tube, and our Fig. 5B from the latter publication, shows the tube's use.

D.C. Receiver

6 AN INTERESTING D.C. receiver, which incorporates a noise limiter and a regenerative R.F. stage, was recently described by R. G. Drewery, G6OY, in Britain's *T. & R. Bulletin*. As D.C. receivers, even without these features, are none too common in America, a complete diagram is reprinted in Fig. 6A. The values of the parts used are shown in the diagram.

Fig. 6B shows an alternative noise eliminator circuit. The tubes used were of British make, but their American equivalents will doubtless suffice. The R.F. stage uses a Ferranti VPTS variable mu pentode; the detector, an ordinary 6K7; and the output stage, an Osram H30 hi-mu triode with plate impedance of 14,500 ohms.

Antenna Coupling

7 O. J. RUSSELL, B. Sc., writing in the *Short-Wave Magazine* of England, brings solace to the owner of a small set which is deficient in selectivity. He tells how to couple and match aerials so that real DX may be pulled in through QRM.

Mr. Russell's first suggestion is that the antenna circuit be tuned as shown in Fig. 7A. The coil and condenser values will vary for different bands if an all-wave set is being used. As a suggestion, standard short-wave R.F. plug-in coils with their associated variable condenser are a convenience. Fig. 7B shows an arrangement when coupling a tubular or balanced feeder system to a receiver having only the usual antenna and ground posts. Another matching system for coupling balanced feeders to a set designed for doublet operation, is shown in Fig. 7C. The coils and condensers used in Figs. 7B and 7C are best determined by experiment.

Marine Receiver

8 READERS who are boating enthusiasts will be particularly interested in the 15 to 1600 meter set, designed and built by VK2MZ, for it is particularly designed for marine work.

The circuit diagram in Fig. 8, taken from *Australasian Radio World*, shows all values and the tubes are available in the United States. All coils are wound on 1½" forms, spaced over 1½", except oscillator, which is spaced over 1¼". Bandspread tap is from bottom end. Coils with no bandspread tap should have a jumper from B.S. tap pin to top of grid winding pin.

All coils are wound with 24-gauge enamel wire except broadcast coils, which are wound with 30-gauge enamel. Aerial and regeneration coils are spaced ¼" from cold end of grid windings. Top of grid winding should go to grid, bottom to ground. Then the beginning of regeneration winding goes to "B+"; other end to plate of oscillator. Coil data follows:

Band	*Grid*	*B.S.*	*Tic.*	*Aer.*
160 m.	27	11	7	5
80 m.	13	4	4	4
40 m.	8	1½	3	3
20 m.	4	1	1½	2

Explaining "Q"

9 AN EXPLANATION of what "Q" really is, is given by an author who signs himself "Engineer" in *Australasian Radio World*. The article uses many analogies, most of which are too simple for the readers of RADIO & TELEVISION. However, its illustrations should be of extreme interest.

Fig. 9A shows how "Q" affects the decay of free oscillations in the tuned circuit shown at the lower part of the figure. The upper graph illustrates high "Q" and the lower one low "Q." Fig. 9B is a graph showing the velocity of a pendulum. The kick given by the spring begins at "X" and vanishes at "Y." In Fig. 9C we see how the plate current gives similar kicks in an os-

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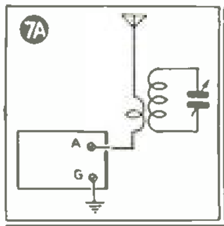
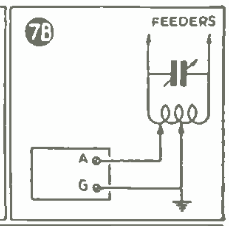
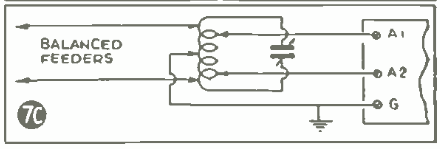
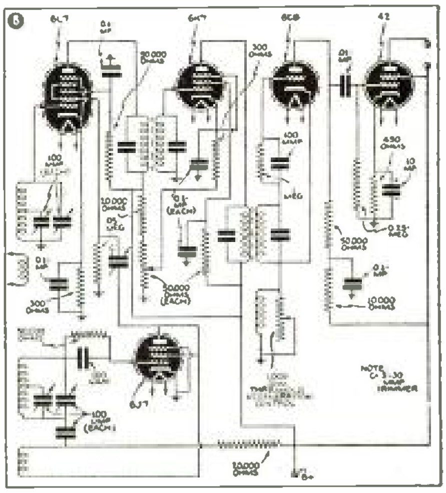
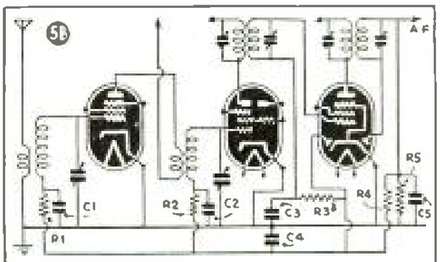
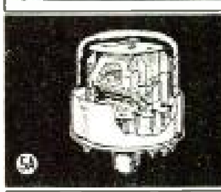


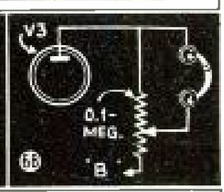


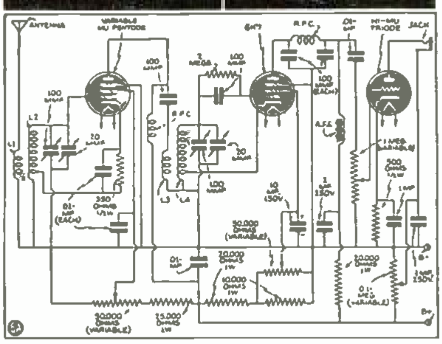


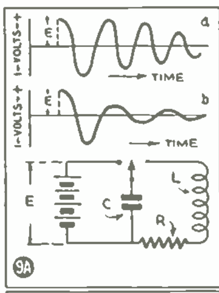


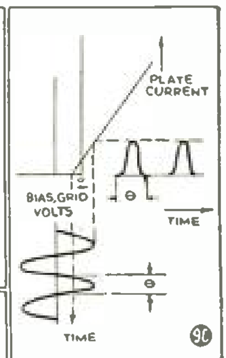


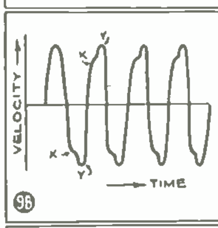


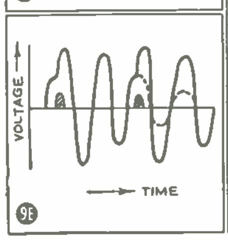


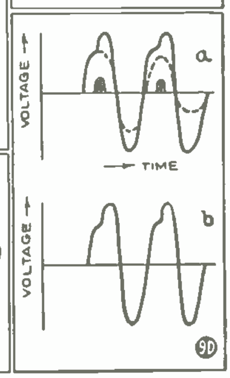




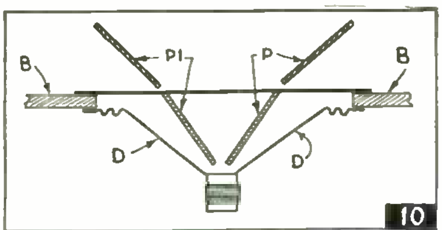








INTERNATIONAL RADIO REVIEW



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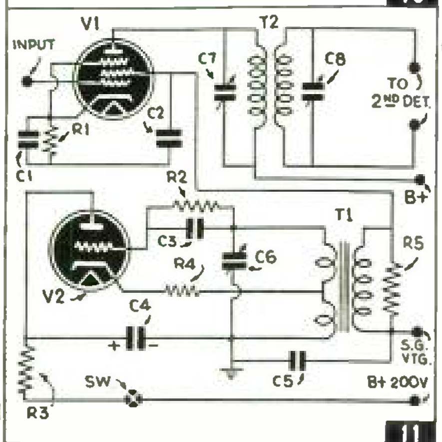

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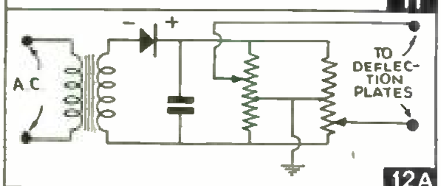

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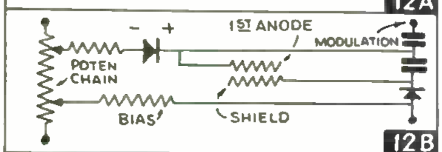

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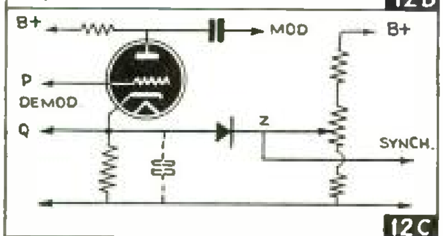
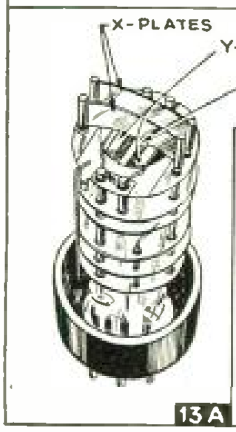
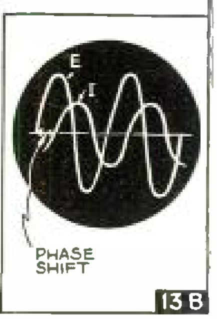


12C



13A



13B

(Continued from preceding page)

cillator or power (R.F.) amplifier, while in Fig. 9D, we see how the "Q" factor of the tank circuit affects the operation of the stage. The shaded parts in the upper graph are the current kicks. The dotted line shows how the oscillation would decay and how the kick prevents this. The high "Q" circuit (above) in Fig. 9D, permits less harmonics than the lower one, and with lower "Q." Frequency doubling is shown in Fig. 9E, where the kick occurs every fourth half cycle and the "Q" must be fairly high to keep the amplitude (peaks) reasonably constant.

Loud Speaker Improvement

10 A PAIR of diverging partitions, which extend inside and beyond the usual diaphragm, will improve the quality of reproduction from a loud speaker, according to *Wireless World* of England. As Fig. 10 shows, the partitions, P and P1, are hinged near the baffle board, B, to which the edge of the diaphragm is attached in the usual way. The partitions break up or separate the radiations from the parts of the diaphragm which may be vibrating out of phase, especially at high frequencies, and increase the high-note content of the reproduction, radiating a flat beam of sound with a large angular spread. N. V. Philips of Holland, the patentee, has suggested that more than one pair of baffles may be used.

Heterotone Reception

11 AN audio oscillator suitable for heterotone reception is described in *Television and Short-Wave World* of Great Britain. The circuit shown in Fig. 11 will give an apparent gain in signal strength by modulating the screen of the I.F. amplifier. The circuit uses a single tube oscillator, with the secondary of an output transformer connected in series with the grid of the I.F. amplifier. B.F.O. is retained in the succeeding stage. V2 is 6J5, and C6 may be a variable condenser or a bank of fixed condensers. Transformer T1 is a standard push-pull input unit. Other values are as follows: R1—100 ohms; R2, R3, R5—100,000 ohms each; R4—20,000 ohms; C1 and C2—.01 mf. each; C3—.002 mf.; C4 and C5—1 mf. each; C6—.0005 mf.

Metal Rectifiers in Television

12 AN article in *Television and Short-Wave World* discusses the use of metal rectifiers in television receivers. Fig. 12A shows the use of a half-wave rectifier for a picture shift circuit. Fig. 12B shows the use of two rectifiers as a D.C. restorer, and Fig. 12C illustrates the use of a rectifier in a synchronizing filter circuit. A suitable rectifier for use with a 70 to 80 ma. 230-240 volt full-wave power supply is a Westinghouse type HT-17, employed in conjunction with 8 mf. condensers. Type HT-16 may be used if the voltage input is 200 at 170 ma.; in this case 4 mf. condensers are used. Where the output is 3000 to 4000 volts at .75 ma., two rectifiers are used. A number of other rectifier specifications for use with other voltages and currents are also given in the original article.

Double-Beam Cathode-Ray Tube

13 AN interesting inside view of the Cossor double-beam cathode-ray tube is given in England's *Wireless World*. Shown at Fig. 13A, the tube includes one extra plate located between the first pair of deflectors. This single plate splits the cathode beam in half so that the two resulting beams may be employed to show both current and voltage waves, or to bring out any other two characteristics that may be of interest. Fig. 13B shows how phase difference between current and voltage or between two voltages may be observed.

Light-Storage in Television Transmitters

14 THE general arrangement of a system in which the cathode-ray tube becomes a form of light valve instead of a light source, is shown in Fig. 14A. In this arrangement, the screen consists of a mosaic of insulated elements (marked "raster elements" in Fig. 14A) is used. A screen of fine mesh wire is placed inside and is scanned by the modulated electron beam. This beam charges the raster elements, building up a picture in variations of potentials. The discharge process begins immediately after the charge. The graph at the right of Fig. 14A shows the charging and discharging of the elements.

An improved system is shown in Fig. 14B in which the graph shows that the elements remain charged for nearly the whole frame period and are then rapidly discharged. This is done by using a double-beam C-R tube, one beam of which is modulated and charges the raster elements as described. Its scan is preceded by that of the other beam, which discharges the elements.

A means of converting such charge variations to light is shown in Fig. 14C, where

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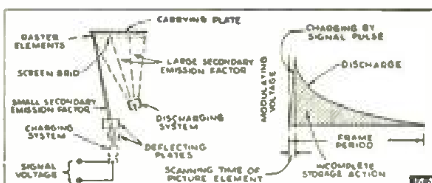
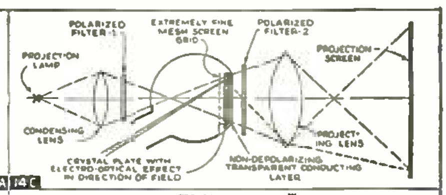
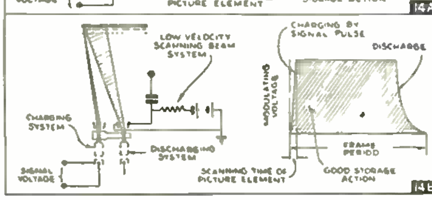


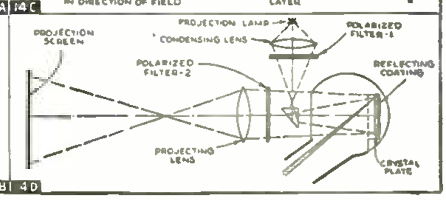
14A



14C



14B



14D

The Radio Beginner

Lesson 8 — Audio Frequency Amplifiers

Martin Clifford, W2CDV

● WE have already seen that waves may vary in their *frequency* or in the number of cycles per second. Since the frequency of waves gives rise to certain identifying characteristics, we may use these characteristics for grouping waves under headings, the headings being somewhat indicative of the nature of the waves. Thus, waves that vary from about twenty-five cycles to approximately fifteen thousand cycles are called *audio-frequency*, for the very simple reason that the human ear will respond to waves within that group of frequencies.

The output from the detector tube of a receiver is audio frequency in nature and can be heard through the proper use of earphones. However, group listening has compelled the development of apparatus to build up the signal *following* the detector. Since the signal at that point is in the *audible* stage, we place such apparatus in the category of *audio frequency amplifiers*. Such amplifiers may be built in a number of ways, some of the most widely used being resistance-coupled amplification, impedance coupled, push-pull or power amplification, and simple transformer coupled amplifiers.

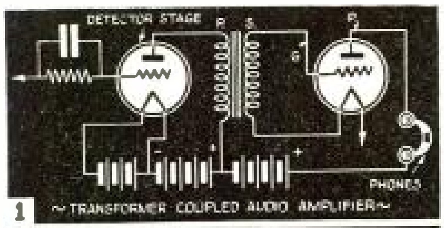
Transformer Coupling

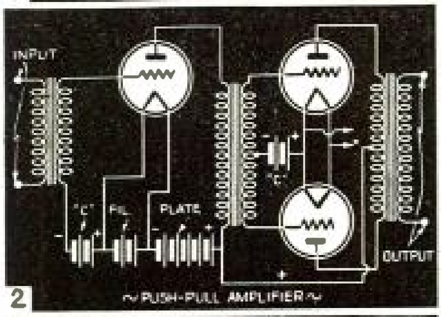
In Fig. 1 we see a representative diagram of a *transformer coupled* amplifier, triodes (3-electrode tubes) being used for the sake of simplicity. The audio amplifier tube is connected to the output of the detector by means of an *audio frequency transformer*. Such a transformer consists of two coils wound on a soft iron laminated core, one of the coils being called the *primary* and the other the *secondary*. We recall that an alternating current passing through a coil builds up a magnetic field around that coil, and through magnetic induction can cause a voltage to be impressed on another coil placed near it. The use of the soft iron core is to allow the maximum transfer of the magnetic lines of force, since these lines of force pass much more easily through iron than through air. The current variations of the detector output circuit are applied across the primary of the transformer. These variations of current in the primary produce a corresponding electromotive force (E.M.F.) across the secondary. Since the secondary is connected to the tube's grid, the voltage variations will be impressed on that grid. Thus we see that the audio transformer is an electrical link between two vacuum tubes. The audio frequency current output of the detector tube, passing through the primary of the audio transformer, produces a magnetic field which in turn induces an alternating voltage across the secondary coil, and hence on the grid of the following tube (first audio tube). Audio transformers may act not only as a link, but as a very practical device for securing an increase in signal strength. This is done by designing them as *step-up transformers*.

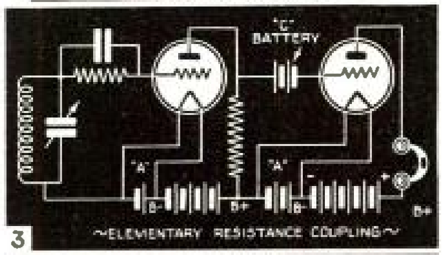
Effect of Increasing Turns Ratios

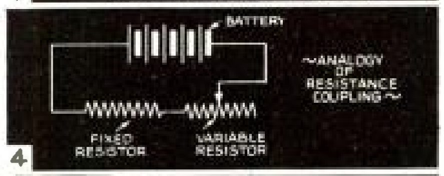
Step-up transformers are so built that the secondaries have more turns of wire than the primary. Transformers may have ratios of two, three, five (or any other figure) to one, that is, the secondary may have two, three or five times as many turns as the primary, etc. Amplification is also secured in the tubes themselves, since it requires only a small voltage on the grid of the tube to secure a large change in the output (or plate) circuit. It might be thought that all that would be required in a transformer-coupled audio frequency amplifier would be a very high ratio of secondary to primary turns in the transformer, in order to secure a very high step-up and maximum amplification. However, as the ratio is increased, the problem of avoiding *distortion* and maintaining fidelity of signal becomes increasingly difficult. In a number of instances, audio transformers have a one to one ratio, that is, the same number of turns in both primary and secondary, in such cases their function is that of a coupling device between the tubes.

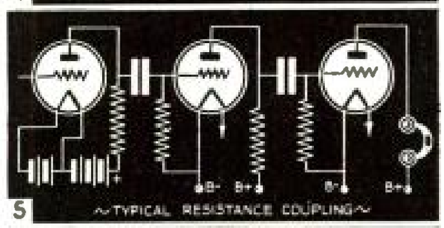
It should be observed that one end of the primary of the audio transformer is connected to the plate of the detector tube, and the other end of the primary to the positive potential of the B battery (or power supply). The currents flowing through the primary of the transformer may be resolved into two components; first, the direct current between plate and battery and, second, the audio frequency current. Since there is no physical connection between the primary and secondary, the positive plate voltage of the first tube is electrically insulated from the grid of the following tube. The direct current of the detector, flowing through the primary, creates a permanent magnetic field of a certain minimum strength. Since it is desired to transmit only the *audio frequency variations* this direct current (necessary to maintain the plate at a positive potential) may cause distortion. This is especially true in audio transformers having a very small iron core, such that the direct current causes it to become *saturated* by the magnetic field. The use of a larger core will reduce the amount of distortion, but may cause certain losses.

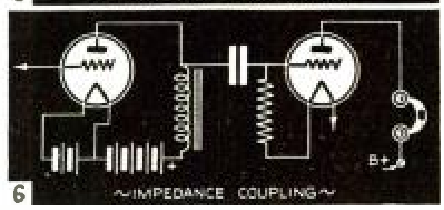












Diagrams above show, top to bottom:—Transformer coupled audio amplifier; push-pull; simple direct-coupling; typical resistance coupling, and impedance type coupling.

Push-Pull Amplification

In order to secure greater efficiency and at the same time greater amplification, use is made of *back to back* or *push-pull* amplification. See Fig. 2. Note that, in this type of amplifier, the transformers are the

(Continued on page 248)

14th Silver Trophy AWARD

For Best HAM Station of the Month

Awarded to

Dr. Philip Weintraub, W9SZW-W9TMQ

3860 Harrison Street, Chicago, Ill.

Description of Dr. Weintraub's Ham Shack

● "EVERYTHING in my shack is home-made (including the face masks of the XYL and myself) but excluding, of course, the receiver which is a Hallicrafter Superskyrider SX17," says Dr. Philip Weintraub. "The room is completely soundproof to avoid awakening the XYL and two junior Ops on late QSO's."

The station, W9SZW, is located in a penthouse and consequently the antennas are about 110 feet above ground. They are a Johnson 10 meter "Q" and a 132 foot flat-top against a 132 foot counterpoise.

The 160 meter rig consists of a 47 crystal oscillator, 59 buffer and a pair of T20's final amplifier. The speech is a 56, 56, 59 driver into a pair of 59's Class B. The microphones are a 387W and Shure crystal. The same microphones and speech amplifier are also used for the 28 and 56 megacycle transmitters.

The 5 and 10 meter xmitters consist of a 6J5 G crystal operating with a 20 meter "rock," 616 buffer and an 809 final at 38 watts input. All districts have been worked and 14 countries.

"The 10 meter rig is used chiefly to keep in personal contact with the XYL's folks in Beverly Hills, California," says Dr. Weintraub, who adds, "It may interest the editors to know that an article on ham radio has been written for *Oral Hygiene* and accepted and will reach the offices of some 75,000 dentists throughout the world. Naturally, the Bibliography gives special credit to RADIO & TELEVISION."

Ham Station of Dr. Philip Weintraub.

This beautiful silver trophy stands 11¾" high and one is awarded monthly by RADIO & TELEVISION magazine for the best photo of a Ham station. The silver statue stands on a handsome bakelite base on which is a silver plate. The name of the winner will be engraved on this plate before the trophy is sent to him.

Rules for Trophy Contestants

● SIMPLY send the Editors a good, clear photograph of your Ham station. If your station photo is selected as the best of those submitted each month, you will be awarded one of these handsome silver trophies with your name engraved on it.

The trophy stands nearly 12" high and is a fine example of the silversmith's art. It represents the spirit of victory and was designed by one of the leading silversmiths. The name of the winner each month will be engraved on a silver plate mounted on the black bakelite pedestal before the trophy is sent to the successful contestant.

The winner of each month's trophy award will be announced in the second succeeding issue, and the closing date for that contest is the end of the current month.

The judges of the contest will be the Editors of RADIO & TELEVISION. In the event of a tie, duplicate prizes shall be awarded to the contestants so tying.

(Continued on page 250)

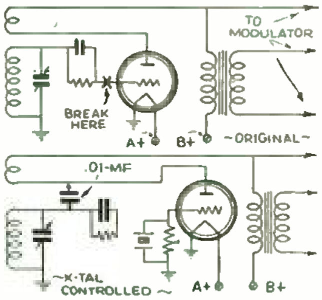
Radio Kinks

Each month the Editor will award a 2 years' subscription for the best kink submitted. All other kinks published will be awarded eight months' subscriptions to RADIO & TELEVISION. Read these kinks; they will be of real use to you, besides indicating what is wanted. Send a typewritten or ink description with sketch of your favorite to the Kink Editor

First Prize Winner

Aligning I. F.

I recently built a crystal filter into my Ham receiver, and after completing it, was stuck for a way to align the I.F. system. I was far away from my shop with all its "spare parts," and so I couldn't set up a crystal oscil-

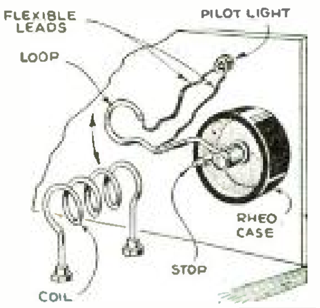


lator. I finally looked into my Triplett No. 1201 signal generator and found a simple way to make a change and make it crystal-controlled. The change is shown herewith. Simply connect a .01 mf. condenser to couple the tuned circuit to the plate, and clip on the crystal unit shunted by a 1 megohm resistor. One thing more had to be done before oscillation could be obtained. An external 45-volt "B" battery was connected in place of the self-contained 22½ volt block, and a milliammeter put in series to indicate oscillation. The signal generator was then employed in the usual manner.—*William "Bill" Locke, W9QVT.*

R. F. Indicator

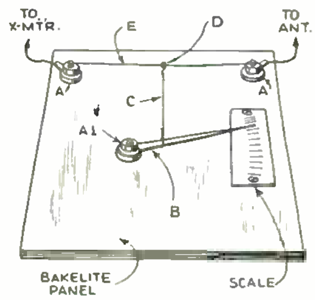
It is often an awkward job to take an R.F. indication on an enclosed 5-meter rig. I have overcome the difficulty, as shown in the accompanying sketch, and now an R.F. indication can be viewed by means of a pilot light, at the turn of a knob.

The basis of the unit is an old rheostat with the back taken off. A piece of No. 12 or No. 14 enameled wire, bent as shown, with a loop to mesh with the coil, is soldered to the arm of the rheostat. A pair of flexible wires is soldered across the loop on the pilot light which is mounted on the panel. A stop makes it easy to bring the turn into the correct position.—*Les. Jones, VE4YK.*



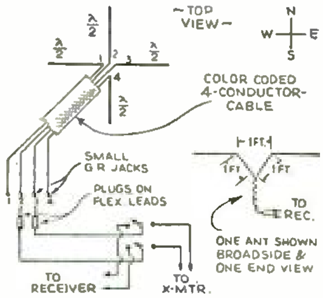
Hot Wire Ammeter

A very simple hot wire R.F. ammeter may be made from five inches of No. 36 resistance wire with a resistance of approximately 100 ohms per foot. The wire should be strung as shown in the accompanying illustration, tightly enough to eliminate sag. It is supported from a bakelite panel by two stand-off insulators, and a thin aluminum pointer is pivoted on a third stand-off insulator loosely enough so that it moves freely. A small wire hook and a silk thread attach the pointer to the center of the wire. When the wire is heated, it stretches, allowing the pointer to sag and thus indicate the current on the scale attached to the panel.—*Billy Swarts.*



Double Doublet

I am using the double doublet illustrated herewith for both transmission and reception. The lead-in is 4-conductor color coded twisted pair cable boiled in paraffin with 25% beeswax. The ends terminate in banana jacks. Two jacks on flexible



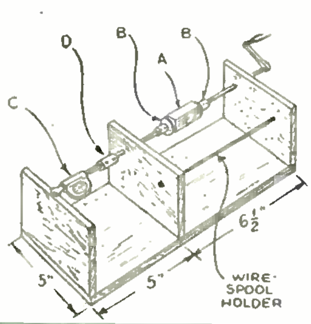
leads go to the blades of a D.P.D.T. knife switch. This changes any antenna you may select from transmitter to receiving position. The N-S antenna has 12" spacing in center. Leads are fanned out to form a 12" equilateral triangle. This is also true of the East-West antenna. With the table below, directional properties are very pronounced.

Jacks	Direction
1-2	Northwest
1-3	North and South
1-4	Southwest
3-2	Northeast
3-4	Southeast
4-2	East and West

By proper selection, QRM may be greatly reduced and a signal gain of 6-8 db. on a RME has been noted when using the V antennas for transmitting.—*Robert F. Scott, W4FSI.*

Coil Turn Counter

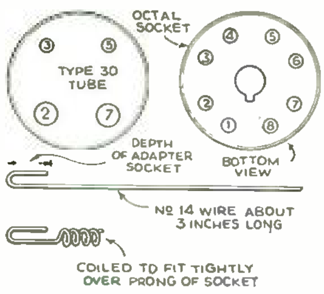
I have used the winder illustrated for several years, during which time I have rewound power and other transformers with success. The winder is made of ⅞" board, and the two shafts shown are ¼". "A" is a wooden block, of the size and shape to suit the transformer core. "B," flexible shaft coupling, is to hold the block fixed on winding shaft and is attached to both by screws. A speed indicator "C" is attached to end of winding shaft by "D," a shaft coupling. The other shaft is to carry the spool of wire.—*E. H. Barrow.*



Simple Tube Adapter for Emergency Use

I had an H4G tube burn out. The 30 type is the equivalent but it just won't fit in the octal socket. It meant two to three days to get another and I wanted to use the set at once. With an octal testing adapter (for testing tubes without breaking carton) and four pieces of No. 14 wire and five minutes' time, I had the set operating, using a 30 tube.

Bend the wire over at one end about three-eighths of an inch; this end then makes a snug fit in the adapter. Select two nails, drill bits, or any straight round metal object slightly smaller than the prongs of the 30 tube, and wind the remainder of the wire in the form of a spring, thus completing the second operation. When you have made the four attachments, slip one over each of the prongs on the 30 tube. Spread coiled parts so that they reach the full length of prong, and insert doubled end in the proper place in adapter. Using a 30 tube to replace an H4G, the two filament prongs of the 30 slip into Nos. 2 and 7 of the octal, the others into Nos.



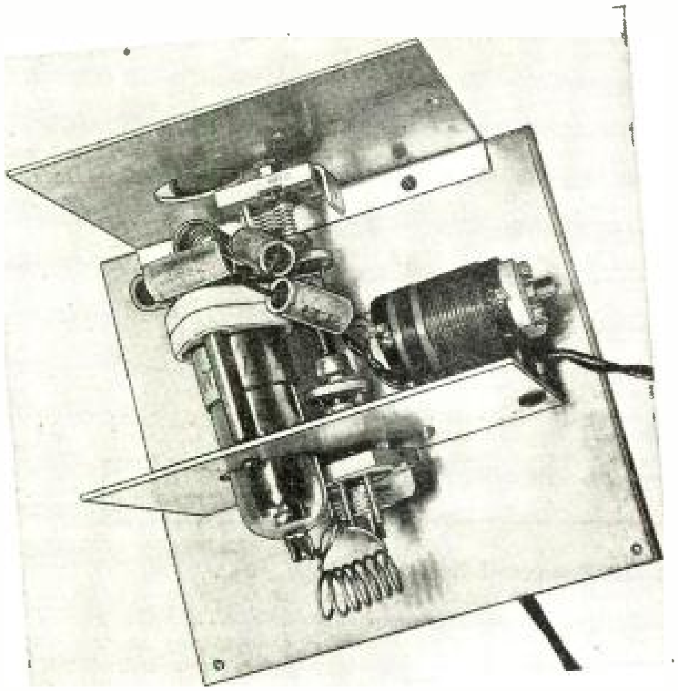
3 and 5. If the fan has no adapter, he can use the base of the burned out tube, but this means a soldering job, which can be done without much trouble.—*Herbert S. Rutherford.*

Headphone Connection

It is very simple to connect a pair of phones to a radio set, even if there are no phone jacks provided. You do not need to have any direct physical connection between the phones and the output of the receiver. In addition, it is possible to vary the volume heard in the phones without using any of the conventional controls.

All you need to do is short circuit the voice coil on the dynamic loud speaker. The signal can then be picked up by connecting a pair of phones to a high inductance winding placed near the output transformer of the receiver. The winding which I used is a secondary coil removed from an old transformer.

Volume of sound heard in the phones may be diminished by moving this "pick-up" coil to a greater distance from the set's output transformer.—*Joseph C. Lipo, W2HTD.*



Top view of the 1-tube Television Sound Converter.

1-Tube TELEVISION

Sound Converter

Herman Yellin, W2AJL

Works on any receiver tuning to 1600 kc. (187 meters.)

● AFTER many false starts, television has at long last arrived—and it's here to stay! The glamour of actually seeing moving images transmitted by radio is enough to fire the imagination of even the most blasé.

Many enthusiasts cannot afford to purchase a complete video and sound receiver; many will wish to build their own. As a modest beginning, a simple *converter* for reception of the *sound* channel is in order. Construction of the simpler sound section will afford some experience in construction, invaluable in the later and more difficult job of building the video section. Too, listening to the sound accompaniment of the images will make one all the more eager to participate in receiving the complete television program.

Only 1 Tube Used

Probably the simplest highly effective system would be to use a single multi-element tube as a *first detector-oscillator*, capable of feeding into the listener's regular radio set, thereby making full use of the *home receiver* with its potentially excellent audio response. In order to accommodate receivers tuning in only the broadcast band, this converter has been built to operate with an intermediate frequency as low as 1600 kc. (187 meters). Where a receiver tuning to a higher frequency of about 2500 kc. (119.9 meters) is available, it is recommended that this higher I.F. be used.

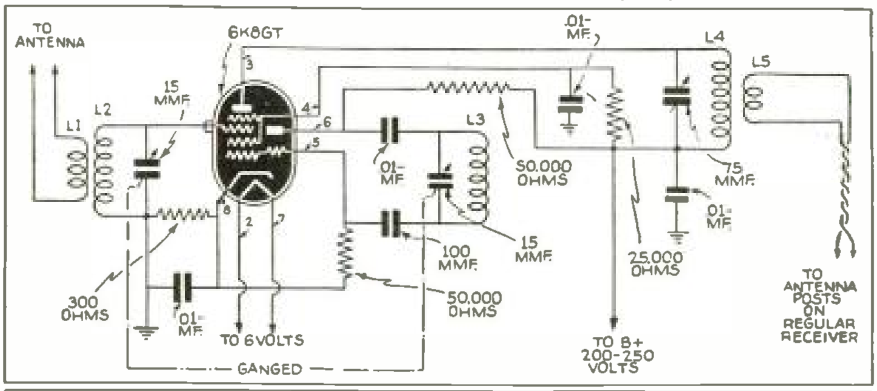
Use of the 6K8GT, one of the new "bantam" tubes approaching the metal-clad variety in size, results in quite compact design. At *six meters* these tubes have quite a high conversion gain, so that in combination with one's regular receiver, a good signal will be available from the loudspeaker.

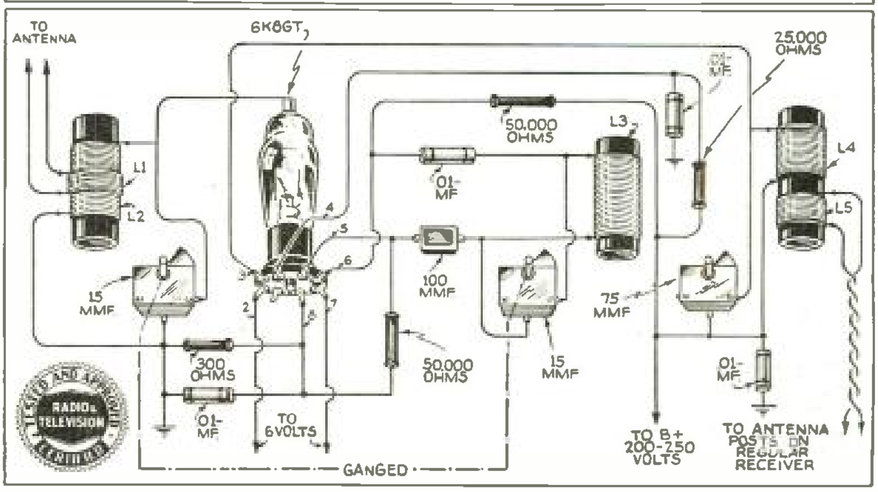
Wiring Requires About An Hour

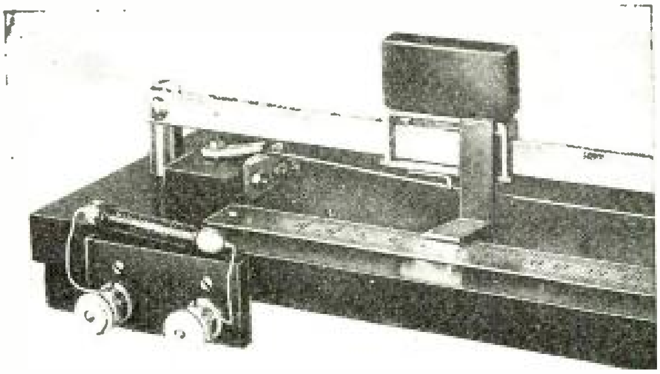
There are so few parts in this converter that wiring should be the work of less than an hour. As the photos show, a small 6¾" x 6½" chassis supports two 5" x 5" aluminum shields. The front shield, upon which is mounted the oscillator tuning condenser and dial, can readily be replaced with the panel of a small cabinet. In fact, it is recommended that a cabinet be used, not only for its shielding effect, but for protection against dust. The detector tuning condenser is mounted on the rear side of the back shield, with the detector coil soldered directly to the condenser terminals. Two 1¾" brass rods, tapped at the ends for 6/32 screws, serve to support the tube socket away from the shield, so that the control grid of the tube will project outside the shield partition and be close to the stator terminal of the detector tuning condenser.

(Continued on page 245)

Wiring diagram of converter to provide Television Sound on your present Receiver.







Close-up view of slider and scale on Wheatstone bridge.

Building and Using a Wheatstone Bridge

Including Inductance and Capacity Measurements

● THE Wheatstone bridge is a very handy instrument for measuring resistances, capacities and inductances.

Its construction is really simple, practical and inexpensive. We shall see that the Wheatstone bridge replaces a certain number of pieces of special and costly apparatus, and that its results are always of remarkable precision.

The Wheatstone bridge is nothing but a simplified modification of a potentiometer consisting of a resistance wire fastened and stretched between two fixed points (see Fig. 1). Let us suppose that a potential E is applied at the ends of the wire A and B and that the resistance has a value R.

A current $i = E/R$ will flow along the wire and a drop of potential will be linearily distributed along the wire and in proportion to its length, the potential measured increasing gradually from A towards B until the total value of E is reached at point B. We may then say that the total voltage drop occurs between ends of that wire. (See Fig. 2.)

The wire should be, of course, perfectly homogeneous in such a way that its specific resistance and its cross-section be exactly the same for each unit area anywhere along its length.

Referring to Fig. 2, the drop produced will be $e = E\frac{a}{l}$ where l = total length of the wire in centimeters; a = the part of the wire over which the drop is calculated.

From this we deduce that

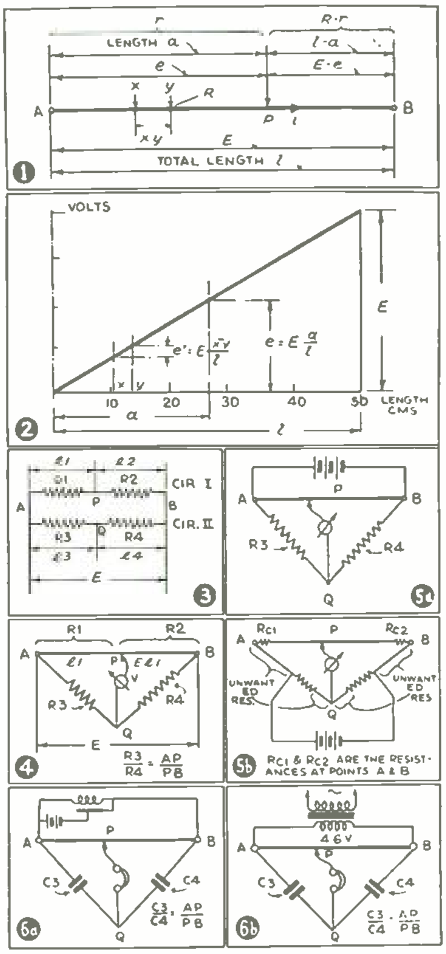
$$e' = E\frac{xy}{l}$$

for the calculation of the potential between points x and y. Thus the total voltage is divided by point P into two parts, e and E – e, the relation being $e/E - e = a/l - a = r/R - r$ (if R is the total resistance of the wire and r is the resistance between points A and P).

Following these fundamentals, we shall become acquainted with the principle of the bridge itself.

Supposing that four resistances R_1, R_2, R_3, R_4, are connected according to Fig. 3. Applying Ohm's Law, we see that the voltage in circuit I divides itself into two particular voltages, e_1 and e_2 the sum of which is equal to E and that e_1/e_2 is equal to the relation of resistances R_1/R_2.

Diagrams mentioned in text giving explanation of the bridge.



$$e_1 + e_2 = E; \frac{e_1}{e_2} = \frac{R_1}{R_2}$$

and it follows that in circuit 2,

$$e_3 + e_4 = E; \frac{e_3}{e_4} = \frac{R_3}{R_4}$$

If the drop e_1 has the same value as the drop e_3; that is, if points P and Q have the same potential relative to A, no voltage shall be obtainable between P and Q. The bridge being balanced we may then write:

$$\frac{e_1}{E - e_1} = \frac{e_3}{E - e_3} \text{ or } \frac{R_1}{R_2} = \frac{R_3}{R_4};$$

Replacing resistances R_1 and R_2 by the wire potentiometer we mentioned before, we derive a schematic illustration of the principle of the Wheatstone bridge as shown in Fig. 4.

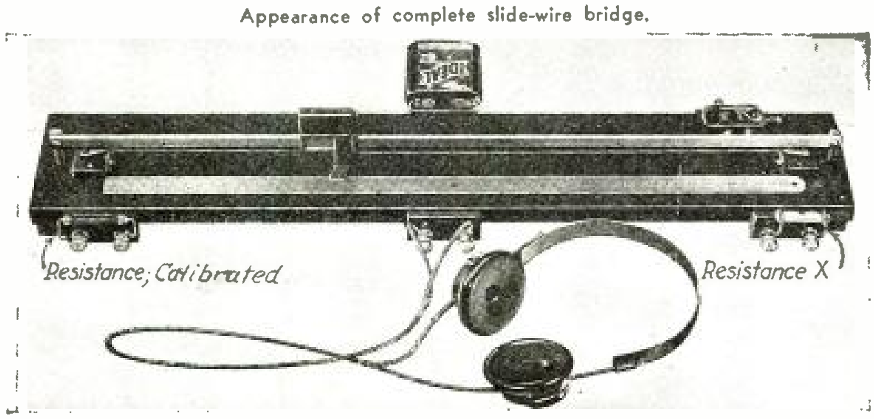
Sliding contact P over the stretched resistance wire, it is possible to change the relation of R_1/R_2 and to find a neutral point, where a sensitive voltmeter connected between P and Q will indicate zero potential.

The balance or equilibrium of the bridge is then perfect. It is not necessary to know the values of R_1 and R_2; it suffices to know the value of their relation. Noting that this relation is equal to that of $e_1/E - e_1$, and to that of lengths AP/PB; to obtain a balance we must write R_3/R_4 = AP/PB.

When a resistance R_x is unknown, and the value of a calibrated resistance

(*Continued on page* 238)

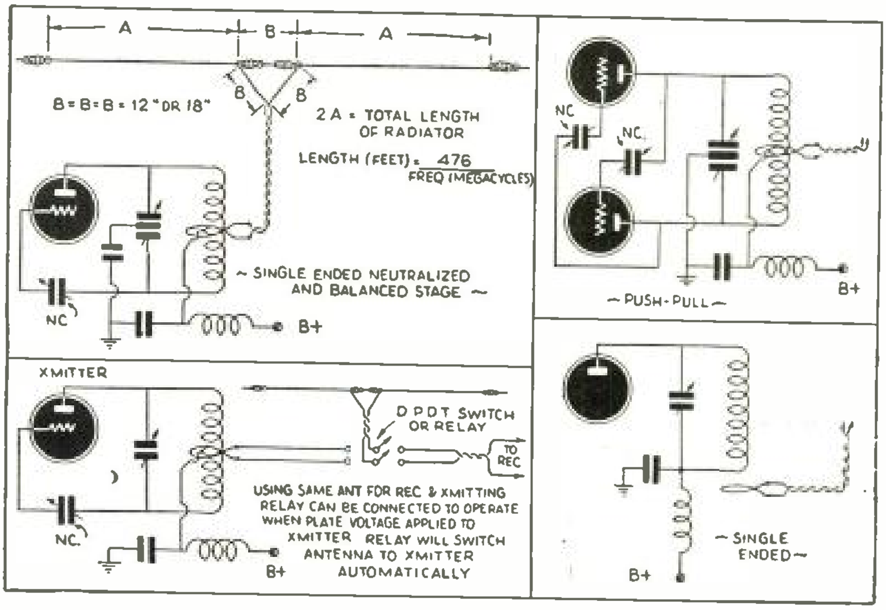
Appearance of complete slide-wire bridge.



Antennas for the HAM

Half-Wave Radiator—Twisted Pair Transmission Line

Herman Yellin, W2AJL



The "half-wave" radiator—an efficient HAM antenna.

● HALF-WAVE radiators can be fed by different types of transmission lines or feeders. In recent years, more and more amateurs, and "commercials," too, have installed *untuned* transmission lines. One of the easiest and perhaps most economical to construct is the *twisted pair* line.

When a transmission line is terminated at the antenna by an impedance equal to the line's surge impedance, there will not be any standing waves on that line. Standing waves on a line result when the radio wave, traveling along the line and striking the radiator, is reflected back along the line. These reflections occur when the transmission line surge impedance is *not* equal to the impedance of the antenna (or radiator) at their *junction* point. At the center of a half-wave antenna, the impedance is approximately 70 ohms. Now it has been found that the surge impedance of a pair of No. 14 weather-proof wires twisted together is also approximately 70 ohms. This, therefore, is a perfect match and provides a simple means of feeding the antenna. Fanning out the ends of the line at the antenna for a distance of about 12 to 18 inches will result in a much better impedance match.

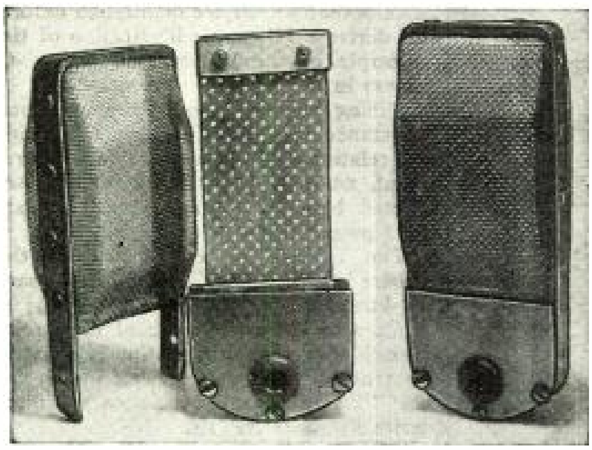
Up to about 14 megacycles (21.3 meters) losses are negligible for lines up to a couple of hundred feet long. The antenna should not be operated on a harmonic because of the danger of standing waves raising the normally low R.F. voltage between the feeders and breaking down the insulation. The feeders should be made from the best weather-proof lead-in wire obtainable, otherwise the line losses will increase

(Continued on page 251)

Your "Mike" Problem Solved

How to make one suitable for Ham and P.A. work.

Arthur Roberts



These photos show "professional" appearance of the mike.

● ONE of the most prevalent problems of "hams" and radio experimenters who have a limited income is the microphone. Frequently it is necessary to put up with an inferior model, with either fair or "hashy" quality, until sufficient cash has been collected to purchase something better.

As the crystal is the heart of the C.W. station, so the "mike" is the heart of the *phone* station. And compelling other amateurs to listen to tinny or distorted speech due to a poor microphone is detrimental to the advancement of amateur radio.

It is for the purpose of solving this problem that this "mike" is described. Besides being suitable for "ham" work, it has been used with excellent results both for recording and P.A. work.

Construction of Unit

The actual unit of the "mike" consists of a perforated metal backplate over which is stretched a row of corrugated foil ribbons. These are insulated from the backplate as described later.

The following list of materials is for the unit alone:

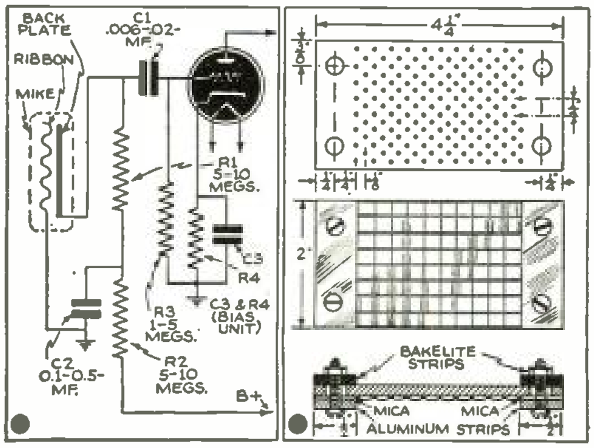
1 piece 1/8" aluminum or brass 2" x 4¼"
2 pieces of bakelite panel 2" x ½"
2 pieces of sheet mica 2" x ½"
2 pieces of 16 gauge aluminum or brass 2" x ½"

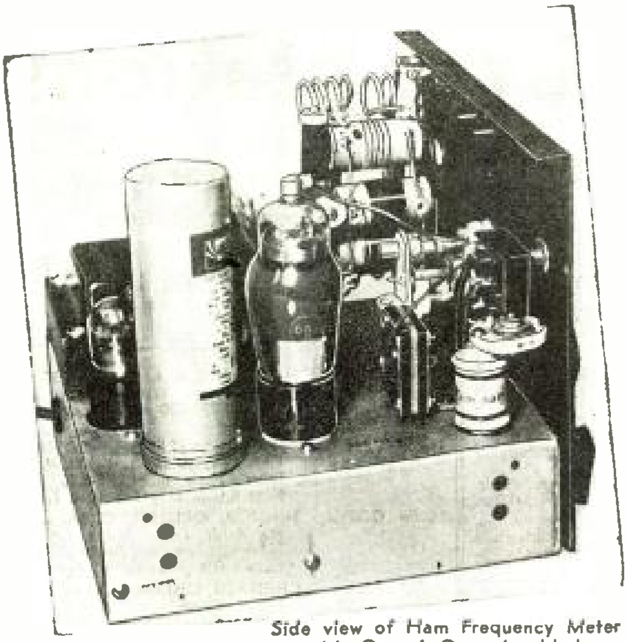
The detailed measurements for the backplate are shown on the diagram. Accuracy in perforating the backplate is not essential but it makes a neater job if the holes are drilled as shown. The small holes should be 1/16" diam., and when they are drilled they should be reamed out to remove any burr around the edges. This can be done by twisting a larger drill in the hole, between the fingers.

Now with a ¼" drill bore the four larger holes (Fig. 1) which are for the ribbon clamps at each end of the plate. The front side of the plate should be selected now and given several coats of model airplane glue,

(Continued on page 247)

Diagrams below show simple construction of the "mike."





Side view of Ham Frequency Meter with Crystal Control added.

Adding Crystal Control to the *Amateur Frequency Meter*

● IN the March issue the writer described a *frequency meter* suitable for amateur use. Consisting of a 100-1000 kc. electron-coupled oscillator with a 10 kc. multivibrator and harmonic amplifier, the unit was an accurate and extremely useful adjunct to the amateur station. Recently we substituted a 100-1000 kc. crystal unit for the variable frequency oscillator. A crystal-controlled oscillator has its advantages; it is no longer necessary to use signals from a broadcast station or WWV to set the oscillator on 100 or 1000 kc. For ordinary work not requiring extreme accuracy, the oscillator frequency is sufficiently near its rated value to be used without further adjustment.

The SMC-100 crystal unit is an "X" cut bar that can be excited along its length to oscillate at 100 kc. and through its thickness for 1000 kc. For extreme accuracy, it is desirable to use a small variable capacity shunted across the crystal to vary the frequency in order to allow for circuit variations and temperature changes. Increasing the shunt capacity decreases the frequency of oscillation. Also, increasing the crystal temperature lowers the frequency. The crystals are ground so that they can be adjusted to exactly 100 kc. with a 20 or 25 mmf. condenser. However, when operating the crystal through its thickness for 1000 kc., the condenser must be disconnected since its use results in crystal sluggishness. This is not disadvantageous since the 1000 kc. or multiple thereof can be used for locating a particular section of the frequency spectrum, and then the highly accurate 100 kc. frequency can be used for more accurate work.

As in all crystal oscillators, the output circuit must be tuned to the crystal frequency. This is taken care of by two coils, either of which may be selected by means of a D.P.D.T. toggle switch, which also disconnects the crystal shunt condenser for 1000 kc. operation. The 100 kc. coil is an 8 mh. R.F. choke. This 8 mh. choke has just the right inductance and distributed capacity to resonate near 100 kc., so no tuning will be necessary. For 1000 kc. operation, the coil used is a single section of 2.1 mh. 5-pie choke coil tuned by a 100 mmf. mica trimmer condenser. This trimmer should be adjusted for maximum oscillator output by listening to one of the harmonics, or the fundamental itself, on a receiver.

Those who built the Frequency Meter described in the March issue by Mr. Yellin, will appreciate this precision attachment — a crystal-controlled oscillator.

In wiring in the crystal, make the leads short and keep the leads from the crystal to switch and variable condenser as short as possible, in order to keep the minimum capacity of the condenser and its leads small. When the crystal gets warm, thereby resulting in a decrease in frequency, the circuit capacity will not cause the frequency to decrease so much that you will be unable to bring it back to 100 kc. As a check, the completed unit was run continuously for 15 hours without the crystal getting hot enough to prevent the frequency being brought back to exactly 100 kc.

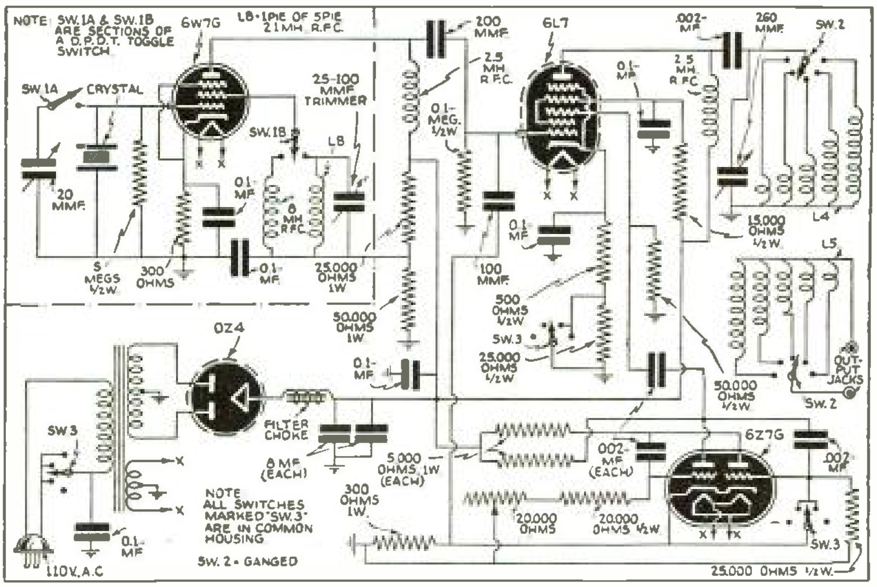


Diagram showing how crystal control was added to the frequency meter circuit.

The completed crystal oscillator-multivibrator-amplifier is used in the same manner as the original electron-coupled oscillator model. Detailed methods of use were described in the preceding article. (See page 674, March issue.)

However, one item was eliminated in the crystal-controlled model. In the original unit, one of the oscillator grid coils permitted the generation of the band of frequencies commonly used in I.F. amplifiers. This was left out in order not to unduly compli-

(*Continued on page* 251)

World Short Wave Stations

Revised Monthly

Complete List of SW Broadcast Stations

Reports on station changes are appreciated.

Mc.	Call	
31.600	W1XKA	BOSTON, MASS., 9.494 m., Addr. Westinghouse Co. Daily 6 am.-1 am., Sun. 8 am.-1 am. Relays WBZ.
31.600	W1XKB	SPRINGFIELD, MASS., 9.494 m., Addr. Westinghouse Co. Daily 5 am.-12 m., Sun. 7 am.-12 m. Relays WBZ.
31.600	W3XEY	BALTIMORE, MD., 9.494 m., Relays WFBR 4 pm-12 m.
31.600	W2XDV	NEW YORK CITY, 9.494 m., Addr. Col. Broad. System, 485 Madison Ave. Daily 5-10 pm.; Sat. and Sun. 12.30-5, 6-9 pm.
31.600	W9XHW	MINNEAPOLIS, MINN., 9.494 m. Relays WCCO 9 am.-12:30 am.
31.600	W3XKA	PHILADELPHIA, PA., 9.494 m., Addr. NBC. Relays KYW 8 am.-9 pm.
31.600	W5XAU	OKLAHOMA CITY, 9.494 m., Sun. 12 n-1 pm., 6-7 pm. Irregular other times.
31.600	W9XUY	OMAHA, NEBR., 9.494 m. No sked. known.
31.600	W4XCA	MEMPHIS, TENN., 9.494 m. Addr. Memphis Commercial Appeal. Relays WMC. 10 am.-6 pm.
31.600	W8XAI	ROCHESTER, N. Y., 9.494 m., Addr. Stromberg Carlson Co. Relays WHAM 7.30-12.05 am.
31.600	W8XWJ	DETROIT, MICH., 9.494 m., Addr. Evening News Ass'n. Relays WWJ 5 am.-11.30 pm. Sun. 7 am.-11 pm.
31.600	W9XPD	ST. LOUIS, MO., 9.494 m., Addr. Pulitzer Pub. Co. Relays KSD.
31.600	W5XD	DALLAS, TEXAS, 9.494 m., 11.30 am.-1.30 pm. Ex. Sat.-Sun.
26.550	W2XGU	NEW YORK CITY, 11.3 m. Relays WMCA.
26.550	W2XQO	NEW YORK CITY, N. Y. 11.3 m. Noon-9 pm.
26.500	W9XTA	HARRISBURG, ILL., 11.32 m. 1-4 pm.
26.450	W9XA	KANSAS CITY, MO., 11.33 m., Addr. Commercial Radio Eqpt. Co. 10 am.-1 pm., 3-7 pm.
26.400	W9XAZ	MILWAUKEE, WIS., 11.36 m., Addr. The Journal Co. Relays WTMJ from 1 pm. to midnite.
26.300	W2XJI	NEW YORK, N. Y., 11.4 m., Addr. Bamberger Broad. Service, 1440 Broadway. Relays WOR 12 n.-6 pm.
26.150	W9XUP	ST. PAUL, MINN. 11.47 m. Rel. KSTP 8 am.-1 am.
26.100	W9XJL	SUPERIOR, WIS., 11.49 m. Relays WEBC daily. 10 am.-8 pm.
26.050	W9XTC	MINNEAPOLIS, MINN., 11.51 m. Relays WCTN 10 am.-9 pm.
26.050	W9XH	SOUTH BEND, IND., 11.51 m. Addr. South Bend Tribune. Relays WSBT-WFAM 2.30-6.30 pm., exc. Sat. and Sun.
25.950	W6XKG	LOS ANGELES, CAL., 11.56 m., Addr. B. S. McGlashan, Wash. Blvd. at Oak St. Relays KGFJ 24 hours daily. DX tips Mon., Wed. and Fri. 2:15 pm.
25.950	W8XNU	CINCINNATI, OHIO, 11.56 m., 7 am.-1 am. Sun. 8 am.-1 am.
21.640	GRZ	DAVENTRY, ENG., 13.86 m. Addr. B.B.C., London. Unused at present.
21.630	W3XAL	BOUND BROOK, N. J., 13.8 m. Addr. N.B.C., N. Y. C. 8 am.-4 pm.
21.570	W2XE	NEW YORK CITY, 13.91 m. Addr. CBS, 485 Madison Ave. Irregular.
21.565	DJJ	BERLIN, GERMANY, 13.92 m., Addr. Broadcasting House. Irreg.
21.550	GST	DAVENTRY, ENG., 13.92 m., Addr. (B.B.C., London) Irregular at present.
21.540	W8XK	PITTSBURGH, PA., 13.93 m., Addr. Grant Bldg. Relays KDKA 5:30-8 am.
21.530	GSJ	DAVENTRY, ENG., 13.93 m., Addr. (See 21.550 mc.) 5.45 am.-12 n.
21.520	W3XAU	PHILA., PA., 13.94 m., Addr. Col. Broad. Syst., 485 Madison Ave., N. Y. C. Irregular.
21.500	W2XAD	SCHENECTADY, N. Y., 13.95 m., General Electric Co., 7-10 am.
21.480	PHI3	HUIZEN, HOLLAND, 13.96 m. Addr. N. V. Philips, Hilversum. Irregular, 6.10-9.35 am.
21.470	GSH	DAVENTRY, ENG., 13.97 m. (See 21.550 mc.), 5.45 am.-12 noon. To Africa.
21.460	W1XAL	BOSTON, MASS., 13.98 m. Addr. University Club. Sun. 9-11.30 am., Tues. 10-11 am.
21.450	DJS	BERLIN, GERMANY, 13.99 m., Addr., Broadcasting House. 12.05-7.50 am.
19.020	HS6PJ	BANGKOK, SIAM, 15.77 m. Mondays 8-10 am. See 15.23 mc.
18.480	HBH	GENEVA, SWITZERLAND, 16.23 m., Addr. Radio Nations. Sun., 10.45-11.30 am.

16 Met. Broadcast Band

Mc.	Call	
17.850	TPB3	PARIS, FRANCE, 16.8 m. Addr. (See 15.245 mc.) 5:30-10 am.
17.845	DJH	BERLIN, GERMANY, 16.81 m., 12.05-7.50, 8-9, 9:15-11 am.
17.840	HVJ	VATICAN CITY, 16.82 m. Heard 12 n. on Wednesday.
17.840	—	MOYDRUM, ATHLONE, EIRE, 16.82 m. Addr. Radio Eireann. 8.30-10 am. 12.30-4.30 pm. irreg.
17.830	W2XE	NEW YORK CITY, 16.83 m. Addr. CBS, 485 Madison Ave., N. Y. C. Daily 6.30-9 am., 12 n.-5 pm. Sat., Sun. 7-11 am., 11.30 am.-5 pm.
17.820	2RO8	ROME, ITALY, 16.84 m., Addr. (See 2RO, 11.81 mc.) 5-8.45 am., 6-9 pm.
17.810	GSV	DAVENTRY, ENGLAND, 16.84 m., 5.45-11 am. to Far East.
17.800	OIH	LAHTI, FINLAND, 16.85 meters, 4-9 am.
17.800	XGOX	CHUNGKING CHINA, 16.85 m., 9.30-11.30 pm. Mar. 21-Sept. 21 to No. America.
17.790	GSG	DAVENTRY, ENG., 16.86 m., Addr. B.B.C., London. 5.45 am.-12 n., 12.25-1.35, 1.40-4 pm.
17.785	JZL	TOKYO, JAPAN, 16.86 m., 4.30-5.30 pm. to S.A., 8-8.30 pm. to Eastern U. S.
17.780	W3XL	BOUND BROOK, N. J., 16.87 m., Addr. Natl. Broad. Co., 8 am.-5 pm. to Europe, 5-9 pm. to So. Amer.
17.770	PHI2	HUIZEN, HOLLAND, 16.88 m., Addr. (See PHI, 11.730 mc.) Daily 7.10-8.15 am. Mon. & Thurs. 7.10-8.30 am. Sun. 6.10-9.35 am.
17.760	DJE	BERLIN, GERMANY, 16.89 m., Addr. Broadcasting House. 12.05-11 am., 4.50-9 pm. Also Sun. 11.10 am.-12,25 pm.
17.755	ZBW5	HONGKONG, CHINA, 16.9 m., Addr. P.O. Box 200. Dly. 11.30 pm.-1.15 am., 5-10 am., Sat. 9 pm.-1.30 am., Sun. 5-9.30 am. Operates irreg.

End of Broadcast Band

Mc.	Call	
17.310	W2XGB	HICKSVILLE, L. I., N. Y., 17.33 m., Addr. Press Wireless, Box 296. Tests 9.30-11.30 am. except Sat. and Sun.
17.280	FZEB	DJIBOUTI, FRENCH SOMALILAND, 17.36 m. Test XMSN 1st Thurs. each month 8-8.30 am. Next B.C.S. May 4 & June 1.
15.550	CO9XX	TUINICU, ORIENTE, CUBA, 19.29 m., Addr. Frank Jones, Central Tuinicu, Tuinicu, Santa Clara. Broadcasts irregularly evenings.
15.510	XOZ	CHENGTU, CHINA, 19.34 m. Daily 9.45-10.30 am.
15.370	HAS3	BUDAPEST, HUNGARY, 19.52 m., Addr. Radiolabor, Gyali Ut 22. Sun. 9-10 am. Daily 8-9 pm.
15.360	DZG	ZEESEN, GERMANY, 19.53 m., Addr. Reichspostzenstralamt. Tests irregularly.
15.360	—	BERNE, SWITZERLAND, 19.53 m. Irreg. 6.45-7.45 pm.

19 Met. Broadcast Band

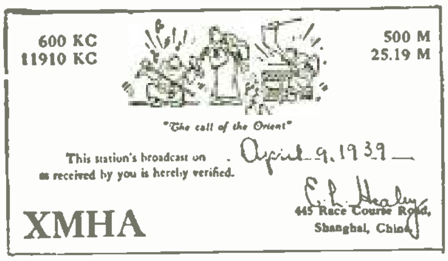
Mc.	Call	
15.340	DJR	BERLIN, GERMANY, 19.56 m., Addr. Br'dcast'g House, 4.50-10.50 pm. to C.A.
15.330	W2XAD	SCHENECTADY, N. Y., 19.56 m., Addr. General Electric Co. Relays WGY, 10.15 am.-5 pm.
15.330	W6XBE	SAN FRANCISCO, CALIF., 19.56 m. Addr. General Electric Co., 6.30-11.15 pm. to So. America.
15.320	OZH	SKAMLEBAK, DENMARK, 19.58 m., Sun. 8 am.-1:30 pm.
15.310	GSP	DAVENTRY, ENG., 19.6 m., Addr. (See 17.79 mc.) 12.25-4, 4.20-6, 6.20-9.15 pm.
15.300	YDB	SOERABAJA, JAVA, N. E. I. 19.61 m. Addr. NIROM. 10.30 pm.-2 am., Sat. 7.30 pm.-2 am.
15.300	XE8M	MAZATLAN, SIN., MEX., 19.61 m., Addr. Box 78. "El Pregonero del Pacifico." Irregularly 9-10 am., 1-2, 8-10 pm.
15.300	2RO6	ROME, ITALY, 19.61 m., Addr. (See 2RO, 11.81 mc.) 4.15-4.55, 10 am.-12.04 pm., 3-5.30, 6-9 pm.
15.290	VUD3	DELHI, INDIA, 19.62 m. Addr. All India Radio. 9.30-11.30 pm., 1.30-3.30 am., 7.30 am.-12.30 pm.
15.290	LRU	BUENOS AIRES, ARG., 19.62 m., Addr. El Mundo. Relays LR1, 7-9 am.
15.280	DJQ	BERLIN, GERMANY, 19.63 m., Addr. Broadcasting House. 12.05-11 am., 4.50-10.50 pm.
15.270	HI3X	CIUDAD TRUJILLO, D. R., 19.65 m. Relays HIX Sun. 7.40-9.40 am. Tues. and Fri. 8.10-10.10 pm.
15.270	W3XAU	PHILA., PA., 19.65 m. (Addr. See 21.52 mc.) Dly. 10.45-11.45 am. 12.30-5.15 pm. Sat. Noon-5.15 pm. Sun. Noon-5 pm.
15.270	W2XE	NEW YORK CITY, 19.65 m., Addr. (See 21.570 mc.) 5.30-7.30 pm.
15.260	GSI	DAVENTRY, ENG., 19.66 m., Addr. (See 17.79 mc.) Mid. to 2.15 am. to Oceania. 12.25-1.45, 9.40-11.30 pm.
15.250	W1XAL	BOSTON, MASS., 19.67 m., Addr. University Club. 2-3:30, or 4 pm., ex. Sat. and Sun.
15.245	TPA2	PARIS, FRANCE, 19.68 m., Addr. 98 Bis. Blvd. Haussmann. "Paris Mondial" 5-10 am. to Asia.
15.240	2RO	ROME, ITALY, 19.68 m. Irregular 3-9 pm.
15.240	CR7BB	LOURENCO MARQUES, MOZAMBIQUE, 19.68 m. Testing 1-4 pm. Irreg.

(Continued on page 216)

All Schedules Eastern Standard Time

Let's *Listen In* with *Joe Miller*

"DX" Editor



XMHA—CHINA: This buff card is enhanced considerably by the amusing Oriental swingsters.

PK6CI—DUTCH NEW GUINEA: This unusual card with drawing in dark green, red call, would stand out on any DX shack's walls.

ZL3IF—NEW ZEALAND: A handsome card with green call and red streak running through call.

● DURING the past month, DX news of interest to the "dyed-in-the-wool" distance tuners has been hard to find. Summer usually brings a letdown in conditions along with a paucity of interesting DX items, so we hope you'll bear with us till the time when things again start "popping."

Regarding summer conditions, OMs, please keep in mind that it is an established fact that Asiatic stations, on the higher frequencies from 9 mc. upwards, actually are heard with better signal strength than in the cool months, so don't forget to give your dials a few twirls weekly during the summer, as the Javanese, Japs, Chinese and other Oriental Short Wave Broadcasters may easily be logged and verified. Don't put it off, feeling that it is better to wait till the fall or winter. Go through the station list, jotting down each Asiatic broadcaster and their freq. and sked, and, every a.m. you tune, try for some of them, and, by systematizing your DXing, you'll make good headway towards a higher VAC rating, which is certainly the DXer's pedigree.

Regarding DX news:

Rules for VAC Certificates

● RADIO & TELEVISION Magazine has prepared a handsome VAC (Verified All Continents) certificate which will be issued to all short-wave listeners submitting adequate proof of verification from all continents. To secure a VAC certificate the listener must send in a verification card from each of the continents. The VAC certificate will only be issued for verifications of radiophone stations, not C.W. stations. The certificates will be signed by the DX Editor, and Hugo Gernsback, Editor-in-Chief of RADIO & TELEVISION.

It is advisable that the cards be sent in a neat package and insured for safe delivery. All cards submitted will be returned. The listener should enclose return postage.

A nominal charge of twenty-five cents (25c) will be made for the certificate to cover the cost of handling and printing.

The DX Editor will be the judge as to whether the verifications submitted are bona fide.

A special notation will be made on the certificate in the event that a listener has more than one complete set of verifications from all continents.

All entries should be made to the VAC Editor, RADIO & TELEVISION, 99 Hudson Street, New York, N. Y.

CHINA

XMHA, lately moved to 11.855 mc., Shanghai, China, sends us the card illustrated, and also a 2 page letter which, signed by Mr. E. L. Healey, station mgr., is very interesting, as evidenced by following extracts from letter. XMHA is a commercial broadcasting station, both *short* and *long* wave, and affiliated with RCA Victor and RCA Communications.

XMHA is also the largest station in all China, second in power only to the 35 kw. National station at Chungking. The staff consists of Americans, English, Poles, Russians, Germans and Chinese. Most programs are in English, but Chinese and German programs are also used, the latter for the benefit of the thousands of Jewish refugees at present in Shanghai.

Though commercial in its operation, this station is on call to serve in all emergencies, for the benefit of the U. S. Gov't. and the people of Shanghai, as, during the first days of the war, XMHA was the only means of communication with the outside world, sending out 15,000 messages free of charge! Still of service to all, XMHA has recently sent out many official messages for Americans and Britons stranded in the interior.

Listeners throughout Asia, the Indies, and the Antipodes are greatly interested in the broadcasts, and, in many cities and villages in the interior of China, local newspapers are published from the daily transmissions. This news, being uncensored, and being the only source, is all the more appreciated.

Mr. Healey adds as a last word that we request listeners to be sure to send a reply coupon when requesting verifications, as postage over there is 25 cents, and, Mr. Healey adds, "there are too many listeners in the U. S. and Canada," which, however, is not meant as a complaint!

Murray Buitekant, W2, also has a card from XMHA. FB!

XMHA is on daily from 11 p.m.-1 a.m., and from 5-11 a.m., and on Suns., 10 p.m.-11 a.m. QRA (address) is: 445 Race Course Road, Shanghai.

OM Gus Gallagher, our ol' faithful in W6, reports XGOX, 17.80 mc. on daily skeds, 9:30-11:30 p.m., weak, and XGOY, 11.90 mc., both in Chungking, 1:15-2:30 p.m., audible only on West Coast, and in a.m., strong from 6:30-8:30 a.m., sometimes using the call letters, XGOA.

XRVG, 11.38 mc., also at Chungking, verified through Mr. Tseng, of the China Information Committee, P.O. Box 107, to Gail T. Beyer, W9, by air mail, costing XRVG, reported previously as XGRV, $1.45—certainly nice of Mr. Tseng. However, the letter contains the bad news that XRVG is no longer on the air.

JAVA

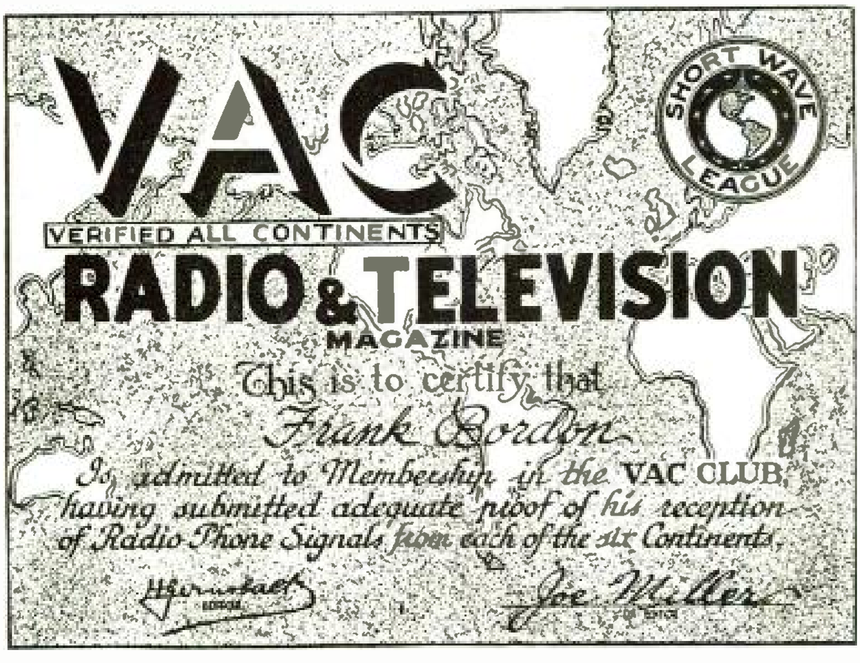
YBG, 10.43 mc., at Medan, Sumatra, an old standby, was recently logged with excellent strength while working PLV, 9.415 mc., at Bandoeng, which latter station always hits at least an R7-8 'way out here in little ol' New York! Don't forget PLP, 11.00 mc., and PMN, 10.26 mc., both also at Bandoeng, which are "DX cinches" during the hot months, in the a.m.'s! Watch also for PLQ, 10.69 mc., which often works YBG, too, during the usual Javanese skeds, 5:30 a.m. to 7 a.m. and sometimes later, but usually near 5:30 a.m. PLE, 18.83 mc., reported by Gus Gallagher at 1 a.m.

JAPAN

JVA, 18.90 mc., Nazaki, heard phoning between 5 p.m. and 1 a.m., frequently, by Gus Gallagher, W6, also JVH, 14.60 mc., transmitting a baseball game once, at midnight. Gus also reports JFO, also known by its BCB call, JFAK, on 9.61 mc., heard outside of sked, at 4 a.m., this station in Formosa, as is also JIB, 10.53 mc., reported several times phoning at 1 a.m.

JFHA has two new relays, another old-timer DX

(*Continued on page 254*)



Mc.	Call	
15.230	HS6PJ	**BANGKOK, SIAM,** 19.7 m. Irregularly Mon. 8-10 am.
15.230	OLR5A	**PRAGUE, BOHEMIA.** 19.7 m. Addr. (See OLR4A, 11.84) Daily 4.55-8.15 am., 6.55-10.20 pm.
15.220	PCJ2	**HUIZEN, HOLLAND,** 19.71 m., Addr. N. V. Philips' Radio Hilversum. Wed. 9.30-11.30 am. Sun. 6.10-9.35 am. Daily 7.10-8.15 am. Mon., Thurs. 7.10-8.30 am.
15.210	W8XK	**PITTSBURGH, PA.,** 19.72 m., Addr. (See 21.540 mc.) 8 am-1 pm.
15.200	DJB	**BERLIN, GERMANY,** 19.74 m., Addr. (See 15.280 mc.) 12.05-11 am., 4.50-10.50 pm. Also Sun. 11.10 am.-12.25 pm.
15.195	TAQ	**ANKARA, TURKEY,** 19.74 m., 5.30-7 am.
15.190	OIE	**LAHTI, FINLAND.** 19.75 m. Addr. (See OFD, 9.5 mc). 1:05-4 am, 9 am.-5 pm.
15.190	ZBW4	**HONGKONG, CHINA,** 19.75 m., Addr. P. O. Box 200. Irregular. 11.30 pm. to 1.15 am., 3-10 am.
15.180	GSO	**DAVENTRY, ENG.,** 19.76 m., Addr. (See 17.79 mc.) 4.20-6, 6.25-9.20 pm.
15.180	RW96	**MOSCOW, U.S.S.R.,** 19.76 m., Daily 1-2, 3-4 am. Mon., Wed., Thurs. 7-9.15 pm.
15.170	TGWA	**GUATEMALA CITY, GUAT.,** 19.77 m., Addr. Ministre de Fomento. Daily 12.45-1.45 pm.; Sun. 12.45-5.15 pm.
15.166	LKV	**OSLO, NORWAY,** 19.78 m. 6.40-10 am.
15.160	JZK	**TOKYO, JAPAN,** 19.79 m. 12.30-1.30 am. to Canada & Hawaii, and Pacific U.S. 7-7.30 am. to Eastern U.S. 8-9.30 am. to China and 2.30-4 pm. to Europe.
15.160	XEWW	**MEXICO CITY, MEXICO,** 19.79 m., 12 n.-12 m., irregular.
15.155	SM5SX	**STOCKHOLM, SWEDEN,** 19.79 m., Daily 11 am.-5 pm., Sun. 9 am.-5 pm.
15.150	YDC	**BANDOENG, JAVA,** 19.8 m., Addr. N. I. R. O. M. 6-7.30 pm., 10.30 pm.-2 am., Sat. 7.30 pm.-2 am., daily 4.30-10.30 am.
15.140	GSF	**DAVENTRY, ENG.,** 19.82 m., Addr. (See 17.79 mc.) 5.45 am.-12 n. 4.20-6, 6.20-9.15 pm.
15.135	JLU3	**TOKYO, JAPAN,** 19.82 m., 8-9.30 am. to China.
15.130	TPB6	**PARIS, FRANCE.** 19.83 m., Addr. "Paris Mondial," 98 Bis Blvd. Haussmann, 1-4 am.
15.130	WIXAR	**BOSTON, MASS.,** 19.83 m., Addr. World-Wide B'cast'g Foundation. University Club, 2.30-5.30, 9-10 pm. ex. Wed., Sat., Sun. 2.30-3 pm.
15.120	SP19	**WARSAW, POLAND,** 19.84 m., 6-9 pm.
15.120	HVJ	**VATICAN CITY,** 19.84 m., 10.30-10.45 am., Tues., Suns. 1-1.30 pm.
15.120	CSW4	**LISBON, PORTUGAL,** 19.84 m., 6-8 am., irreg.
15.110	DJL	**BERLIN, GERMANY,** 19.85 m., Addr. (See 15.280 mc.) 12.10-2, 8-9 am., 10.40 am.-4.25 pm.
15.100	CB1510	**VALPARAISO, CHILE.** 19.87 m. Testing near 7.30 am.
15.100	2RO12	**ROME, ITALY.** 19.87 m. Testing irreg.
15.080	RKI	**MOSCOW, U.S.S.R.,** 19.95 m. Works Tashkent near 7 am. Broadcasts Sun. 12.15-2.30 pm. Daily 7-9.15 pm.

End of Broadcast Band

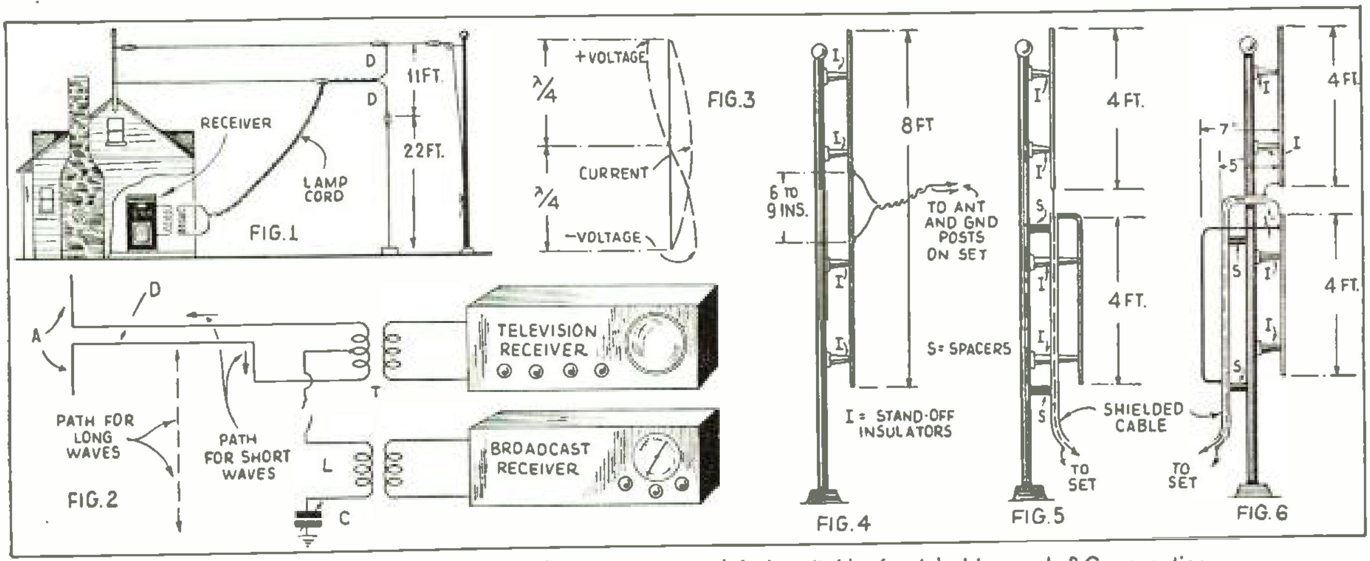
Mc.	Call	
14.960	RZZ	**MOSCOW, U.S.S.R.,** 20.05 m., Thurs. 6 pm. Dutch program.
14.930	PSE	**RIO DE JANEIRO, BRAZIL.** 20.09 m. Broadcasts 6-7 pm., Wed. 4-4.10 pm., Thurs. 3-3.30 pm.
14.920	KQH	**KAHUKU, HAWAII,** 20.11 m. Sats. 1-1.30 am., 11-11.30 pm. Fri. 9-10 pm.
14.795	IQA	**ROME, ITALY,** 20.28 m. 4.30-5 am. In Arabic.
14.600	JVH	**NAZAKI, JAPAN,** 20.55 m. Works Europe 4-8 am. Rel. JOAK Irr. after midnight.
14.535	HBJ	**GENEVA, SWITZERLAND,** 20.64 m. Addr. Radio Nations. Broadcasts Sun. 10.45-11.30 am., Mon. 4-4.15 am., 6.45-8.15 pm.
14.440	—	**RADIO MALAGA, SPAIN,** 20.78 m. Relays Salamanca 5.45-7.30 pm. Sometimes 2-4 pm.
14.420	HCIJB	**QUITO, ECUADOR,** 20.80 m. 7-8.15, 11.30 am.-2.30, 4.45 pm.-10.15 pm. Exc. Mon.
14.166	PIIJ	**DORDRECHT, HOLLAND,** 21.15 m., Addr. (See 7.088 mc.) Sat. 12 n.-12.30 pm.
13.997	EA9AH	**TETUAN, SPANISH MOROCCO,** 21.43 m. Apartado 124. 5.15-6.15 pm., 6.30-7.30 pm., 9-10 pm. Relays Salamanca from 5.40 pm.
13.635	SPW	**WARSAW, POLAND,** 22 m. Daily 6-8 pm. Sat. & Sun. 6-9 pm.
12.862	W9XDH	**ELGIN, ILL.,** 23.32 m. Press Wireless, Tests 2-5 pm.
12.486	HIIN	**TRUJILLO CITY, DOM. REP.,** 24.03 m. 6.40-10.40 am., 5.10-10.10 pm.
12.460	HC2JB	**QUITO, ECUADOR,** 24.08 m. Daily exc. Mon. 7-8.15, 11.30 am.-2.30, 4.45-10.15 pm.
12.310	VOFB	**ST. JOHNS, NEWFOUNDLAND.** 24.37 m. 5.30-7.30 pm.
12.235	TFJ	**REYKJAVIK, ICELAND,** 24.52 m. Works Europe mornings. Broadcasts Sun. 1.40-2.30 pm.
12.230	COCE	**HAVANA, CUBA,** 24.53 m.-8 am.-11.30 pm. Sun. noon-11.30 pm.
12.200	—	**TRUJILLO, PERU,** 24.59 m., "Rancho Grande." Address Hacienda Chiclin. Irregular.
12.000	RNE	**MOSCOW, U.S.S.R.,** 25 m. 6-6.30, 10-10.30 am., 1-1.30, 3-5.30, 8.30-10 pm., Sun. 6-10 am., 1-6, 9-10 pm.
11.970	CB1180	**SANTIAGO, CHILE,** 25.06 m. 7-11 pm.
11.970	HI2X	**CIUDAD TRUJILLO, D. R.,** 25.07 m., Addr. La Voz de Hispaniola. Relays HIX Tue. and Fri. 8.10-10.10 pm. Sun. 7.40-9.40 am.

25 Met. Broadcast Band

Mc.	Call	
11.940	TI2XD	**SAN JOSE, COSTA RICA,** 25.13 m. La Voz del Pilot. Apartado 1729. 7.30 am.-noon, 4-10 pm.
11.940	XMHA	**SHANGHAI, CHINA.** 25.13 m. 5-11 am.
11.910	CD1190	**VALDIVIA, CHILE,** 25.19 m., P. O. Box 642. Relays CB69 10 am.-1 pm., 3-6, 7-10 pm.
11.910	—	**HANOI, FRENCH INDO-CHINA.** 25.19 m. "Radio Hanoi". Addr. Radio Club de l'Indochine. 3.45-4.15 am., 7-9.30 am., 150 watts.
11.900	XEWI	**MEXICO CITY, MEXICO,** 25.21 m., Addr. P. O. Box 2874. Mon., Wed., Fri. 3-4 pm., 9 pm.-12 m. Tues. and Thur. 7.30 pm.-12 m., Sat. 9 pm.-12 m., Sun. 12.30-2 pm.
11.900	XGOY	**CHUNGKING, CHINA,** 25.21 m., 5.30-7.10 am. to North Asia, 7.15-7.55 am. to Japan. 8-10.30 am. to South Asia. 11-11.45 am. to U.S.S.R. 4-6.30 pm. to Europe. Mar. 21-Sept. 21—35 kw.
11.895	2RO13	**ROME, ITALY.** 25.23 m. Irregular 6-9 pm.
11.885	TPA3	**PARIS, FRANCE,** 25.24 m., 10.15 am.-5 pm. 1-4 am.
11.885	TPB7	**PARIS, FRANCE,** 25.24 m. (See 15.245 mc.) 6-8.15, 8.30-11 pm.
11.880	VLR3	**MELBOURNE, AUST.,** 25.25 m., 3.30-7.15 pm., 9 pm.-3 am. weekdays. Suns. mid.-3 am. Irregular.
11.870	W8XK	**PITTSBURGH, PA.,** 25.26 m., Addr. (See 21.540 mc.) 1-10 pm.
11.870	VUM2	**MADRAS, INDIA,** 25.26 m. M.W.F. 3.30-4 am. Irregular.
11.865	—	**BERNE, SWITZERLAND.** 25.28 m. Irreg. 8-9 pm. to No. Amer.
11.860	GSE	**DAVENTRY, ENG.,** 25.30 m., Addr. (See 11.75 mc.) Irregular.
11.855	DJP	**BERLIN, GERMANY,** 25.31 m., Addr. (See 15.280 mc.) Irregular.
11.850	CB1185	**SANTIAGO, CHILE,** 25.32 m. Sat. 6-11 pm. and irreg.
11.850	OAX2A	**TRUJILLO, PERU,** 25.32 m. Testing on this freq. (See 12.200).
11.840	KZRM	**MANILA, P. I.,** 25.35 m. Addr. Erlanger & Gallinger, Box 283. 9 pm.-10 am. Irregular.
11.840	CSW	**LISBON, PORT.,** 25.35 m. Nat'l Broad. Station. 11.30 am.-1.30 pm. Irregular.
11.840	OLR4A	**PRAGUE, BOHEMIA,** 25.35 m., Addr. Czech Shortwave Sta., Praha XII, Fochova 16. Daily 6.45-9 pm.
11.830	W9XAA	**CHICAGO, ILL.,** 25.36 m., Addr. Chicago Federation of Labor. Irregular 7 am.-6 pm.
11.830	W2XE	**NEW YORK CITY,** 25.36 m., Addr. Col. Broad. System, 485 Madison Av., N.Y.C. 8-10.30 pm.
11.826	XEBR	**HERMOSILLA, SON., MEX.,** 25.37 m., Addr. Box 68. Relays XEBH. 9.30-11 am., 1-4 pm., 9 pm.-12 m.
11.810	2RO4	**ROME, ITALY,** 25.4 m., Addr. E.I.A.R., Via Montello 5. Daily 4.30-8.45 am., 10 am.-2.30 pm., 6-9 pm.
11.805	OZG	**SKAMLEBAK, DENMARK,** 25.41 m. Addr. Statsradiofonien. Irreg.
11.801	DJZ	**BERLIN, GERMANY,** 25.42 m. Addr. See 15.280 mc. Irreg.
11.800	COGF	**MATANZAS, CUBA,** 25.42 m., Addr. Gen. Betancourt 51. Relays CMGF, 2-3, 4-5, 6 pm.-Mid.
11.800	JZJ	**TOKYO, JAPAN,** 25.42 m., Addr. Broadcasting Co. of Japan, Overseas Division 7-7.30, 8-9.30 am. Irreg.
11.795	DJO	**BERLIN, GERMANY,** 25.42 m. Addr. (See 15.280 mc.) Irreg.
11.790	WIXAL	**BOSTON, MASS.,** 25.45 m., Addr. (See 15.250 mc.) 2.30-5.30 pm. Sat., 2-6.30 pm.
11.780	HP5G	**PANAMA CITY, PAN.,** 25.47 m., Addr. Box 1121. Noon-1 pm., 6-10 pm.
11.780	OFE	**LAHTI, FINLAND.** 25.47 m. Addr. (See OFD, 9.5 mc.) 1.05-3 am., 5-6.20, 10 am.-12.30 pm.
11.770	DJD	**BERLIN, GERMANY,** 25.49 m., Addr. (See 15.280 mc.) 11.30 am.-4.25 pm., 4.50-10.50 pm.
11.760	TGWA	**GUATEMALA CITY, GUAT.,** 25.51 m. (See 17.8 mc.) Irregular 10-11.30 pm. Sun. 6-11.30 pm., irregular.
11.760	XETA	**MONTEREY, MEX.** 25.51 m., Addr. Box 203. Relays XET, n.-3.30 pm. and evenings.
11.760	OLR4B	**PRAGUE, BOHEMIA,** 25.51 m. Addr. (See 11.840 mc.) Daily exc. Sun. 8.25-10.05 am.
11.750	GSD	**DAVENTRY, ENG.,** 25.53 m., Addr. B.B.C., London, 12-2.15 am., 12.25-4, 4.20-6, 6.20-9.15, 9.40-11.30 pm.
11.740	SP25	**WARSAW, POLAND,** 25.55 m., 6-9 pm.
11.740	HVJ	**VATICAN CITY,** 25.55 m. Tues. 8.30-9 am.
11.740	CR6RC	**LOANDA, ANGOLA,** 25.55 m., Tues., Thurs., Sat. 2-3.30 pm.
11.735	COCX	**HAVANA, CUBA.** 25.57 m. P. O. Box 32. Daily 8 am.-1 am. Sun. 8 am.-1 am. Relays CMX.
11.735	LKQ	**OSLO, NORWAY,** 25.57 m. 2-6.40, 10 am.-3 pm.
11.730	PHI	**HUIZEN, HOLLAND,** 25.57 m., Addr. N. V. Philips' Radio.
11.730	WIXAR	**BOSTON, MASS.,** 25.58 m., Addr. World-Wide B'cast'g Foundation, University Club. Daily 7 or 7.30-9, 9.15-11 pm. Sat.-Sun. 2.30-5 pm.
11.720	CJRX	**WINNIPEG, CANADA,** 25.6 m., Addr. James Richardson & Sons, Ltd. Daily 6 pm.-12 m., Sat. 6 pm.-Sun. 4 am.
11.720	ZP14	**VILLARICA, PARAGUAY,** 25.60 m. 5.30-7.55 pm, irreg.
11.718	CR7BH	**LAURENCO MARQUES, PORTUGUESE E. AFRICA,** 25.6 m. Daily 12.05-1, 4.30-6.30, 9.30-11 am., 12.05-4 pm., Sun. 5-7 am., 10 am.-2 pm.
11.715	TPA4	**PARIS, FRANCE,** 25.61 m., (See 15.245 mc.) 6-8.15, 8.30-11 pm. to No. America.
11.710	YSM	**SAN SALVADOR, EL SALVADOR,** 25.62 m., Addr. (See 7.894 mc.) 1-2.30 pm.
11.710	—	**SAIGON, FRENCH INDO-CHINA.** 25.62 m., Addr. Boy-Landry, 17 Place A Foray. 7.30-9.15 am.
11.705	JLG3	**TOKYO, JAPAN,** 25.63 m. 2.30-4 pm.—Irreg. 4.30-5.30 pm.
11.705	SBP	**MOTALA, SWEDEN,** 25.63 m., 1-4.15 pm. Sun. 3 am.-4.15 pm. Wed and Sat. 8-9 pm.

(Continued on page 218)

All Schedules Eastern Standard Time



Various types of ultra-high frequency doublets. One at left is suitable for television and B.C. reception.

Efficient U.H.F. Doublets

WITH the advent of television and facsimile, and the resultant resurgence of interest in ultra-high frequency reception, the use of highly efficient antennas again becomes extremely important.

While almost any piece of wire will serve for broadcast reception, a thoroughly engineered antenna is needed to keep the signal up and the interference down when the very short waves are being received.

Although the antenna is tuned by means of inductance and/or capacity for broadcast reception, this is not so desirable when working with television, for it results in too sharp a resonance peak. For this reason, the untuned antenna is highly preferable.

Antennas whose natural period of oscillation is ¼ or ½ or 1 wavelength afford most efficient results. Therefore a doublet having a total length of approximately 11 feet works out well for 7-meter reception. This is, likewise, a convenient size to handle.

The antenna works most effectively when mounted vertically, with the lower end of the bottom half at least 10 feet above the ground—and higher, if possible. As shown in Fig. 1, each half of the doublet is about 5 feet 3 inches, with a 6-inch separation between them. Exact dimensions for any

(*Continued on page* 246)

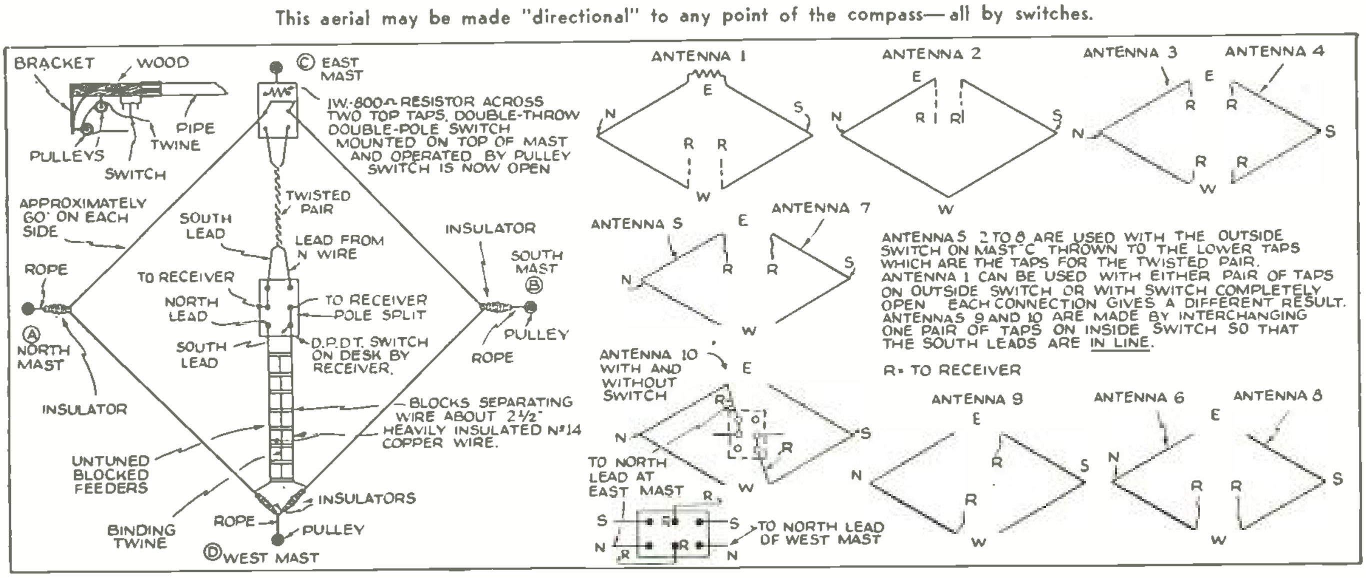
A "DX" Aerial for Short Wave Fans

HERE is a short wave antenna that has helped me very much in my SWL work. I believe it is an original idea, for I have never seen nor heard of one like it. It occurred to me when I was trying to figure out a way to have good directional antenna (all directions) without having to have a separate antenna for each direction. It has worked wonderfully well for the past six months, so I thought that others interested in the same field might like to try it.

To begin with, it takes four masts or other elevated objects to anchor the antenna to. At present I am using three 40 foot pipes and a 26 foot wooden pole fastened on the side of the house. All of these are well braced and are on a lot 65 by 175 ft. Two of the masts are at the extreme ends of the length of the lot. (A and B.) The other two are approximately in the center or half-way between the north and south masts. The enameled wire is of the seven strand type and can be lowered by pulleys on all masts except mast C to the east. By taking the leads on the west side of this rhombic first, we have the best and most important

(*Continued on page* 246)

This aerial may be made "directional" to any point of the compass—all by switches.



Mc.	Call	
11.700	HP5A	**PANAMA CITY, PAN.,** 25.64 m. Addr. Radio Teatro, Apartado 954. 10 am.-1 pm., 5-10 pm. Sun. 6-10 pm. 7-8.30 am.
11.700	CB1170	**SANTIAGO, CHILE,** 25.65 m. Addr. P.O. Box 706. Relays CB89 10 am.-2 pm., 3.30-11 pm.

End of Broadcast Band

Mc.	Call	
11.676	IQY	**ROME, ITALY.** 25.7 m. 5.20-5.40 am. ex. Sun., Daily 12.07-12.56, 1.50-2.30 pm.
11.535	SPD	**WARSAW, POLAND,** 26.01 m., Addr. 5 Mazowiecka St. 6-9 pm.
11.402	HBO	**GENEVA, SWITZERLAND,** 26.31 m., Addr. Radio Nations. Sun. 7-7.45, 8-8.45 pm. 1.45-2.30 pm. Mon. 6.45-8.15 pm.
11.380	XGRV	**CHUNGKING, CHINA.** 26.36 m. 1-1.35, 8-8.35 am.
11.040	CSW5	**LISBON, PORTUGAL,** 27.17 m., Addr. Nat. Broad Sta. 11 am.-4.30 pm. Sun. 10 am.-4.30 pm.
11.000	PLP	**BANDOENG, JAVA,** 27.27 m. Relays YDB. 6-7.30 pm., 10.30 pm.-2 am., 4.30-10.30 or 11 am. Sat. until 11.30 am.
10.950	—	**TANANARIVE, MADAGASCAR,** 27.40 m., Addr. (See 9.38 mc.) 12.30-45, 10-11 am., 2.30-4 am.,
10.670	CEC	**SANTIAGO, CHILE,** 28.12 m. Irregular.
10.660	JVN	**NAZAKI, JAPAN,** 28.14 m. Broadcasts daily 1.50-7.40 am. Works Europe irregularly at other times.
10.535	JIB	**TAIHOKU, TAIWAN,** 28.48 m. Works Japan around 6.25 am. Broadcasts, relaying JFAK 9-9.55 am., 1-2.30 am. Sun. to 10.15 am.
10.400	YSP	**SAN SALVADOR, EL SALVADOR,** 28.85 m., 1-3, 6.30-11 pm.
10.360	EAJ43	**TENERIFE, CANARY ISL.,** 28.96 m., 3-4.30, 5-7, 7.45-8.45, 9-10 pm.
10.350	LSX	**BUENOS AIRES, ARG.,** 28.98 m., Addr. Transradio International. Tests irregularly.
10.330	ORK	**RUYSSELEDE, BELGIUM,** 29.04 m. Broadcasts 12.30-2 pm. Works OPM 1-3 am., 3-5 pm.
10.260	PMN	**BANDOENG, JAVA,** 29.24 m. Relays YDB 6-7.30 pm., 10.30 pm.-2 am., 4.30-10.30 or 11 am., Sat. to 11.30 am.
10.220	PSH	**RIO DE JANEIRO, BRAZIL,** 29.35 m., Addr. Box 709. Broadcasts 6-7 pm., Mon. 8-8.30 pm., Fri. 7-7.30 pm.
10.100	—	**DEUTSCHE FREIHEITS SENDER,** 29.70 m., loc. in Germany, undercover. 4-5 pm.
10.050	TIEMT	**SAN JOSE, COSTA RICA,** 29.85 m., 4.30-8 pm.
10.050	DZC	**ZEESEN, GERMANY,** 29.16 m., Addr. (See 15.360 mc.) Irregular.
10.042	DZB	**ZEESEN, GERMANY,** 29.87 m., Addr. Reichspostzenstralamt. Irregular.
9.995	COBC	**HAVANA, CUBA,** 30.02 m., Addr. P. O. Box 132. Relays CMBC 6.55 am.-1 am.
9.920	JDY	**DAIREN, MANCHUKUO,** 30.24 m. Relays JQAK daily 7-8 am. Works Tokyo occasionally in early am.
9.892	CPI	**SUCRE, BOLIVIA,** 30.33 m., 11 am.-n., 7-9 pm.
9.855	EAQ	**MADRID, SPAIN,** 30.45 m., Addr. P. O. Box 951. 7.30-8, 8.40-9 pm. 3.45-4.05, 4.45-5.05 am., also.
9.830	IRF	**ROME, ITALY,** 30.52 m. Works Egypt afternoons. Relays 2RO, 12-12.25 pm. Thurs. Daily 12.40-1, 1.37-3.35, 6-9 pm.
9.815	COCM	**HAVANA, CUBA,** 30.57 m. Addr. Transradio Columbia, P. O. Box 33. 8-1 am. Relays CMCM.
9.785	HH3W	**PORT-AU-PRINCE, HAITI,** 30.66 m. Addr. P. O. Box A117. 1-2, 7-9.15 pm.
9.753	ZRO	**DURBAN, SOUTH AFRICA,** 30.75 m. Addr. S. A. Broadcasting Corp., P. O. Box 4559, Johannesburg. Daily exc. Sat. 11.45 pm.-12.50 am. Daily exc. Sun. 3.30-7.30, 9 am.-12.30 pm., Sun. 5.30-7, 9 am.-12.30 pm., also 4-5 am. on 3rd Sun. of month.
9.735	CSW7	**LISBON, PORTUGAL,** 30.82 m. Addr. Nat. Broad. Sta. n.-2 pm., 6-9 pm. for No. Amer.
9.730	CB970	**VALPARAISO, CHILE,** 30.83 m., 6.30-11.30 pm., or mid.
9.708	COCQ	**HAVANA, CUBA,** 30.90 m. Addr. 25 No. 445, Vedado, Havana, 7-1 am. Sun. 6.55 am.-1 am.

31 Met. Broadcast Band

Mc.	Call	
9.705	—	**FORT DE FRANCE, MARTINIQUE,** 30.92 m., Addr. P. O. Box 136. 6-8.10 pm. Irr. to 9.30 pm.
9.700	—	**SAIGON, INDO-CHINA,** 30.93 m., Addr. 17, Place A. Foray. "Radio Boy-Landry." 7.30-9.45 am. Irreg.
9.700	HNF	**BAGHDAD, IRAQ,** 30.93 m., 10 am.-3 pm. S.O. before or after 3 pm.
9.690	TI4NRH	**HEREDIA, COSTA RICA,** 30.96 m., Addr. Amando C. Marin, Apartado 40. Sun. 7-8 am., Tues., Thurs., Sat. 9-10 pm.
9.690	LRA1	**BUENOS AIRES, ARG.,** 30.96 m., 6-9 pm. Mon-Thur., 4-9 pm. Fri., 7-9 pm. Sat.
9.690	—	**TANANARIVE, MADAGASCAR,** 30.96 m., 12.30-12.45, 3.30-4.30, 10-11 am., Sun 2.30-4 am.
9.690	ZHP	**SINGAPORE, MALAYA,** 30.96 m. Sun. 5.40-9.40 am., Wed. 12.40-1.40 am., Mon.-Fri. 4.40-9.40 am., Sat. 12.25-1.40 am., 4.40-9.40 am., 10.40 pm.-1.10 am. (Sun.)
9.690	GRX	**DAVENTRY, ENGLAND,** 30.96 m., Addr. See GSC, 9.58 mc., 5.45 am.-12 n., 12.25-6 pm.
9.685	TGWA	**GUATEMALA CITY, GUAT.,** 30.96 m. Daily 10-11.30 pm.; Sun. 7-10.45 pm.
9.680	JFO	**TAIHOKU, TAIWAN,** 30.99 m. Relays JFAK irreg. 4-10.30 am.
9.675	DJX	**BERLIN, GERMANY,** 31.01 m., Addr. (DJD, 11.77 mc.) 11.30 am.-4.25 pm. To Africa.
9.670	W3XAL	**BOUND BROOK, N. J.,** 31.03 m. Addr. NBC, N. Y. C. 5 pm.-12 m.
9.665	2RO9	**ROME, ITALY,** 31.04 m. 12.40-1, 1.37-5.30 pm., 6-6.30 pm.
9.660	LRX	**BUENOS AIRES, ARG.,** 31.06 m., Addr. El Mundo. Relays LR1, 6-6.45 am.-9.15 am.-10 pm.
9.660	HVJ	**VATICAN CITY,** 31.06 m. Sun. 5-5.30 am.
9.650	W2XE	**NEW YORK CITY,** 31.09 m. (See 21.570 mc. for addr.) Irregular.
9.650	CS2WA	**LISBON, PORTUGAL,** 31.09 m., Addr. Radio Colonial. Tues., Thurs. and Sat. 4-7 pm.
9.650	IABA	**ADDIS ABABA, ETHIOPIA,** 31.09 m., 3.55-4.05, 4.15-4.45, 11 am.-noon, 1-3 pm. Suns. 3.30-3.55 am.
9.645	JLT2	**TOKYO, JAPAN,** 31.10 m., 2.30-4 pm. to Europe.
9.640	CXA8	**COLONIA, URUGUAY,** 31.12 m., Addr. Belgrano 1841, Buenos Aires, Argentina. Relays LR3 Buenos Aires 5 am.-10.45 pm. Sat. to 1 am.
9.635	2RO3	**ROME, ITALY,** 31.13 m., Addr. (See 11.810 mc.) 12.07-3 pm., 5.30-9 pm., also Mon. 3.50-4.05 pm., Fri. and Sat. 4-4.20 pm.
9.620	CXA6	**MONTEVIDEO, URUGUAY,** 31.19 m., Rel. CX 6 to 9 pm.
9.618	HJ1ABP	**CARTAGENA, COL.,** 31.20 m., Addr. P. O. Box 37. Daily 9 am.-1.30 pm., 7-10.15 pm., Sun. 4.30-9 pm.
9.610	LLG	**OSLO, NORWAY,** 31.22 m., 3-6, 8-9, 11 pm.-mid.
9.606	ZRL	**KLIPHEUVAL, SOUTH AFRICA,** 31.23 m., Addr. P. O. Box 4559, Johannesburg. Daily, exc. Sat. 11.45 pm.-12.50 am. Daily exc. Sun. 3.20-7.20, 9-11.45 am., Sun. 3.30-4.30 or 4-5, 5.30-7, 9-11.45 am.
9.600	RAL	**MOSCOW, U.S.S.R.,** 31.25 m. Daily exc. Sun. 6-10 pm. Sun. 6-7, 9.15-10 pm.
9.600	CB960	**SANTIAGO, CHILE,** 31.25 m., 8-11.30 pm.
9.600	GRY	**DAVENTRY, ENG.,** 31.25 m., Addr. See GSC, 9.58 mc., Irreg. 12.25-6 pm.
9.595	—	**MOYDRUM, ATHLONE, EIRE,** 31.27 m., Radio Eireann. 12.30-4.30 pm. Irreg.
9.595	HBL	**GENEVA, SWITZERLAND,** 31.27 m., Addr. Radio Nations. Irregular.
9.590	HP5J	**PANAMA CITY, PANAMA,** 31.28 m. Addr. Apartado 867. 12 n. to 1.30 pm., 6-10.30 pm.
9.590	VUD2	**DELHI, INDIA,** 31.28 m. Addr. All India Radio, 1.30-3.30 am., 7.30 am.-12.30 pm., 8.30-10.30 pm.
9.590	PCJ	**HUIZEN, HOLLAND,** 31.28 m., Addr. (See 15.220 mc.) Sun. 2-3, 7.15-9.25 pm. Tues. 1.45-3.30, 7-8.30, 8.45-10.15 pm., Wed. 7.15-8.40 pm., Fri. 8-9 pm.
9.590	VK6ME	**PERTH, W. AUSTRALIA,** 31.28 m., Addr. Amalgamated Wireless of Australasia, Ltd. 6-8 am. exc. Sun.
9.590	VK2ME	**SYDNEY, AUSTRALIA,** 31.28 m., Addr. Amalgamated Wireless of Australasia, Ltd., 47 York St., Sun. 1-3 am.; 5-9, 10.30 am.-12.30 pm.
9.590	W3XAU	**PHILADELPHIA, PA.,** 31.28 m. (Addr. See 21.52 mc.) Mon. & Thurs. 5.30-6.15, 6.30-10.30 pm., 11 pm.-Mid. Sat. 5.30-6, 6.30-10.30 pm.
9.580	GSC	**DAVENTRY, ENGLAND,** 31.32 m., Addr. B. B. C., Portland Pl., London, W. 1., 12.25-4, 4.20-6, 6.25-9.20 pm.
9.580	VLR	**MELBOURNE, AUSTRALIA,** 31.32 m. Addr. Box 1686, G. P. O. Daily exc. Sat. 3.30-7.15 pm., Sat. 5-10.30 pm. Daily exc. Fri., Sat. 9 pm.-8.30 am., Fri. 9 pm.-9 am. (Sat.), Sat. 12 m.-7.30 am. (Sun.).
9.570	KZRM	**MANILA, P. I.,** 31.35 m., Addr. Erlanger & Galinger, Box 283. Wkdys. 4.30-6 pm. m. tof. 5-9 am., Sat. 5-10 am., Sun. 4-10 am.
9.570	W1XK	**BOSTON, MASS.,** 31.35 m., Addr. Westinghouse Electric & Mfg. Co. 6 am.-12 m. Sun. 7 am.-12 m.
9.566	OAX4T	**LIMA, PERU,** 31.37 m., 7-8, 11.30 am.-1.30 pm.
9.560	XGAP	**PEKING, CHINA,** 31.38 m. Addr. S. Yoshimura, Dir. Peking Central Sta., Hsi-chan-an-chieh, Peking. 4-9 am.
9.560	DJA	**BERLIN, GERMANY,** 31.38 m., Addr. Broadcasting House. 6.30-10.50 pm.
9.550	HVJ	**VATICAN CITY,** 31.41 m., Sun. 5-5.30 am., Wed. 2.30-3 pm.
9.550	TPB11	**PARIS, FRANCE,** 31.41 m. Addr. (See 15.245 mc.) 11.15 am.-7 pm., 9.30 pm.-mid. Irreg.
9.550	W2XAD	**SCHENECTADY, N. Y.,** 31.41 m., General Electric Co., 5.15-8.15 pm. to So. Amer.
9.550	OLR3A	**PRAGUE, BOHEMIA.** 31.41 m. (See 11.840 mc.) Irreg. 4.40-5.10 pm.
9.550	XEFT	**VERA CRUZ, MEX.,** 31.41 m. 10.30 am.-4.30 pm., 10.30 pm.-12.30 am.
9.550	YDB	**SOERABAJA, JAVA,** 31.41 m., Addr. N.I.R.O.M. Daily exc. Sat. 6-7.30 pm., 10.30 pm.-2 am.-4.30-10.30 am. Sat. 7 pm.-2 am.
9.550	VU82	**BOMBAY, INDIA.** 31.41 m., Addr. All India Radio. 9.30-10.30 pm., 1-3.30 am. 5-6 am. also.
9.540	DJN	**BERLIN, GERMANY,** 31.45 m., Addr. (See 9.560 mc.) 12.05-2.30, 9.30-11 am., 4.50-10.50 pm. to So. Amer.
9.538	VPD2	**SUVA, FIJI ISLANDS,** 31.46 m., Addr. Amalgamated Wireless of Australasia, Ltd. 5.30-7 am., exc. Sun.
9.535	—	**SCHWARZENBURG, SWITZERLAND,** 31.46 m., 1-2 pm. 6.45-7.45, 8-9 pm.
9.530	W6XBE	**SAN FRANCISCO, CAL.,** 31.48 m., Addr. Gen. Elec. Co., 12 m.-3 am., 7 am.-12 n. to Asia.
9.530	W2XAF	**SCHENECTADY, N. Y.,** 31.48 m., Addr. General Electric Co. 3-11 pm.
9.530	VUC2	**CALCUTTA, INDIA.** 31.48 m. Addr. All India Radio. 2.06-4.06 am. 10 pm.-2 am.
9.526	XEDQ	**GUADALAJARA, GAL., MEXICO,** 31.49 m., N.-4.30 pm., 7 pm.-midnight.
9.526	ZBW3	**HONGKONG, CHINA,** 31.49 m., Addr. P. O. Box 200. 5.10 am., 11.30 pm.-1.15 am. Sun 5-9.30 am.
9.525	LKC	**JELOY, NORWAY,** 31.49 m., 4.30-10.30 am., Sun. 2.30-10.30 am.

(Continued on page 220)

All Schedules Eastern Standard Time

● WELL, here we are with another month of reports, and they look very good. Our new plan seems to be working out *fine business*, and every one of the observers co-operated with us 100% in getting it started. There was lots of competition for the first place in the Best DX box, and it turned out to be a tie between Lendzioszek of Massachusetts and Mannheimer of Iowa. Both sent in very good reports, and some swell DX for this time of the year.

Conditions on the twenty-meter band have been very erratic, and nothing can be depended upon to produce any good DX. It is there one time and gone a short time later. However, the Aussies are now being heard regularly as well as the New Zealanders. Ten meters is producing some results but nothing like it was a few months ago.

A few special observers for *five meters* have been appointed, and it is hoped to have some reports on five-meter DX during the coming months. Last summer saw some very fine results, and it is hoped that this year it will even be better.

John Fitzpatrick reports hearing the following in New Jersey:—

W9ZHB	Zearing, Ill.	5	8
W9GGH	Kenosha, Wis.	4	7
W9RGH	Peoria, Ill.	4	8

Todd Storz of Omaha, Nebraska, reports:—

W8NOR	Tonawanda, N. Y.	5	9
W8SFF	Calver, Pa.	5	8-9
W8RV	Buffalo, N. Y.	5	8-9
W3RL	Washington, D. C.	5	9

Laurence Weber of East Orange, New Jersey, reports the following on five meters:—

W9ZHB	Zearing, Ill.	W9LVK	
W9GGH	Kenosha, Wis.	W8CVQ	Kalamazoo, Mich.
W9ARN	Bartinville, Ill.		
W9VHG	Glenview, Ill.	W8NZ	Bat'e Cr'k, Mich.
W9UDO	Union, Ill.		
		W9RGH	Peoria, Ill.

This is the first month that we have had any good DX on five meters reported since last fall, and we hope that it continues to come in.

TEN BEST DX'ERS LAST MONTH

Name	*Call*	*Freq.*	*R*	*S*	*Distance*
Lendzioszek	KA1ER	14.25	4	7	11,700 miles
Mannheimer	PK2AY	14.05	5	5	11,700 miles
Fleming	PK2AY	14.05	4	8	11,600 miles
Hegler	PK4KS	14.06	4	6-7	11,600 miles
Mannheimer	PK3WI	14.045	5	6	11,400 miles
Slaughter	PK1VY	14.35	5	7	11,200 miles
Hegler	PK2LZ	14.04	4	5-6	11,100 miles
Rush	ZS5Q	14.08	5	9	11,000 miles
Clarke	PK6XX	14.01	5	7	11,000 miles
Lendzioszek	PK6XX	14.095	5	8	10,900 miles

Call	*Freq.*	*R*	*S*	*Where Heard*
EK1AF	14.12	4-5	7-9	Conn., N. Y., Quebec
FA8CF	14.06	5	8	Ala.
SU1MW	14.14	5	9	Mich.
SU1JM	14.38	5	7	Ala.
SU1MN	14.35	4	7	Mass.
SU1SG	14.4	5	8	Quebec
VQ2PL	14.0	3	5	Mass.
ZS2AF	14.09	5	7	Tex.
ZS2BJ	14.01	5	7	Tex.
ZS4H	14.05	4	6	Calif.
ZS5AW	14.1	5	6	Calif., Tex., Kans.
ZS5Q	14.07	5	9	Ia., Calif., Nebr.
ZS5T	14.06	5	7	Tex.
ZS6DY	14.07	5	7-8	Ia., Calif.
ZS6DW	14.005	5	7	Mass.
ZS6AJ	14.1	5	6	Calif.
ZS6BB	14.06	5	7	Calif.
ZS6DV	14.06	5	7-8	Tex., Kans.

NORTH AMERICANS

Call	*Freq.*	*R*	*S*	*Where Heard*
CO6CM	14.498	5	8	S. Dak.
K4FKC	14.1	5	7	Ore.
K4FAY	14.32	4	8	S. Dak.
K4EJT	14.45	3	7	S. Dak.
W3LE	14.25	5	8	England
W3CBV	14.22	5	7	England
W3EMM	14.	5	4	South Africa
W3EOZ	14.	5	8	South Africa
W4CDG	14.19	5	9	England
W4DCR	14.25	5	8-9	England
W4EEV	14.2	4-5	7-8	England, New Zealand
W5VU	14.2	5	8-9	England, South Africa
W5FAB	14.21	5	7	England
W5VV	14.23	5	8	England
W5GFF	14.2	3	5	England
W5BEK	14.19	5	9	England
W5ATW	14.19	5	8	England
W5ADO	14.21	5	6	England
W5BEV	14.22	3	5	England
W5FHJ	14.225	5	8	England
W5BGW	14.26	5	7	England
W5YF	14.	5	6	South Africa
W5FXH	14.19	3-5	5-6	South Africa, P. I.
W5HDK	14.	5	9	New Zealand
W5JB	14.	5	9	New Zealand
W5ZS	14.	5	9	New Zealand
W5FAM	14.2	5	6	P. I.

The Short Wave League

DX on the Ham Bands

(with the "Listening Post" Observers)

Edited by Elmer R. Fuller

HONORARY MEMBERS

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

Hugo Gernsback, Executive Secretary

A few of our observers report stations on twenty meters which were less than two thousand miles from their listening post. These cannot be used, and are not considered good DX by this department.

Reports for May were received from the following observers:—

Alabama	Jack Wells
Arizona	Lester Fuller
California	Richard Rush
Connecticut	Howard G. Kemp
Florida	Major Lester
Iowa	Dick Mannheimer
Kansas	Burns E. Hegler
Maryland	Cecil Wilkes
Massachusetts	Edward Lendzioszek
Michigan	Vernon Gabriel
Missouri	R. B. Fleming
Nebraska	William Dean Noyes
New Jersey	John Fitzpatrick
New York	Charles H. Fuller
	W. F. Herzog
Oregon	Elwood C. Trueman
Pennsylvania	Tom Jordan
South Carolina	Ray Halliday
South Dakota	Robert Hutchinson
Texas	Edward C. Slaughter
Washington	Ernest Lang
Quebec	Stanley Clarke
England	Kenneth Spencer
South Africa	Morris Wasserzug
New Zealand	H. Vernon Wheatley
Philippine Islands	J. M. Ruiz

Only a few Asiatics were reported last month.

Call	*Freq.*	*R*	*S*	*Where Heard*
VS2AK	14.035	3	5	Wash.
VU2AY	14.105	5	7	Mass.
XU6KA	14.025	4	6	Wash.
XU6TL	14.06	3-4	5-6	Mo.
XU8RB	14.09	4	6	Wash.
XZ2EX	14.065	4	7	Wash.

AFRICANS

Call	*Freq.*	*R*	*S*	*Where Heard*
CN8MI	14.26	5	6	Ala.
CN8BA	14.075	3	5	Conn.
CN8AU	14.055	2	5-6	Mass.
CN8AM	14.025	4	7	N. J.
CT2BP	14.17	5	6-7	Mich., Ala., Quebec
EK1AS	14.12	5	9	Mich.
K5AS	14.21	5	5	N. Y.
K5AA	28.	5	6	Ore.
NY4AD	14.23	5	7	Ore.
TG5JG	14.08	5	5	N. Y.
TG9AA	14.12	5	4	N. Y.
TI2AV	14.005	5	8	Md.
VE1ET	14.15	5	8	England
VE1CK	14.09	5	8-9	England
VE1CR	[illegible]	5	9	England
VE2EW	14.125	4	7	South Africa
VE3WV	14.13	4	5	South Africa
VE3GK	14.	4	8	New Zealand
VE4SS	14.12	5	6	South Africa
VE4ACP	14.12	5	5	South Africa
VE5EF	14.12	5	7	England
VE5OT	14.13	5	5-9	England, New Zealand
VE5VP	14.12	5	5-7	England
VE5VO	14.085	5	6	South Africa
VP6YB	28.	5	7	Ore.
VP6FO	14.075	5	8	N. J.
W1ABM	14.17	5	7-8	England
W1JFG	14.2	5	9	England
W1JCX	14.25	3	5	England
W1BLO	14.19	5	9	England
W1DHS	14.18	5	8	England
W1AIO	14.28	5	7	England
W1JLU	14.2	5	7	England
W1AJZ	14.2	5	8-9	England
W1ADM	14.22	5	9	England
W1WE	14.22	5	7	England
W1MW	14.26	5	6	England
W1CND	14.	5	6	South Africa
W1XKK	14.	4	7	New Zealand
W2JKO	14.19	5	9	England
W2CTF	14.2	5	8	England
W2IKV	14.18	5	8	England
W2HWS	14.32	5	7	England
W2IXY	14.25	5	9	England
W2GIZ	14.25	5	7-9	England, South Africa
W2EVI	14.	5	8	New Zealand
W2ZC	14.	5	8	New Zealand
W2AEB	14.16	5	8	P. I.
W2AZ	14.2	5	5	P. I.
W3BRX	14.19	5	8	England
W3FJU	14.26	5	7-8	England
W3ASG	14.2	5	8	England
W3GOG	14.22	5	7	England
W3ECF	14.23	5	9	England
W3BFY	14.21	5	6	England
W3DEK	14.16	5	5	England
W6USA	14	5	9	New Zealand
W6RZ	14.21	5	6	England
W6IKQ	14.26	4	7	England
W6AH	14.2	4	4	England, New Zealand
W6TDY	14	5	5	South Africa
W6PMB	28	5	7	New Zealand
W6ATH	28	5	7	New Zealand
W6POV	28.	4	6	New Zealand
W6RR	28.	3	5-7	New Zealand
W6GZZ	28.	4	8	New Zealand
W6MW	14.25	3	6	P. I.
W6OSY	14.	4	5-7	New Zealand
W6MBS	14	5	9	New Zealand
W6EJC	14.	5	7	New Zealand
W6BUY	14	5	8	New Zealand
W6GR	14.	5	8	New Zealand
W6MY	14.	5	9	New Zealand
W6GRL	14.	4	6	New Zealand
W6OCH	14.	5	8	New Zealand
W6MYO	14.	3	5	New Zealand
W6MIE	14.2	5	6	P. I.
W6RX	14.2	5	7	P. I.
W6IDY	14.19	5	7	P. I.
W6CC	14.2	5	8	P. I.
W6LYC	14.24	5	6	P. I.
W6OI	14.2	5	7	P. I.
W6GHI	14.25	5	4	P. I.
W7KS	28.	5		New Zealand
W7DC	14.	5	9	New Zealand
W7GAE	14.	5	9	New Zealand
W7BCU	14.2	5	6	P. I.
W8RL	14.	5	5	South Africa
W8VNK	14.2	4	5	P. I.
W9CI	14.15	5	7	England
W9MGT	14.19	5	8-9	England
W9RUK	14.22	5	6	England
W9PTY	14.	5	5	South Africa
W9SZY	14.	5	6	South Africa
W9MCD	14.	5	5	South Africa
W9ARA	14.	4	6	New Zealand
W9CVM	14.	5	9	New Zealand
W9AOM	14.2	5	6	P. I.
XE1MD	14.01	5	7	Md.
XE1CQ	14.18	5	5	N. Y.
CE1AS	14.137	5	5	N. Y.
CE1AM	14.0	5	5	Penna., Quebec
CE2PO	14.482	5	8	S. Dak.
CE3AA	14.07	3	4	Conn.
CE3AC	13.9	4	6	Penna.
CE3AG	13.995	5	8	Penna.

(Continued on page 252)

Mc.	Call	
9.523	ZRG	**ROBERTS HEIGHTS, S. AFRICA.** 31.5 m., Addr. (See ZRK, 9.606 mc.) Daily exc. Sun. 5-7.30 am.; Sun. 5.30-7 am.
9.520	OZF	**SKAMLEBOAEK, DENMARK,** 31.51 m., Addr. Statsradiofonien, Heibergsgade 7, Copenhagen, 8-9.30, 9.30-11 pm. to No. Amer.
9.520	YSH	**SAN SALVADOR, EL SALVADOR** 31.51 m., Addr. (See 7.894 mc.) Irregular 6-10 pm.
9.520	RV96	**MOSCOW, U.S.S.R.** 31.51 m., 1-3, 4-7 pm. and irr.
9.510	GSB	**DAVENTRY, ENGLAND,** 31.55 m., Addr. (See 9.580 mc.—GSC) 12 m.-2.15 am., 6.20-9.15, 9.40-11.30 pm.
9.510	HJU	**BUENAVENTURA, COLOMBIA.** 31.55 m., Addr. National Railways. Mon., Wed. and Fri. 8-11 pm.
9.510	—	**TANANARIVE, MADAGASCAR,** 31.55 m. Addr. Le Directeur des PTT, Radio Tananarive, Administration PTT. 12.30-12.45, 10-11 am., 2.30-4 am.
9.510	HS8PJ	**BANGKOK, SIAM,** 31.55 m. Thursday, 8-10 am.
9.510	—	**HANOI, FRENCH INDO-CHINA.** 31.55 m. "Radio Hanoi", Addr. Radio Club de L'Indochine. 12 m.-2 am., 6-10 am. 15 watts.
9.503	XEWW	**MEXICO CITY, MEX.,** 31.57 m. Addr. Apart. 2516. Relays XEW. 7:45 am.-12.30 am.
9.501	PRF5	**RIO DE JANEIRO, BRAZIL,** 31.58 m., 4.45-5.55 pm. Ex. Suns.
9.500	VK3ME	**MELBOURNE, AUSTRALIA,** 31.58 m., Addr. Amalgamated Wireless of Australasia, 167 Queen St. Daily except Sun. 4-7 am.
9.500	OFD	**LAHTI, FINLAND,** 31.58 m., Addr. Finnish Brcst. Co., Helsinki. 12.15-5 pm.
9.497	KZIB	**MANILA PHIL. ISL.,** 31.59 m., 6-9.05 am.
9.488	EAR	**MADRID, SPAIN,** 31.6 m., Addr. (See 9.860 mc.) Irreg.

End of Broadcast Band

Mc.	Call	
9.465	TAP	**ANKARA, TURKEY,** 31.70 m., 11.30 am.-5 pm.
9.445	HCODA	**GUAYAQUIL, ECUADOR,** 31.77 m., 8.15-10.15 pm., exc. Sun.
9.437	COCH	**HAVANA, CUBA,** 31.8 m., Addr. 2 B St., Vedado. 8 am.-9.30 pm. Sun. 8 am.-12 m.
9.390	OAX5C	**ICA, PERU,** 31.95 m., Radio Universal, 7-11.30 pm.
9.370	XOY	**CHENGTU, CHINA,** 32.02 m., 9.45-10.30 am.
9.355	HCIETC	**QUITO, ECUADOR,** 32.05 m., Addr. Teatro Bolivar, Thurs. until 9.30 pm. 8-11 pm. Sats.
9.350	COCD	**HAVANA, CUBA,** 32.08 m., Addr. Box 2294. [illegible]ays CMCD 10 a.m.-11.30 pm. Sun. 10 am.-9 pm.
9.345	HBL	**GENEVA, SWITZERLAND,** 32.11 m., Addr. Radio Nations. Sun. 7-7.45, 8-8.45 pm. Mon. 6.50-8.15 pm.
9.340	OAX4J	**LIMA, PERU,** 32.12 m., Addr. Box 1166, "Radio Universal." 12 n.-3 pm., 5 pm.-1 am.
9.295	HI2G	**CIUDAD TRUJILLO, D. R.,** 32.28 m. 6.40-8.40 am., 11.40 am.-2.10 pm., 3.40-4.40 pm.
9.280	LYR	**KAUNAS, LITHUANIA,** 32.33 m., 11 am.-1.25 pm. and Irreg.
9.200	ZMEF	**SUNDAY ISLAND,** 32.61 m., Conts. ZIL5, N.Z. 1.45-2.15 am. Irreg.
9.200	COBX	**HAVANA, CUBA,** 32.61 m. Addr. San Miguel 194, Altos. Relays CM8X 8 am.-11.30 pm.
9.188	HC2AB	**ECUADOR,** 32.65 m., nightly to 10 pm.
9.170	HCIGQ	**QUITO, ECUADOR,** 32.72 m., Mon., Wed., Sat. 9-9.55 pm.
9.125	HAT4	**BUDAPEST, HUNGARY,** 32.88 m., Addr. "Radiolabor," Gyali-ut, 22. Daily 7-8 pm., Sat., 6-7 pm.
9.124	HC2CW	**GUAYAQUIL, ECUADOR,** 32.88 m., 11 am.-1, 7-11 pm.
9.100	COCA	**HAVANA, CUBA,** 32.61 m. Addr. Galiano No. 102. Relays CMCA Noon-1.15 am. Irreg. to 3 am.
9.091	PJCI	**CURACAO, D. W. INDIES,** 33 m., 6.36-8.36 pm., Sun. 10.36 am.-12.36 pm.
9.030	COBZ	**HAVANA, CUBA,** 33.32 m., Radio Salas Addr. P. O. Box 866. 7.45 am.-1.15 am. Sun. 7.45 am.-12 m. Relays CMBZ.
8.965	COKG	**SANTIAGO, CUBA,** 33.44 m. Addr. Box 137. 9-10 am., 11.30 am.-1.30 pm., 3-4.30, 5-6, 10-11 pm., 12 m.-2 am.
8.841	HCJB	**QUITO, ECUADOR,** 33.5 m. 7-8.30 am., 11.45 am.-2.30 pm., 5-10 pm., except Mon. Sun. 12 n.-1.30 pm., 5.30-10 pm.
8.830	COCQ	**HAVANA, CUBA,** 33.98 m., 6.55 am-1 am.
8.700	HKV	**BOGOTA, COLOMBIA,** 34.46 m. Tues. and Fri. 7-7.20 pm.
8.665	COJK	**CAMAGUEY, CUBA,** 34.64 m., Addr. Fin'ay No. 3 Altos. 11.30 am.-12.30 pm., 3.30-6, 8-9 pm.
8.665	W2XGB	**HICKSVILLE, N. Y.,** 34.64 m., Addr. Press Wireless, Mon. to Fri. News at 9 am. and 5 pm.
8.652	HJ4DAU	**MEDELLIN, COLOMBIA,** 34.67 m.,
8.580	YNPR	**MANAGUA, NICARAGUA,** 34.92 m. Radiodifusora Pilot. 12.45-2.15, 6.45-10.15 pm.
8.572	--	**BUCHAREST, ROUMANIA,** 35.02 m., 8.15-10.30 am., 4-7 pm.
7.894	YSD	**SAN SALVADOR, EL SALVADOR,** 37.99 m., Addr. Dir. Genl. Tel. & Tel. 7-10.30 pm.
7.870	HCIRB	**QUITO, ECUADOR,** 38.1 m. La Voz de Quito. 8.30-11.30 pm.
7.854	HC2JSB	**GUAYAQUIL, ECUADOR,** 38.2 m. 11 am.-2, 4-11 pm.
7.797	HBP	**GENEVA, SWITZERLAND,** 38.48 m., Addr. Radio-Nations.
7.614	CR6AA	**LOBITO, ANGOLA,** 39.39 m., Mon., Wed., Sats. 2.30-4.30 pm. Also 7.177 mc.
7.520	KKH	**KAHUKU, HAWAII,** 39.89 m., Fri. 9-10 pm., Sat. 1-1.30 am., 9.30-10 pm.
7.490	EAJ43	**TENERIFE, CANARY ISL.,** 40.05 m., 8-9.30 pm. and Irreg.
7.450	TI2RS	**SAN JOSE, COSTA RICA,** 40.27 m. "Radioemisora Athena". 7-11 pm.
7.440	FG8AH	**POINT-A-PITRE GUADELOUPE, F.W.I.,** 40.32 m., 6-7.10 pm., also 9-10.30 pm. Irreg. P. O. Box 125.
7.410	HCJB4	**QUITO, ECUADOR,** 40.46 m., 7-9.30 pm. irregularly.
7.380	XECR	**MEXICO CITY, MEX.,** 40.65 m., Addr. Foreign Office. Sun. 6-7 pm.
7.310	VIG	**PORT MORESBY, PAPUA,** 41.01 m., June 10 & 24, 3-5 am.
7.280	TPB12	**PARIS, FRANCE,** 41.21 m., 10.15 am.-5.15 pm., 8.30-11 pm.
7.260	CSW8	**LISBON, PORTUGAL,** 41.32 m., addr. Emissora Nacional de Radiodifusao, rua do Quelhas. Tue., Thur., Sat. 4.05-5 pm.
7.250	YDA	**TANDJONGPRIOK, JAVA,** 41.38 m., Addr. N.I.R.O.M., Batavia. 10.30 pm.-2 am.; Sat. 7.30 pm.-2 am.
7.220	HKE	**BOGOTA, COL., S. A.,** 41.55 m. Tues. and Sat. 8-9 pm. Mon. and Thurs. 6.30-7 pm.
7.220	YDX	**MEDAN, SUMATRA, N. E. I.,** 41.55 m. Daily exc. Sat., 10.30 pm.-2 am. Sat. 7.30 pm.-1.30 am. Irreg. to 9 am.
7.200	YI5KG	**BAGHDAD, IRAQ,** 41.67 m., 7.30 am.-4 pm.
7.200	YNAM	**MANAGUA, NICARAGUA,** 41.67 m. Irregular at 9 pm.
7.177	CR6AA	**LOBITA, ANGOLA, PORT. WEST AFRICA.** 41.75 m., Mon., Wed., and Sats. 2.45-4.30 pm. Also see 7.614 mc.
7.128	YN3DG	**LEON, NICARAGUA,** 42.09 m., 2-2.30, 8.30-9.30 pm. ex. Suns.
7.100	FO8AA	**PAPEETE, TAHITI,** 42.25 m., Addr. Radio Club Oceanien. Tues. and Fri. 11 pm.-12.30 am.
7.088	PIIJ	**DORDRECHT, HOLLAND,** 42.3 m., Addr. Dr. M. Hellingman, Technical College. Sat. 11.10-11.50 am.
7.010	XGSA	**KWEIYANG, CHINA,** 42.80 m., 5.30, or 6-11 am.
6.990	XEME	**MERIDA, YUCATAN,** 42.89 m., Addr. Calle 59, No. 517, "La Voz de Yucatan desde Merida." Irregular.
6.977	XBA	**TACUBAYA, D. F., MEX.,** 43 m. 9.30 am.-1 pm., 7-8.30 pm.
6.960	2ZB	**WELLINGTON, N. Z.,** 43.10 m., Mid.-7 am.
6.880	XOJD	**HANKOW, CHINA,** 43.60 m., 6-8.30 am.
6.805	HI7P	**CIUDAD TRUJILLO, DOM. REP.,** 44.06 m., Addr. Emisoria Diaria de Commercio. Daily exc. Sat. and Sun. 12.40-1.40, 6.40-8.40 pm. Sat. 12.40-1.40 pm. Sun. 10.40 am.-11.40 am.
6.790	PZH	**PARAMIRABO, SURINAM.** 44.16 m., Addr. P. O. Box 18. Sun. 8.40-10.40 am. Tues. & Fri. 5.40-8.40 pm. 1st & 3rd Thurs. monthly 6.40-8.40 pm.
6.775	HIH	**SAN PEDRO DE MACORIS, DOM. REP.,** 44.26 m. 7-9.40 pm. Sun. 5.20-6.40 pm.
6.730	HI3C	**LA ROMANA, DOM. REP.,** 44.58 m., Addr. "La Voz de la Feria." 12.30-2 pm., 5-6 pm.
6.720	PMH	**BANDOENG, JAVA,** 44.64 m. Relays N.I.R.O.M. programs. 4.30-11 or 11.30 am. Also Sat. 9.30 pm.-1.30 am.
6.690	TIEP	**SAN JOSE, COSTA RICA,** 44.82 m., Addr. Apartado 257, La Voz del Tropico. Daily 7-11 pm.
6.675	HBQ	**GENEVA, SWITZERLAND,** 44.94 m. Addr. Radio-Nations. Sun. 1.45-2.45 pm.
6.660	HI5G	**TRUJILLO CITY, D. R.,** 45.05 m., to 8.40 pm.
6.635	HC2RL	**GUAYAQUIL, ECUADOR,** 45.18 m., Addr. P. O. Box 759. Sun. 5.45-7.45 pm., Tues. 9.15-11.15 pm.
6.630	HIT	**CIUDAD TRUJILLO, D. R.,** 45.25 m., Addr. "La Voz de la RCA Victor," Apartado 1105. Daily exc. Sun. 12.10-1.40 pm., 5.40-8.40 pm.; also Sat. 10.40 pm.-12.40 am.
6.625	PRADO	**RIOBAMBA, ECUADOR,** 45.28 m. Thurs. 9-11.45 pm.
6.610	YNLG	**MANAGUA, NICARAGUA.** 45.39 m. Emisora Ruben Dario. 1.30-2.30, 6-10.15 pm.
6.600	HI6H	**TRUJILLO CITY, D. R.,** 45.45 m., 7.40-8.40 pm.
6.565	HI5P	**PUERTO PLATA, D. R.,** 45.70 m., 5.40-7.40, 9.40-11.40 pm.
6.558	HI4D	**CIUDAD TRUJILLO, D. R.,** 45.74 m. Addr. Apartado 623. 12.30-2, 6-8 or 9 pm. Except Suns.
6.550	XBC	**VERA CRUZ, MEX.,** 45.8 m. 8.15-9 am.
6.550	TIRCC	**SAN JOSE, COSTA RICA,** 45.8 m., Addr. Radioemisora Catolica Costarricense. Sun. 11 am.-2 pm., 6-7, 8-9 pm. Daily 12 n.-2 pm., 6-7 pm., Thurs. 6-11 pm.
6.540	YNIGG	**MANAGUA, NICARAGUA,** 45.87 m., Addr. "La Voz de los Lagos." 1-2.30, 8-10 pm. Except Sundays.
6.490	TGWB	**GUATEMALA CITY, GUAT.,** 46.2 m. La Voz de Guatemala. Daily 7.45-9 am. 12.45-3.45 pm., 7.30 pm.-12.15 am. Sun. 10.30 am.-5.15 pm., 7 pm.-12 m.
6.480	HIIL	**SANTIAGO DE LOS CABALLEROS, D. R.,** 46.28 m., Addr. Box 356. 9.40-11.40 am., 7.40-9.40 pm.
6.470	YNLAT	**GRANADA, NICARAGUA,** 46.36 m., Addr. Leonidas Tenoria, "La Voz del Mombacho." Irregular.
6.455	HI4V	**SAN FRANCISCO DE MACORIS, D. R.,** 46.44 m., 11.40 am.-1.40 pm., 5.10-9.40 pm.
6.420	HIIS	**SANTIAGO, D. R.,** 46.73 m., 5.40-7.35 pm. Ex. Suns.
6.400	TGQA	**QUEZALTENANGO, GUATEMALA,** 46.88 m., Mon.-Fri. 9-11 pm. Sat. 10 pm.-1 am. Sun. 1-3 pm.
6.388	HI9B	**SANTIAGO, D. R.,** 46.95 m., Mon. 6-6.45, 8-8.45 pm.
6.384	ZIZ	**BASSETERRE, ST. KITTS, W. INDIES,** 46.99 m. 4-4.45 pm., Wed. 7-7.30 pm.
6.357	HRPI	**SAN PEDRO SULA, HONDURAS,** 47.20 m., 6-7.30 am., 2-4 pm. & Irreg. to 10 pm.
6.340	HIIX	**CIUDAD TRUJILLO, D. R.,** 47.32 m. Sun. 7.40-10.40 am., daily 12.10-1.10 pm., Tues. and Fri. 8.10-10.10 pm.
6.335	OAXIA	**ICA, PERU,** 47.33 m., Addr. La Voz de Chiclayo, Casilla No. 9. 8-11 pm.

(Continued on page 253)

All Schedules Eastern Standard Time

What Do YOU Think?

Two New Ideas

Editor,

I have just had a couple of brainstorms so I thought I'd write to you and if you wish, you might print them in "What Do YOU Think?"

Nobody knows all of the languages used by radio stations of foreign countries when they announce. Now after spoken announcements, why couldn't these stations send their call letters, and perhaps location, in International Morse code, such as WWV does? This would greatly simplify logging and add new joy to S.W. listening. It could be easily done with a code oscillator or other suitable means.

My other idea is: It would be a great help if Radio & Television Magazine would list the power of stations in the S.W. station list.

I listen regularly to the short waves on my 5-tube home-made receiver and 1-tube super-regenerative set for U.H.F. I've heard 34 countries!

I subscribe to "R. & T." and belong to the *Short Wave League*. I'm studying up for a Ham license and hope to have one soon.

Good luck to your very F.B. (Fine Business) magazine and 73.

Ernest Emmons,
DuBois, Pa.

News from India!

D. R. D. Wadia of Bombay, India, well known in Amateur Radio since 1921, tuning in on the latest 1939 11-tube All-Wave super. "DIARDI" has verified over 300 stations and his rating in the "Heard All Continents" Club is fifth in the world or first among non-American SWL's. The picture below shows a few of his "veris." He is vice-president of the All-India Radio Merchants' Association, president of the Indian Radio Amateurs' League, life member Society of Wireless Pioneers, one of the oldest Indian members of the International Short Wave Club, International DXers' Alliance, R9 Listeners' League, etc., etc. The cup in the photograph is for a golf championship. He is a keen big game shikari, having bagged seven panthers, five bison, three elephants, the last being a record for India, 10 feet, 9 inches high with 60-inch circumference of the front feet and five-feet, four-inch tusks.

This Month's Prize Winner

Photo at right shows Elmer R. Walker and his daughter in their short-wave listening shack at Spokane, Wash. His address is W. 2501 College Ave. Mr. Walker is a member of the I.D.A. He has just built a new room measuring 12 x 20 feet. He says that "he sure looks forward each month to R. & T." (This month's prize winner—one year's subscription to "R. & T.")

A Good Idea

Editor,

I have been reading Radio & Television Magazine since it was first published and believe it to be the best radio publication.

As an experimenter and SWL I wish to urge all SWL's to be sure and include postage and give accurate reports to amateurs, so that our hobby will not soon be *blacklisted* by the Hams. Commercial sta-

(Continued on page 237)

Above—the smiling face of Bake Young—"the sage from the sagebrush." Bake aspires to become a licensed Ham. Bake has over 400 verifications from S-W broadcast stations and a few of his veri cards are here exhibited on the walls of his shack.

But Will We Get It?

Editor,

Since my stack of R. & T. is beginning to look like something, I guess it's about time I tossed in my two pins' worth.

I find most interesting the articles on construction of receivers, etc. For financial reasons, I am unable to try out many of them but they all go down in my notebook. I also find the *"World Wide Radio Digest"* and *"International Radio Review"* very valuable! Keep up the *television* and *facsimile* articles. One punk stated that, as most of the readers were unable to do the actual experiments because of lack of funds, the television articles should be left out! Say, if that was the way I felt, I'd cut out all the "something free for nothing" ads and use the rest to light the fire with.

The *"Radio Test Quiz"* is OK in a way, but why not stick to the technical end of it?

Let's have a little more about the Frequency Modulation System. The *"What Do YOU Think?"* page is very good also, and when, I mean *if*, I learn something, I might send in something for it. I could also send a picture of my listening post; it should prove unusual, and I might get the handle "King of Junk."

The *"Radio Beginner's Course"* is OK but didn't have to begin so near the beginning. The *"Television Course"* is just what the doctor ordered! You must have heard me getting all set to kick up a yowl for just such a course.

Your list of *World Short Wave Stations* is very useful and well set up. I have one or two items for your FB "Radio Kinks" page and will send them in shortly, and may also make use of your "Question Box" department.

"Barter and Exchange" is a swell idea! I have already used this and I got what I wanted, and also an interesting and helpful correspondent. On the last pages I find another good idea, the listing of free catalogs and index to all advertisers.

There you are—my criticism and stuff. If you have read this through without skipping, you deserve a raise!

Thomas D. Grant,
Lumby, B. C., Canada.

CWL's Can Help

Editor,

In the June Radio & Television appeared a letter from Jack Gant, W5EGR, who, in my opinion, very capably answered "SWL Punk's" letter of the February issue.

To begin with, I am not yet a licensed amateur but am working to attain that rating. I do spend considerable time on the C.W. Ham bands, receiving answers from a little better than 50% of the cards written—a better average perhaps than most phone SWL's can boast of. I have written to only one station I haven't copied code from, and that was a phone several hun-

(Continued on page 237)

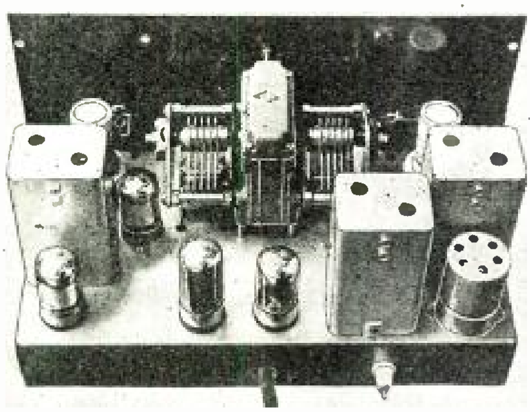
The LT-6 "loktal" receiver provides good all-around reception.

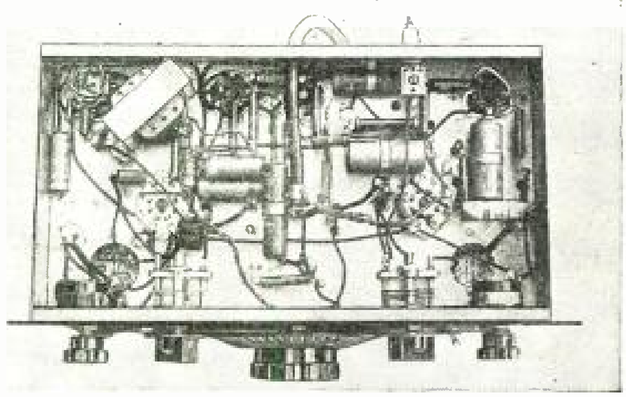
Harry D. Hooton, W8KPX

BUILD the LT-6

● THE new type of construction embodied in the recently released "loktal" tubes makes them especially interesting to the ham or short wave experimenter. It consists of an all-glass tube without the familiar bakelite base. The contact pins are sealed in the glass bottom, thus eliminating soldered connections.

The "loktal" arrangement provides compactness, suitable shielding and a lock-in feature as well as the single-ended type of construction which eliminates the top grid cap. The lower portion of the tube is fitted with a metal shell and guide pin. This unit acts as a shield and makes possible the lock-in feature by employing a groove around the bottom of the locating pin which fits into a catch on the socket. The locking arrangement holds the tube tightly in the socket, assuring good contact at all times. The tubes cannot be removed by a direct, upward pull. By using a slight off side pressure, the socket lock releases and the tube is easily removed.





The three photos at the left show front, rear and bottom views of the LT-6 receiver. This set will be found very useful by both Hams and Fans, plenty of bandspread being provided by the National dial and tuning unit.

Six Loktal Tubes Used

The superheterodyne receiver to be described in this article uses six of the new "loktals" and is designed especially for these tubes. As shown in Fig. 1, the line-up is as follows: A 7A8 semi-regenerative mixer, a 7B7 high-frequency oscillator, a 7B7 460 kc. I.F. amplifier, a 7C6 detector, A.V.C. and first A.F. amplifier, a 7B5 output and a 7B7 beat frequency oscillator The electrical characteristics of these tubes are similar to the older types 6D8G, 6S7G, 75 and 41 but are considerably more efficient

As the photographs show, the receiver is constructed around the National PW-2 tuning unit and iron-core, air-trimmed I.F. transformers. The plug-in coils are wound on one-inch isolantite forms for the 10, 20 and 40 meter bands and all losses have been reduced as much as possible. The mixer circuit is made semi-regenerative, just enough feedback being used to boost the sensitivity and the image selectivity. The resistor "R" across the 7A8 cathode coil is used to level out the regenerative effect over the entire tuning range of each set of coils. It is placed inside the mixer coil forms down close to the cathode pins. The exact value depends somewhat upon the frequency band in use and the number of turns in the feedback coil, and may vary from 1,000 to 5,000 ohms; usually, however, a value of about 2,000 ohms will be satisfactory for all bands.

"Unusual Band-Spread" Provided

It is interesting to note the amount of band-spread that can be obtained with the National dial and the 50 mmf. double-spaced tuning condensers. The dial which is of the micrometric type reads direct to one part in 500. The division lines are approximately ¼-inch apart. The dial revolves ten times in covering the tuning range, and the numbers visible through the small windows change every revolution to give consecutive numbering by tens from 0 to 500. The tuning condensers used in this particular unit are of special construction, 50 mmf. per section and double spaced. The spread on the 14 and 28 megacycle bands is about seventy-five degrees; on the lower frequencies the amount of spreading increases until almost two hundred degrees is obtained on the 80 and 160 meter bands.

The actual construction of the receiver is not at all difficult. Lay out the panel and chassis as shown in Fig. 2, making certain that the dimensions are exactly as indicated. The tuning unit is mounted first, with the mixer and oscillator tube sockets next in order. The sockets should be placed in the position which will permit short, direct wiring between the various parts of the R.F. circuit. The R.F. and I.F. bypass condensers and the fixed resistors are mounted either on the parts themselves or on small insulated mounting lugs, as close as possible to their respective circuits.

This interesting superhet receiver uses six of the new "loktal" tubes, and among the features incorporated are a semi-regenerative mixer and a beat-frequency oscillator. Coil data is given for the following bands: 10, 20, 40, 80 and 160 meters.

"Loktal" Receiver *for the* HAM OR FAN

Keep the wiring, especially the "hot" I.F. and R.F. grid and plate leads, as short and direct as possible. It may be necessary to shield some or all of the I.F. leads, as indicated by the dotted lines in Fig. 1, in order to prevent oscillation at this level. Due to the extremely high gain of the National iron-core I.F. transformers, a high noise level may be encountered when the trimmers are "peaked" for the maximum signal output. In most cases this condition can be entirely eliminated by careful shielding, without affecting the gain in any way.

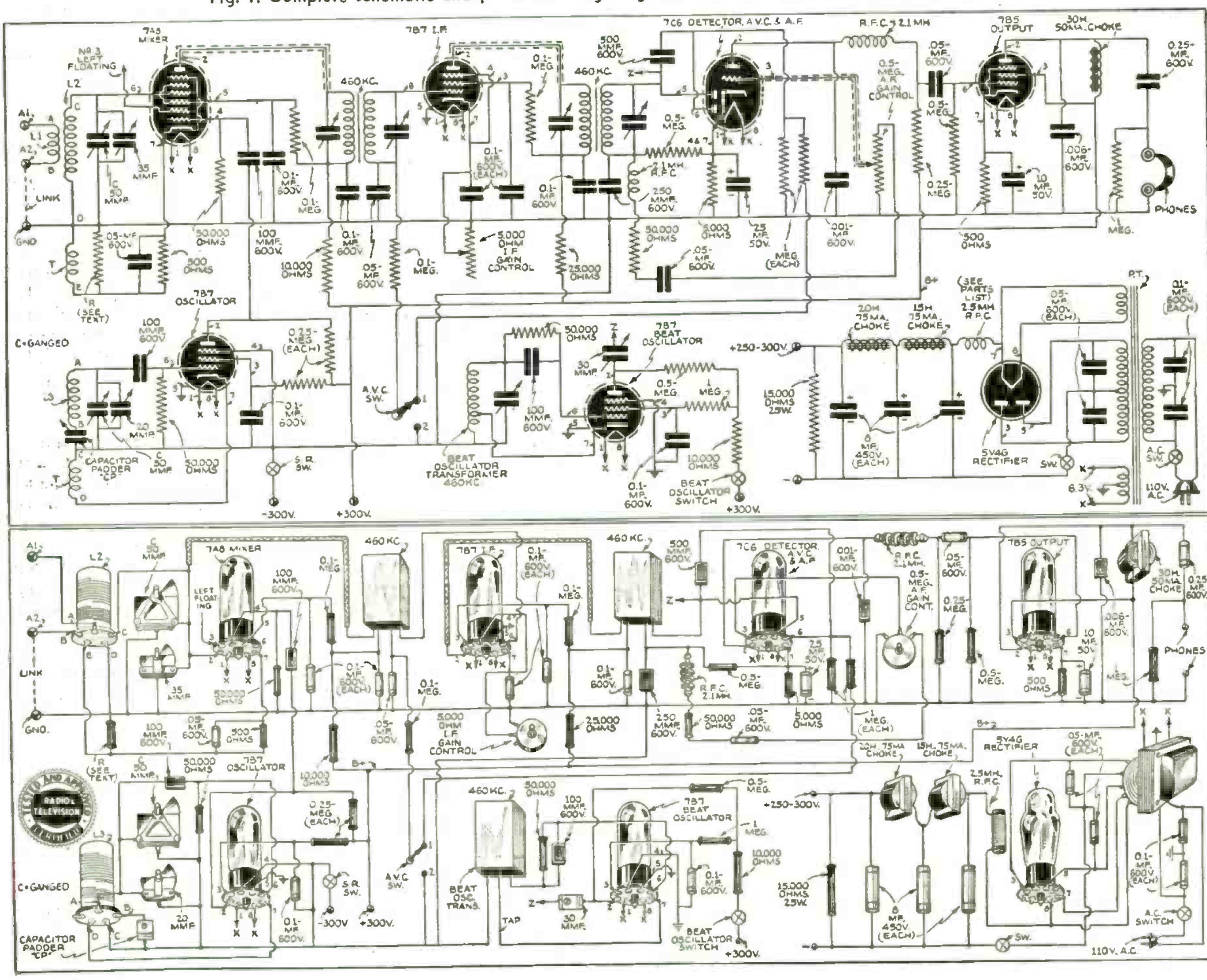
Aligning I.F. Stages

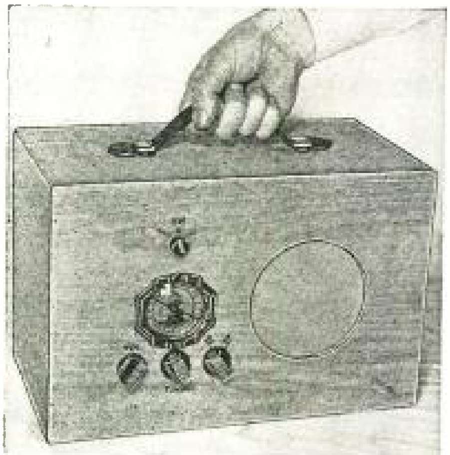
If possible, use a good test oscillator for the alignment of the I.F. circuits. The procedure is quite simple: Disconnect the grid lead from the 7A8 mixer by removing the plug-in coil and turning the tuning condenser plates all the way out. Feed the 460 kc. test signal to the mixer input by making a connection to the fixed plates of the mixer tuning condenser. If the signal can be heard in the speaker or headphones, adjust each I.F. trimmer for the maximum signal output. If the signal becomes very strong, adjust the attenuator of the test oscillator for a weak signal. The weakest signal that can be heard in the phones or shown on an output meter will give the most accurate alignment.

In lieu of a test oscillator and output meter, the following alignment procedure may be used: Place a set of coils in their sockets, preferably those covering the 40 meter amateur band.

(Continued on page 243)

Fig. 1. Complete schematic and pictorial wiring diagrams for the LT-6 receiver are given below.





Front view of the set that gives you radio wherever you go.

You Can Easily Build This

2-Band Vacation

No plug-in, no aerial, no ground needed in this 4-tube light-weight set, which pulls in stations from 67 to 550 meters.

● AT the "old ball game"—at the summer camp—on the lawn on summer evenings—and as a second set which can be used anywhere (and I do mean *anywhere*) this little set offers an attraction to radio fans that has not been met before in portables.

In size, the set is no larger than many of the A.C.-D.C. midgets, being only 13½ x 8½ x 7½ inches over-all. It has an enclosed loop so that no trailing wires are needed, except where the set is used at locations where the nearest broadcast station is several hundred miles away. The complete set with batteries weighs less than 16 pounds.

Short Waves, Too! And as an attraction to the short-wave fan, it has a *short-wave* band in addition to the regular broadcast coverage of 550 to 1500 kc. The short-wave band covers 1500 to 4480 kc. (200 to 67 meters).

Four Tubes Used: Four tubes of the new 1.4 volt, low filament current series are used. The first is a 1A7G which operates as first-detector and oscillator. The second, a 1N5G, is the I.F. amplifier. The third is a 1H5G diode-triode which fills the three functions of second-detector, A.V.C. and A.F. amplifier, while the fourth is a 1C5G pentode output tube.

The I.F. coils are iron-core units with air-condenser trimmers to give the best possible gain. They are Meissner type 16-6643 input which produces a gain of 77, and a type 16-6645 output, rated at a gain of 105. The oscillator coil is a Meissner type 14-7475, which has the required 2 wavebands.

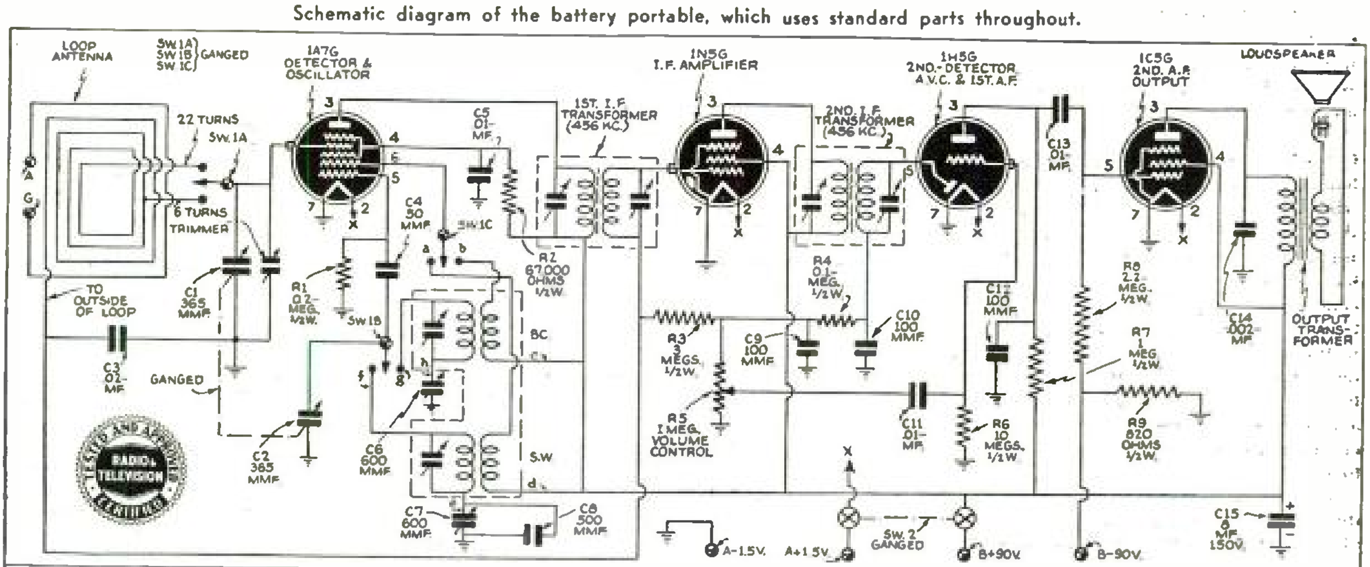
Before beginning assembly, lay out all parts in the order in which they will be used.

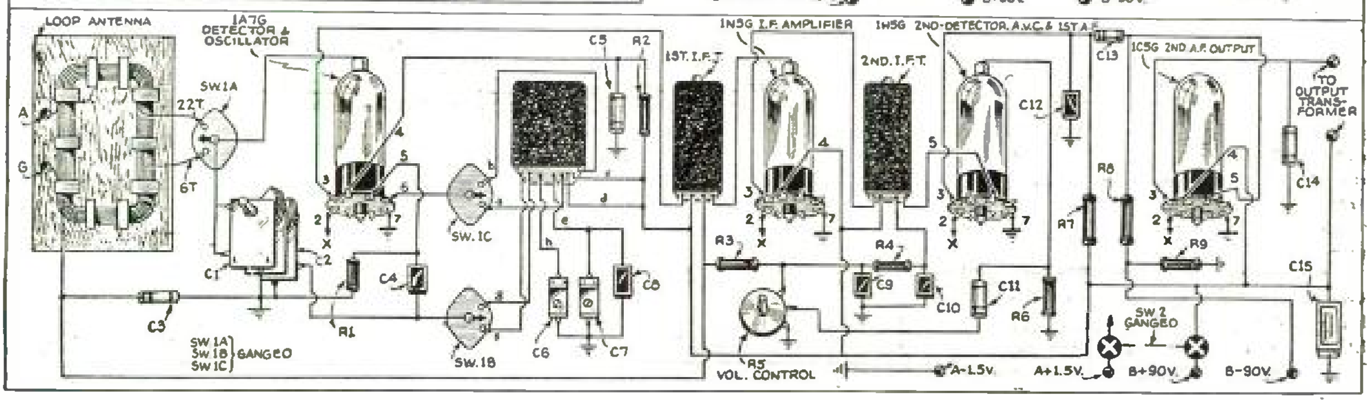
Construction Details

The set is built on an aluminum chassis 6 x 7 x 1¼ in. deep. Positions of the parts can be seen in the photos. In order that the dial may be centered on the front of the case, the variable condenser is mounted on a small "U" shaped aluminum bracket which raises it to the desired height. The wave-change switch and the volume control are mounted on another bracket which puts the tuning, volume and wavechange knobs all in line.

Mount the sockets, coils, variable condenser, dial, padding condenser, volume control and waveband switch in place. When this has been done, the wiring can be started. Leave lead wires projecting for the loop aerial and the batteries. Note that the "A" plus and the "B" plus leads are opened by the switch, so that when the set is turned off, both battery circuits are broken. The

Schematic diagram of the battery portable, which uses standard parts throughout.

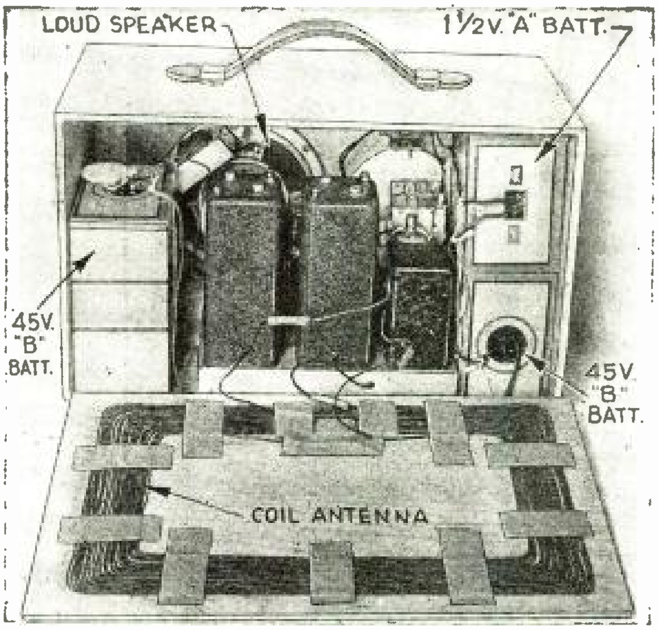




Self-Powered Portable

C. W. Palmer, E.E.

Set with cabinet back removed, showing loop antenna.



bias for the pentode output tube is obtained through the voltage drop in the 820 ohm resistance in the "B" minus circuit. This eliminates the need for "C" batteries.

Loop Aerial: The loop aerial consists of 22 turns of special flexible loop wire wound on the inside of the back of the wooden case. The wire is formed into an oblong shape, starting at 12 x 7½ inches and decreasing to 9 x 5 for the innermost turn. Small brads hammered into the board will hold the wires while winding—they can be removed later. A tap is made at 6 turns from the outside for the *short-wave* band. The outside of the loop is connected to the A.V.C. line. Duco cement and strips of masking tape, or adhesive tape, will serve to secure the loop to the case. When the turns are all in place, one additional turn on the inside is wound to serve as a coupling coil for an outside aerial if one is desired. Two binding posts on the back make contact with this single turn.

The case is constructed of wood ¼ inch thick. This is fastened together with good glue and thin headless finishing nails. The positions of the holes in the front for the 5-inch permanent magnet speaker and the dial and knobs are shown in the detail drawings. A suitable leather carrying handle can be purchased from a hardware or leather-goods shop, or one can be taken from an old traveling case. The latter procedure was used by the writer. The case can be covered with airplane cloth, imitation leather or stained and varnished to suit individual preference.

When the wiring is completed, it is advisable to check all connections thoroughly, because if the "B" voltage is applied to the filament circuit, the tubes will burn out. Try connecting the "A" battery—with all other batteries disconnected—to "B" plus and chassis and look at the tube filaments in a darkened room and note if the filaments light. If they do, when the "on-off" switch is turned on, there is a short-circuit between the "B" and "A" leads and this *short* should be removed before the "B" batteries are connected to the set.

Adjustments

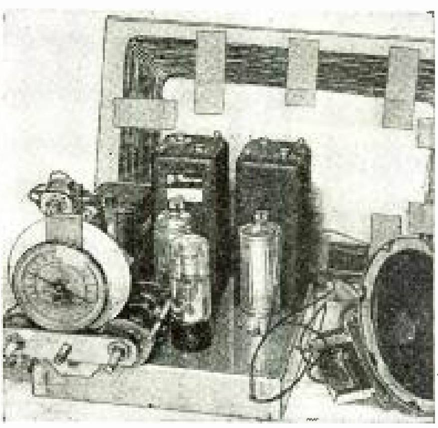
Alignment of the set can best be done with a service oscillator. If one is available, tune it to 456 kc. and align the I.F. trimmers for greatest volume or widest swing on an output indicator. Connect the output of the oscillator to the grid cap of the 1A7G, leaving all connections in place. Next, with the switch in the *broadcast* position, connect the oscillator to the aerial terminal on the back of the loop. Tune the oscillator to 550 kc. and turn the dial to this same point. Then, with the volume control on full, adjust the broadcast padding condenser to the point giving the strongest signal. Finally turn the oscillator and dial to 1400 kc. Then adjust the broadcast trimmer condenser (the lower one) in the oscillator coil can and the trimmer on the tuning condenser to give greatest volume (turn the aerial section only, leave the oscillator trimmer at the lowest capacity position).

This will complete the trimming of the *broadcast* band. Repeat the above to be sure all trimmers are peaked correctly.

Trimming on the *short-wave* band consists of adjusting the padding condenser for this band at about 1700 kc., using a signal

(*Continued on page* 240)

Inside the set. Note compact arrangement of components.



LIST OF PARTS

RCA
1—Type 1A7G tube
1—Type 1N5G tube
1—Type 1H5G tube
1—Type 1C5G tube

I.R.C.
1—1-Megohm volume control
1—0.2 meg., ½ watt resistance
1—67,000 ohm, ½ watt resistance
1—3 meg., ½ watt resistance
1—0.1 meg., ½ watt resistance
1—10 meg., ½ watt resistance
1—1 meg., ½ watt resistance
1—2.2 meg., ½ watt resistance
1—820 ohm, ½ watt resistance

SPRAGUE
1—8 mf., 150 volt electrolytic condenser
3—.01 mf., 600 volt paper condensers
1—.02 mf., 600 volt paper condenser
3—100 mmf. mica condensers
1—50 mmf. mica condenser
1—.002 mf. mica condenser
1—500 mmf. mica condenser

PAR-METAL PRODUCTS
1—Aluminum chassis 7 x 6 x 1¼ inch deep

MEISSNER
1—Type 14-7475 oscillator coil
1—Type 16-6643 I.F. 456 kc. iron core transformer
1—Type 16-6645 I.F. 456 kc. iron core output transformer
1—Type 22-5211 600 mmf. dual padder
1—Type 21-5214 2-section 365 mmf. tuning condenser
1—Type 24-8265 band switch (one section removed)
3—Type 25-8221 knobs

CINAUDAGRAPH
1—5-inch permanent-magnet speaker, Type CA-5-9 with C53 transformer

CROWE
1—Type 380 dial and scale with Type 13312 escutcheon for condenser, with ¼-inch shaft and clockwise rotation for maximum capacity

NATIONAL CARBON CO.
1—"Eveready" Type 741 battery, 1½ volt
2—"Eveready" Type 762 battery, 45 volt

CINCH MFG. CO.
4—Wafer sockets for octal tubes

EBY
2—Binding posts
3—Grid clips

HART & HAGEMAN
1—2 pole, single-throw rotary panel switch

GOAT RADIO TUBE PARTS, INC.
3—Type G1222B tube shields
3—Type G1202 shield bases

CORNISH WIRE CO.
1—Roll No. 18 push-back wire
1—¼-lb. spool special silk-covered loop wire

MISCELLANEOUS
Wood for box, carrying handle, aluminum for brackets, screws, nails, glue, etc.

HAMS, Build This

2½ Meter *Acorn*

Every Amateur Will Find

With two of these highly efficient Transceivers, 2-way phone contact can be established over distances of 5 to 15 miles. Construction cost moderate — wiring very simple — parts few in number.

Extremely neat and highly efficient, this portable phone Transceiver will make many friends.

● NOW that amateurs have been forced off five meters with simple equipment by the new F.C.C. regulations, the only band where conventional circuits may be used in highly compact and lightweight *transceivers* is two and a half meters. At higher frequencies it becomes practically imperative to use linear oscillators and unusual circuits, but on 2½ meters the normal circuits such as were used on 5 meters are still workable and practical.

New Acorn Tubes Used

The recent development of a line of *battery-operated acorn tubes* should give a tremendous boost to all portable ultra-high frequency work. Although this line includes two triodes and a pentode, it is only the former that are of use in the equipment to be described. These tubes operate on 1.5 volts with a filament current of 50 ma. and 100 ma. for the 957 and 958 respectively. Like all acorn tubes they oscillate beautifully at the ultra high frequencies and are not at all fussy to get going.

The use of *acorn* tubes is practically a necessity. With ordinary tubes it is quite possible to get good results with relatively high plate voltages, but with only a limited plate supply and the cramped layout required in a portable rig, the very best pos-

The front panel swings forward on hinges to permit adjusting the coils, etc. The batteries are in the case.

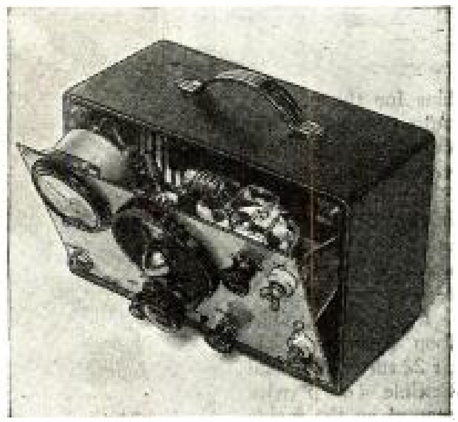
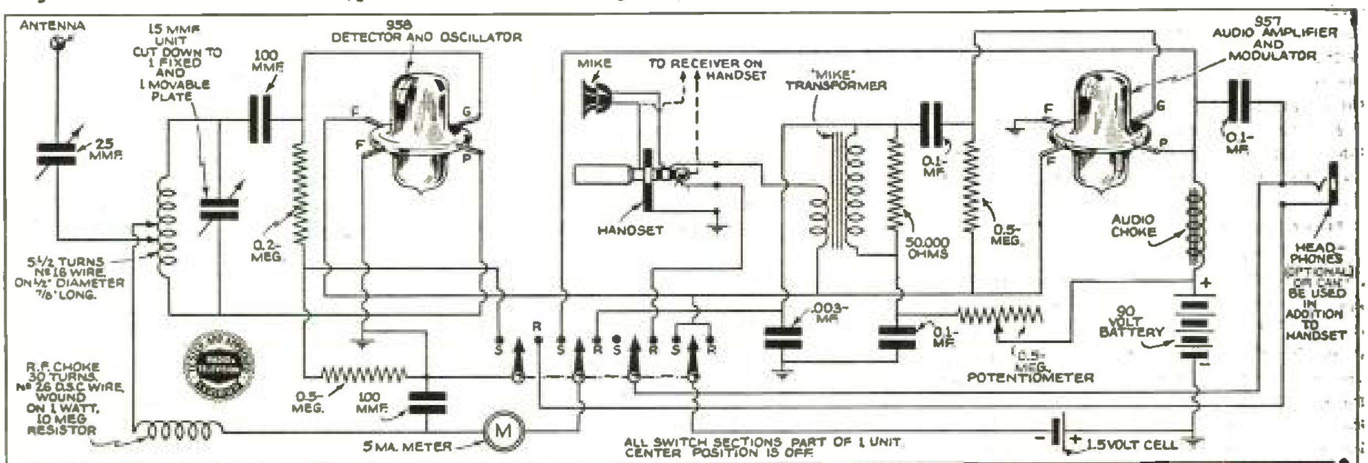
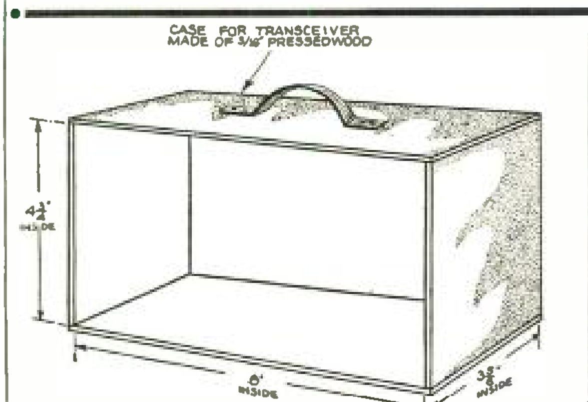
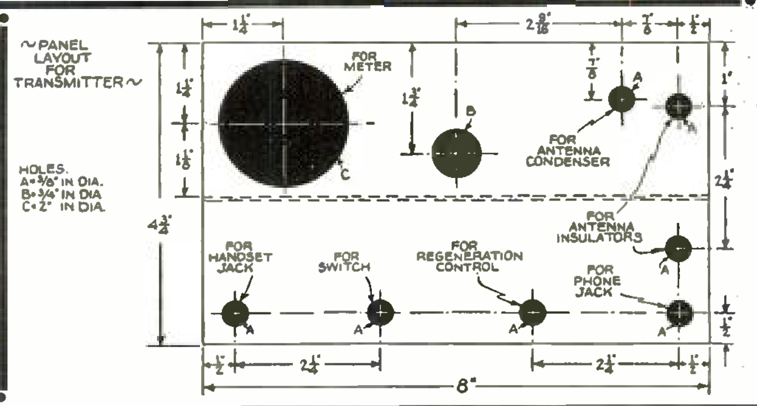


Diagram of connections for the 2½ meter Transceiver. A single 4-pole double-throw switch converts the circuit from "Talk" to "Listen."





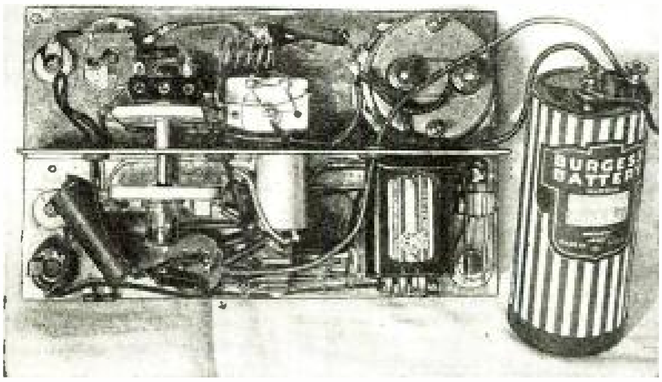


High-Quality

Transceiver

Dozens of Uses For It

Howard G. McEntee, W2FHP



Rear view of the Acorn 2½-meter Transceiver. The batteries are sufficiently large to provide worthwhile service.

sible tubes for the purpose are necessary.

In the *transceiver* to be described, a 958 is used as the detector and oscillator and a 957 as audio amplifier and modulator. The oscillator is a simple single-coil type, while the audio system is one which was quite popular in 5-meter transceiver work, and is particularly interesting since an ordinary mike transformer and audio choke are used, eliminating the need for the usual three-winding coupling transformer.

A single four-pole double-throw switch takes care of all change-over operations, and also acts as an ON-OFF switch.

Handset or Pair of Phones Can Be Used

A close study of the circuit will show that either a handset or a pair of headphones may be used for receiving, or *both* may be used together if desired. When the switch is in "SEND" position, both phone circuits are opened to conserve audio power. Even though these circuits are opened, however, the voice may still be heard well enough for monitoring purposes, due to stray circuit capacities.

The handset uses a three circuit plug; one lead of the receiver and one of the microphone are common. If another microphone with the ordinary two-circuit plug is to be used, the plug is inserted in the handset jack so that only the first spring of the latter is contacted.

The smallest possible parts are used throughout to conserve space. The batteries are not the smallest available, but are very compact and give surprisingly long service.

Details of Home-Made Case

The case is made entirely of 3/16" tempered pressed-wood which is fastened at the corners with duco cement and small wood screws carefully tapped in place. The screws serve mainly to hold the parts in place while the cement is drying.

The back is removable to facilitate battery changes, and the front panel is hinged at the bottom so that the coil and antenna tap may be easily reached. Two thumbscrews at the top corners of the panel are removed to allow the latter to swing outward.

After the case has been made and all sides sanded, it is given two coats of clear lacquer with a sanding between. The surface is rubbed with powdered pumice after the second coat and then given a good rubdown with furniture wax. This gives a very tough, smooth surface.

In addition to those on the panel, many of the parts are mounted on a sub-base or chassis of aluminum. This is mounted just high enough so that the lugs of the audio choke do not touch the inside of the case.

The tuning condenser is fastened to the chassis by means of a small bracket and the two tube sockets are both mounted with a single pair of long screws which pass through the chassis.

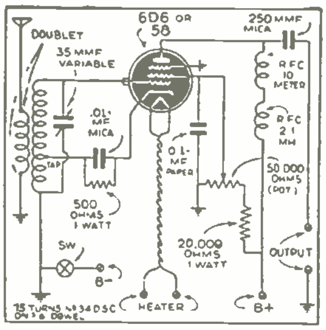
Placement of other parts may be seen from the photos. If any parts of different make are substituted for those listed, it may be necessary to alter the layout or change the size of the case. Should such alteration be made, be sure all parts will go in the space allowed before constructing the case.

The coil is wound as specified on the circuit, while the R.F. choke is made by winding 30 turns of No. 26 D.S.C. wire on a one-watt insulated resistor. It is supported by pigtails.

The antenna usually employed with the

(*Continued on page* 244)

Question Box



Hook-up of 1 tube Pre-Selector Circuit; Plug-in coils cover all bands. No. 1190.

Data on Pre-Selector

I would like to construct a regenerative pre-selector to be used with my present receiver and one which would take in the 160, 80, 40, 20 and 10 meter bands. Can you publish a diagram of such a unit with complete constructional data?—L. K. Kelly, San Francisco, Cal.

A. Here is a diagram with complete technical data on an R.F. regenerative pre-selector designed to cover most of the bands as requested. The unit makes use of a 6D6 tube or one similar, with cathode regeneration and screen grid voltage control of regeneration. The grid is tuned to the desired signal and a slight amount of regeneration is introduced by tapping the cathode ¼ to ¾ of a turn from the grounded end of the coil in the tuned circuit. A potentiometer varies the screen voltage from zero to approximately 100 volts, thus smooth control of regeneration and volume is available. A very important feature of this unit is the variable antenna coupling system which can be adjusted to suit various conditions and receiving antennas. Should a strong signal be bothersome, a mere turn of the antenna coupling primary coil will bring in the desired weak signal.

The coils are wound on 4-prong plug-in coil forms. The grid end is at the bottom and the ground end at the top. This method minimizes capacity coupling to the grid of the R.F. tube.

For 160 meters	80 turns No. 30 enameled wire close-wound with tap ¾ of a turn from ground end.
For 80 meters	40 turns No. 24 DSC wire close-wound with tap at ½ turn.
For 40 meters	23 turns No. 18 DSC wire close-wound with tap at ¼ or ½ turn.
For 20 meters	12 turns No. 18 DSC space wound to cover 1¼ inches of winding length with cathode tap at ¼ turn.
For 10 meters	5 turns No. 18 DSC space-wound to cover 1 inch with tap at ¼ turn.

With loose antenna coupling the R.F. pre-selector should oscillate when the regeneration control is turned toward the higher screen voltage.

2½ Meter Transceiver

I intend to construct a 2½ meter transceiver, battery operated for use in our summer camp. If possible, could you supply a diagram with the needed data for its construction? K. L. Peters, Nyack, N. Y.

A. In the July "Question Box" is shown a diagram with complete data for just such a unit. Write to our circulation department for a copy of that issue. Also see page 226 this issue.

Data on U.H.F. Transmitters

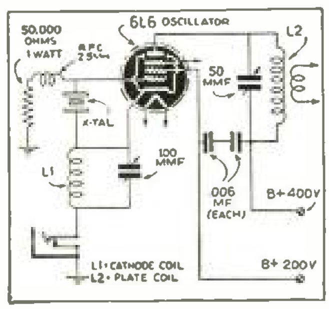
Being a recent owner of an ultra-high frequency receiver, I heard two stations, the location of which I would like to know. They are W2XUP and W2XDV. C. M. Belittle, Brooklyn, N. Y.

A. W2XUP is the experimental facsimile transmitter of WOR located atop 1440 Broadway in N. Y. City. It operates on a frequency of 25.7 megacycles and is on the air with daily transmissions from 4 to 6 p.m. W2XDV is a general experimental station and is located atop 485 Madison Ave. It broadcasts CBS network programs from 5 to 9 p.m. daily and operates on a frequency of 31.6 megacycles.

Principle of Facsimile

Can you advise one of your ardent readers what the principles of facsimile broadcasting are and can a recorder be had to operate from the D.C. lines?—Larry Hamsley, New York City.

A. The principle of facsimile broadcasting is briefly as follows: The material to be transmitted is "scanned" much as the human eye scans a page of reading matter, at a rate of 100 lines to an inch, and one inch per minute, by a minute spot of light, which registers light, dark or medium impulses upon a photo-electric cell. These impulses are transmitted by radio to this "printer-receiver." Here an arm, exactly synchronized with the scanner and equipped with a stylus, moves over a special paper. A dark impulse will press down the stylus, bringing through a black impression, a light impulse will leave the paper its natural color, and the medium impulses will bring out varying shades of grey. In this way, an exact facsimile of the original transmitted material is built up *line by line*. Listeners operating from farm lighting plants or batteries or direct current may receive copy with equal facility as their city cousins.



A crystal-controlled 6L6 oscillator circuit for Transmitter. No. 1191.

6L6 Oscillator

I plan to rebuild my transmitter and, in place of using a 42 or 59, intend using the 6L6. Can you show by diagram a circuit for such a tube when used as an oscillator? K. Kitery, Detroit, Mich.

A. The 6L6 makes a far more effective oscillator than either the 42 or 59 type tubes. The actual cathode tuning capacity should be at least 100 mmf. for high output and moderate crystal current. Too low capacity in this circuit will often result in fractured crystals.

The cathode circuit is tuned to a frequency about 50% higher than that of the crystal in the triode section and the system oscillates at the crystal frequency. The large tuning condenser in the cathode provides a cathode by-pass condenser for the second harmonic to which the plate circuit is correctly tuned with low C-to-L ratio in its tuned circuit.

6L6 Coil Data
All coils wound on 1½-inch diameter forms.

	L2	L1	Crystal
80 meters	38 turns No. 18 enam. close wound	25 turns No. 22 DSC 1½ inches long	160 meters
40 meters	20 turns No. 18 enam. 1½ inches long	12 turns No. 18 enam. 1½ inches long	80 meters
20 meters	9 turns No. 18 enam. 1¼ inches long	7 turns No. 18 enam. same	40 meters

Adding Switch

Would you recommend the use of a switch in my televisor so that I could receive the sound program only when I am not interested in the vision end of it?—Jack MacGregor, Tulsa, Okla.

A. Yes this can be done very easily and economically. However, if one is not familiar with television receivers it would be best to have a serviceman do the job. Such a switch should be placed in the part of the 110 volt line leading to the primary of the high voltage transformer. Or just turn "brightness control" down.

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

Beyond the Last Wave Bands

Dr. D. L. Webster

(Continued from page 197)

vision also spread around obstacles to some extent, though not so well around big ones.

Even light, in fact, spreads around obstacles if they are small enough; but exactly as with radio waves, the size of the obstacle must not be too great in comparison with the wavelength. This sort of spreading of light waves is indeed the evidence from which we calculate their wavelengths; but we do not notice the spreading unless we look for it very carefully or with nearly microscopic obstacles.

For our present purpose, however, it means this: *The shorter you make the wavelength, the less the waves will spread around any given obstacle.*

At first sight, this fact might look like an argument against using very short waves. And it is, indeed, a definite reason for not using them for ordinary broadcasting, where most of us are so located that the only waves we can receive are those which have spread around hills or houses. But for other uses, very short waves are exactly what we want.

One such use, in which these waves have just recently been tested for the first time, is for *landing airplanes in a fog.* When the pilot of an airplane can see the ground, light waves received by his own eyes are his best guides into the airport. But when the fog rolls in, the next best guides are the radio waves that most closely resemble light and yet penetrate fog. Fortunately, radio waves do penetrate fog and rain when they have any wavelength down to about 5 centimeters, or 2 inches. The shortest of these fog-penetrating waves are still quite different from light, but their wavelength is short enough so that they go almost as straight past some obstacles just not too big to handle. Such waves, therefore, can be sent out almost like the light from a searchlight. In this way they can mark out a straight line inclined slightly upward from the airport, and a pilot receiving these waves can use this line to steer his plane home through any fog.

Receiving these waves! That is good—but possible only when there are such waves to be received, and practical only when the messages carried by these waves can be understood quickly. Strange to say, the means for quick understanding was invented before the means for sending and receiving the waves.

Irving R. Metcalf, of the Civil Aeronautics Authority, a few years ago, realized that such waves would be the only solution of the problem of *blind landing,* and felt sure that somebody would invent means for sending and receiving them; but he also realized that if the pilot had to read several instruments at once, and translate their figures into knowledge of his position, it would be very difficult for him to act quickly enough for safety when close to the ground. It would be much better, Metcalf thought, if we could have the radio waves make the instruments project a sort of moving picture of the airport, so that the pilot could watch the picture and imagine himself looking right through the fog at the airport itself. So Metcalf devised a very ingenious arrangement of lights on the field, to be represented in such a movie; and research workers at Massachusetts Institute of Technology, led by Professor E. L. Bowles, discovered a way to make the instruments really show the movie—provided they had the ultra-short radio waves to tell the instruments what to show. All was ready but the waves.

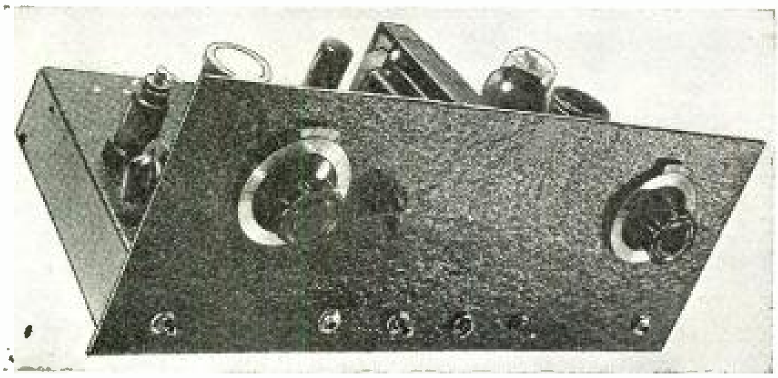
Other aviators also had faith in ultra-short waves, among them Captain Sigurd F. Varian of Pan-American Airways. Looking for a source of such waves, he inquired of his brother, Russell H. Varian, a television engineer and a graduate of Stanford University.

Meanwhile, at Stanford University, Professor William W. Hansen had been interested in a wholly different problem, that of smashing atoms by extremely high voltages, as a purely scientific research, with no idea of direct application. In this research, a part of his apparatus was an electrical resonant circuit of a new type, having an unprecedentedly high efficiency, which he had discovered and had named the *Rhumbatron.* The Varian brothers, hearing of Hansen's Rhumbatron, saw in it a prospect for the solution of their problem. There was as yet no means of using the Rhumbatron at the ultra-high frequencies required for ultra-short waves, but it looked hopeful. So they came to Stanford.

At Stanford, Russell Varian made a brilliant invention. He put to use a pair of little Rhumbatrons and some accessories in a new device which he called a "Klystron." This was first put into practical form by Sigurd Varian, and then it was developed further by the Varians and other research workers at Stanford. Coming to the attention of Metcalf and the research workers at Massachusetts Institute of Technology, the Klystron proved to be exactly what they wanted.

As a result of cordial cooperation in this research, at last a radio searchlight shot its invisible beam on an upward slope from a runway at Boston Airport, and an airplane far away picked up the beam and flew in on a straight line marked out by it.

Beyond the last wave bands, then, what we shall find is a different kind of radio, enabling us to do what could not be done before.



The beginner in Amateur Radio will find many good features in this 25-watt crystal-controlled CW Transmitter and 2-tube regenerative receiver. It is available in kit form and is simple to assemble.

Front view of Transmitter-Receiver, which will interest every beginner in the Amateur Radio Game.

D. L. Warner
W9IBC

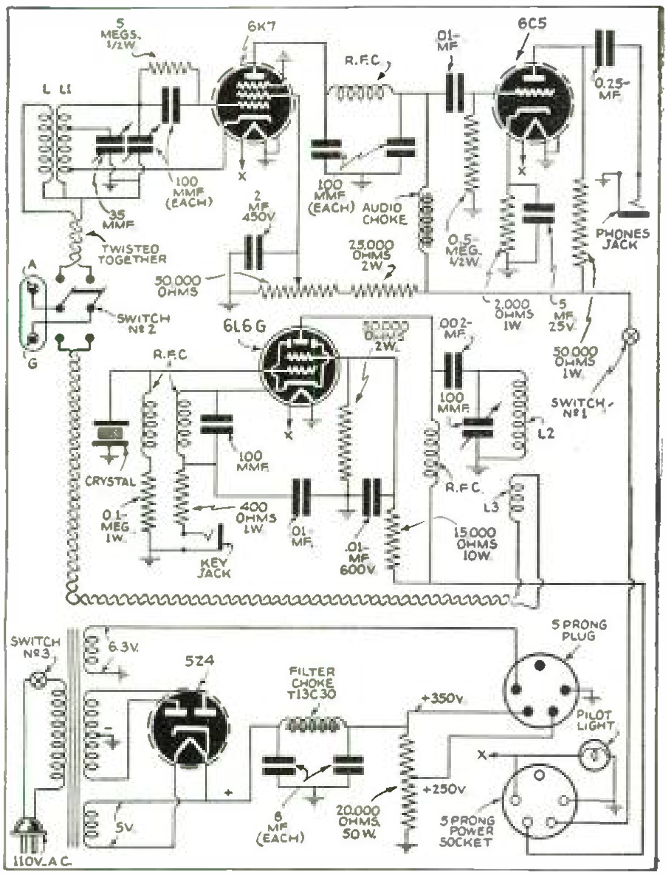
Xmitter-Receiver for the HAM Beginner

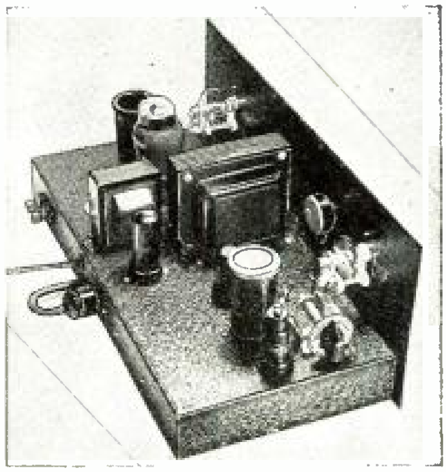
● THIS kit has been designed to provide the Ham beginner with one complete unit consisting of a two-tube Autodyne regenerative *receiver*, a 25-watt crystal-controlled CW *transmitter*, and one power-supply which will operate either the receiver or transmitter unit. All three sections are built on one metal chassis and panel, providing a compact unit which is, in itself, a complete amateur station, requiring no accessories other than an antenna, a pair of headphones, and a transmitting key.

In assembling the various parts on the chassis and panel, it is important that you follow a definite method of assembly in order to secure the best operating performance from the completed unit. First mount the front panel on the chassis by inserting the various switches and jacks through the proper holes in the chassis and through the front panel. When these units are tight in place, they will securely hold the front panel to the chassis.

The next operation is to mount all tube sockets on the metal chassis, and then, turning the unit right side up, mount the various receiver parts such as the tuning condenser, etc., on the top of the metal chassis and on the front panel. Then mount the power transformer and filter choke for the power supply section on top of the metal chassis in their proper positions, and follow that by mounting the tuning condenser for the transmitter section on the front panel in its proper place.

Hook-up of Beginner's Transmitter-Receiver.





Rear view of Transmitter-Receiver.

After all large parts have been mounted, you are ready to start the actual wiring. Refer to the photograph of the bottom of the unit, and carefully follow the placement of parts. You will find that many of the smaller parts may be mounted directly in position by means of their own wire pigtail leads. In wiring both receiver and transmitter sections keep all leads as short as possible, making all connections from point to point.

The *band-setting* condenser on the left end of the chassis just behind the front panel should be mounted by means of two of the small isolantite stand-off insulators which are supplied with the tube sockets. The small 2" bronze dial plate mounts directly on this band-setting condenser by means of the lock nut, which would ordinarily hold this condenser to the panel. This dial provides a convenient reference point when changing the receiver from one frequency band to another.

Note that all leads from the power-supply section go through the short piece of five-conductor cable and terminate in the five prong plug. This plug should then be inserted in the five prong socket at the rear of the chassis; filament and plate voltage leads for the receiver and transmitter circuit all come from this power socket.

If it is ever desired to operate this unit at points remote from the regular 110-volt A.C. power lines, the power cable plug can be pulled out of the power socket.

(*Continued on page* 241)

New HAM Licenses

COMPILED FROM THE LATEST RECORDS OF THE FEDERAL COMMUNICATIONS COMMISSION

THERE are now approximately 50,000 licensed radio amateurs in this country. And dozens of new amateurs are being licensed every month.

Heretofore no publication has listed the names and addresses of the new licensees as issued. RADIO & TELEVISION Magazine now provides this unique service, and publishes a list of newcomers in every issue. Check the names carefully so that you will be able to get in touch, not only with amateurs in your neighborhood and vicinity, but also with those distant amateurs whom you wish to contact either by mail or by radio.

This list contains 266 names of newly licensed amateurs. YLs' names appear in blackface type.

K6HOT James E. Keefer, 475 Lau Kapu, Hilo, T. H.
K6RNX Teruo H. Arakaki, 1030 Akapahulu, Honolulu, T. H.
K6RNZ Kenneth N. Hanks, Waimanalo, Oahu, T. H.
K7HPL Irene Schaeffer Smith, Tanana, Alaska.
W1AUE Harry Olin Groves, 32 Hope Ave., Concord, N. H.
W1BGH Robert W. Kingman, Purchase St., S. Easton, Mass.
W1MBI Walter Wm. Knowles, Jr., 11 Pearl, Liverpool Falls, Me.
W1MBS Stanley F. Brigham, 63 Oriole, West Roxbury, Mass.
W1MBT Eugene E. Camerlin, 50 Linden, Chicopee Falls, Mass.
W1MBU Anthony Henry Cipolle, 2 McTurs Court, West Warwick, R. I.
W1MBV Julian Hamilton, 245 Cabot St., Beverly, Mass.
W1MBW Donald A. Sturgeon, 59 Summer St., Bristol, Conn.
W1MBX Francis E. Berry, 71 Aldie St., Boston, Mass.
W1MBZ William Henry Draimond, Jr., 68 Eleanor, Chelsea, Mass.
W1MCA William O. Hamlin, 194 Plymouth, Stratford, Conn.
W1MCB Harry H. Handfield, 13 Norton, Nashua, N. H.
W1MCC William G. Knonos, 28 Eden, Salem, Mass.
W1MCD Michael A. Limanni, 115 Garden, Lawrence, Mass.
W1MCE Paul M. Erlandson, M.I.T. Dormitories, Cambridge, Mass.
W1MCF Albert H. LaFleur, Camp S-82, W. Townsend, Mass.
W1MCG Edward R. Patacchiola, 5 Elston, Somerville, Mass.
W1MCI Frank G. Boston, 211 Roslindale Ave., Roslindale, Mass.
W1MCJ Robert E. Prigger, 277 Pine St., South Weymouth, Mass.
W1MCK James E. Farley, 39 Plummer Ave., Lowell, Mass.
W1MCL Edward J. Rice, 19 Willow, Whitinsville, Mass.
W1MCM Forrest J. Rye, 8½ Stark Ave., Dover, N. H.
W1MCN Robert W. Greene, 110 Laura, Providence, R. I.
W1MCO Douglas H. Hickox, 189 W. Center, Manchester, Conn.
W2BKO Emil J. Sibi, 265 New York Ave., Union City, N. J.
W2LEX Willard I. Rogers, 137 Kensington Ave., Jersey City, N. J.
W2IVX Fred John Kienzle, 15 Ridgewood Place, Brooklyn, N. Y.
W2MGF Richard Allen Jensen, 69 Kempton Place, Metuchen, N. J.
W2MGI Edward M. Coan, 76 Elm St., Montclair, N. J.
W2MGJ Rudolph John Brossmann, 291 Wardwell Ave., Westerleigh, L. I., N. Y.
W2MGK Paul Joseph Barczik, 769 Park Ave., Brooklyn, N. Y.
W2MGL Milton J. Schreiber, 806 Pennington St., Elizabeth, N. J.
W2MGM Robert E. Lee, 640 W. 139th St., New York, N. Y.
W2MGN Charles Spreeman, 9430 54th Ave., Elmhurst, L. I., N. Y.
W2MGO Victor F. Suel, 401 E. 71st, New York, N. Y.
W2MGP George Shaler, 2332 E. 19th St., Brooklyn, N. Y.
W2MGS Andrew Mehalko, Oceanport Ave., Oceanport, N. J.
W2MGT Leo P. George, 1717 78th St., Brooklyn, N. Y.
W2MGU Douglas J. Johnson, 526 W. 133d St., New York, N. Y.
W2MGU Charles P. Stenger, 116 Gotham Ave., Brooklyn, N. Y.
W2MGW John F. Uliet, 25 Elizabeth Ave., Cranford, N. J.
W2MGX Louis Weber, 256 Snediker Ave., Brooklyn, N. Y.
W2MGZ Kenneth Everhart, 3613 Ave. D, Brooklyn, N. Y.
W2NHA Arthur M. Peterson, 167 Midland Ave., Grant, N. Y.
W2MHB Everett J. Althoff, 98 22d St., Kenilworth, N. J.
W2MHC Vincent S. Dembowskve, 420 42d St., Brooklyn, N. Y.
W2MHD Vester H. Thurmond, 320 W. 96th St., New York, N. Y.
W2MHE Frank V. Pacier, 140—54 Queens Blvd., Jamaica, L. I., N. Y.
W2MHG Herman W. Grissler, 64 Morgan Place, North Arlington, N. J.
W2MHH Joseph J. Jeransky, 72 Hallock, Farmingdale, L. I., N. Y.
W2MHI Gerald O'Brien, 71 Bayview Ave., Jersey City, N. J.
W2MHJ John R. Nelson, 6 Burnet, Maplewood, N. J.
W2MHK Samuel G. Nelson, 6 Burnet, Maplewood, N. J.
W3DUG William H. Guerrant, 927 Tazewell Ave., Roanoke, Va.
W3HY John Nathan Boland, Mews Ferry, Va.
W3IFB Lawrence W. Bullock, Washington Blvd., Halethorpe, Md.
W3IFD John Jasper Kimball, 319 Tennessee Ave., Washington, D. C.
W3IFF Marion Paschal Shorb, 319 13th St., S. E., Washington, D. C.
W3IFI Rudolph F. Brandt, 2913 Diamond St., Philadelphia, Pa.
W3IFJ Robert W. Vernon, 1120—26th St., Newport News, Va.
W3IFK Alvan S. Goodman, 1610 N. Payson St., Baltimore, Md.
W3IFL Jiles W. Collins, Main St., Marion, Va.
W3ZZZ Roland O. S. Akre, Saxis, Va.
W4BLV John J. Ross, 201 Green, Robersonville, N. C.
W4GCQ Robert Bovd Wilds, 605 E. Walnut St., Decatur, Ala.
W4GCU Richard Gould Bullock, 118 Turtle Ave., Bennington, Ala.
W4GCV Julius T. Weidlich, 1936 North 10th Ave., Pensacola, Fla.
W4GCW Newell E. McCombs, New Airail Mt., 1 mile N. of Easley, S. C.
W4GCX Howard H. Rowe, 315 S. E. 5th Ave., Ft. Lauderdale, Fla.
W4GCY Leslie E. Thompson, 17 S. Catherine St., Mobile, Ala.
W4GCZ George E. Myrick, 1461 Brown St., Mobile, Ala.
W4GDD Samuel T. Davenport, 800—17th, Phenix City, Ala.
W4GDC Earl C. Pritchard, 303 Woodland Ave., Homewood, Ala.
W4GDF Heber R. Adams, 14th and Glen Arthur, Greenville, N. C.
W4GDI Lawrence E. Victor, 1320 S. Oak, Memphis, Tenn.
W4GDH Robert W. Townsley, 324 N. Willett, Memphis, Tenn.
W4GDJ John W. Goodwin, 404 N. Appletree, Dothan, Ala.
W4GDK James R. Garner, 407 W. Washington, Dothan, Ala.
W4GDL Stanley D. Stearns, 77 N. W. 48th St., Miami, Fla.
W4GDM Donald H. Drennan, 828 Forrest Rd., Columbus, Ga.
W4GDN Johnnie R. Edmondson, Robersonville, N. C.
W4GDO James C. Handey, 410 LeBron Ave., Montgomery, Ala.
W4GDP William H. Small, 190 N. Oak, Bartow, Fla.
W4GDQ Alvin F. Badgett, 1820 Highland, Knoxville, Tenn.
W4GDR Claude V. Holland, Teacheys, N. C.
W4GDS Samuel F. Hubbard, 2269 York St., Memphis, Tenn.
W4GDT Joseph W. LaFrange, 2780 Mt. Brook Parkway, Birmingham, Ala.
W5AAZ John G. Clark, 126 Main, Uvalde, Tex.
W5BCZ Jewel Lee Sikes, R. F. D. No. 3, Little Rock, Ark.

(Continued on page 233)

SEE PAGES 242 AND 249 FOR SPECIAL SUBSCRIPTION OFFERS!

NEWEST RADIO APPARATUS

Receiver with B.C. and 13 to 49 Meter S-W Range

● AVAILABLE in two models, the new RCA Victor de luxe table model radio is housed in an ultra-modern style molded plastic cabinet and provides domestic, foreign, police, aviation, and amateur reception. Incorporating radically new circuit design, this powerful instrument has exceptionally high sensitivity and combines outstanding performance with distinctive appearance. Other features include 5" high-sensitivity electro-dynamic

loudspeaker; vernier tuning; edge-lighted, angle-vision, straight-line dial. Tuning range is 540-1720, 2300-7000, 7000-22,000 kcs., providing domestic broadcasts and foreign short-wave reception on the 49-, 40-, 31-, 25-, 19-, 16- and 13-meter bands, plus police, aviation and amateur calls. This set is available in two colors—mottled brown and ivory.

Paper-Wound Replacements for Electrolytics

● TO meet the occasional demand for paper-wound replacements for metal-can and card-board-case dry electrolytics, two new condensers have been announced by Aerovox Corporation.

The PWC series, matching in size and shape the dry electrolytic metal-can condensers, is available

in three types replacing the 4-600, 8-600 and 8-8-600 electrolytics, with actual capacities of 2.0, 2.75, and 1.75-1.75 mf., respectively. The PWP series matches the cardboard-case dry electrolytics of 4-600, 8-600 and 8-8-600, with actual capacities of 2.0, 3.0, and 2.75-2.75 mf. These paper replacement units have extremely low power factor and leakage. No polarity need be observed.

Visual Freq. Meter

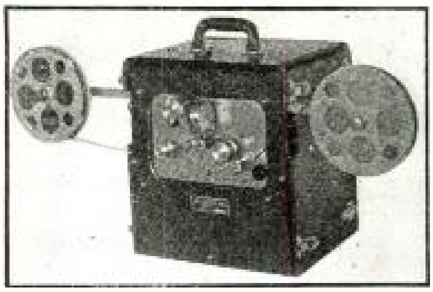
● AN amateur Visual Frequency monitor and deviation meter has been recently announced by the Browning Laboratories. It is so designed that amateur bands are spread over approximately 240 degrees on a 5½" laboratory type dial calibrated in megacycles. The circuit devised makes it possible to check various points in each amateur band against WWV's frequency. An electric eye is used as an accurate zero beat indicator. This frequency monitor can be set to a precision of at least two parts in 70,000.

Records Sound on Film

● AN ideal device for the man who wishes to keep a permanent record of all DX work or QSO's, is the model BBA Filmgraph. This ingenious apparatus records sound on 16 mm. motion picture film. The film may be old exposed film, or any other inexpensive film, as the recording is done by engraving the sound track into the film mechanically, rather than by optical means. As the impressions are made on the side of the groove, several hundred playbacks may be had with each recording.

The sturdily constructed recording head makes use of a sapphire stylus, the same head and stylus being used for both recording and playback. The head has an impedance of 500 ohms and can be matched to any radio receiver by using a standard adapter. A special adapter is available to permit wireless linkage between the filmgraph and the receiver. The magazine is provided with feeding and take-up arms to accommodate all sizes of reels up to 2000 feet of film. Twenty-eight sound tracks may be indented across the width of 16 mm. film and each track will take four minutes of recording and playback on 100 feet of film. In other words, a 100-foot length of film will provide 112 minutes (or about 1¾ hours) of recording and playback. As no dark room or processing is required, playback may be immediate.

Model BBA includes amplifier, speaker and microphone.



Latest "Filmgraph" recorder.

There are also various other models for both 16 mm. and 8 mm. film. The model BBA illustrated and described here has a sprocketless drive to insure flutterless operation. In fact, film without sprocket holes may be used in this machine.

Paper Replacements for Dry Electrolytics

● TO meet the demand for paper condensers of the same sizes and shapes as dry electrolytics, Solar Products Company has introduced Type DR condensers, can type units, and Type RP rectangular cardboard container condensers. Actual capacities are from one-third to one-half those of dry electrolytics in the same size container. Leakage and power factor are extremely low, and no polarity has to be observed. Thus, the new paper units are unexcelled as dry electrolytic replacements in high voltage P.A. systems, power amplifiers, high voltage filter circuits, etc.

Types DR (inverted can types) are available in four capacities, 4, 8, dual 4-4 and dual 8-8 mf. Cardboard Type RP is supplied in two capacities, 8 mfd. and 8-8 mf. All are conservatively rated at 600 volts, working voltage.

Television Dipole

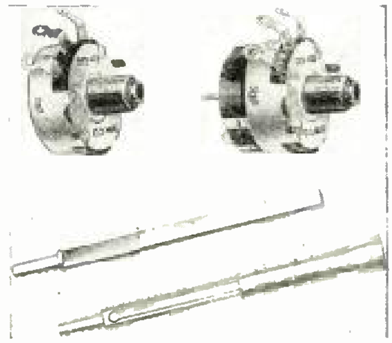
● A NEW dipole type television antenna has just been announced by Consolidated Wire & Associated Corps. It has two telescoping brass rods (shown in the closed position) which allow for adjustment to the exact frequency to be picked up by the television receiver. An especially designed,

low loss transmission line is used, the impedance of which will match the input of every television receiver (approximately 100 ohms). The unit comes with 75 feet of transmission line.

New Midget Controls Have Universal Shafts

● MIDGET Controls with metallized type resistance elements and exclusive construction features heretofore available only in the larger Standard Controls have been announced by the International Resistance Co. Known as IRC Type D Midgets, the new controls are designed to accommodate two types of plug-in shafts.

Among the exclusive features included in Type D Controls are the spiral spring connector which



eliminates wiping, metal-to-metal contact between rotor arm and center terminal; the 5-finger "knee action" silent element contactor and a special steel coil spring on the shaft used as a thrust washer to eliminate end-play.

Plug-in Shaft "A" which is packed with each Type D control is designed for use where definite flat location is necessary. Shaft "B", which must be ordered separately, is for use where either a slotted or tongued shaft is required.

New All-Purpose Tester

● THE new Simpson "Hammeter" measures only 5½" x 2⅞" x 1¾" and weighs but 20 ounces. A 3,000 volt self-contained unit using no external multipliers, it is completely encased in bakelite and its test cables are insulated for 5,000 volts which makes it safe to use on amateur apparatus, transmitters and television sets. The ranges provided by the instrument are: 0-15 - 150 - 750 - 3000 volts, A.C.; 0-15-75-300 - 750 - 3000 volts, D.C.; 0-15 - 150 - 750 ma. D.C.; and 0-3000 - 300,000 ohms. The resistance of the meter is 1000 ohms per volt for both the A.C. and D.C. scales—a valuable feature when testing circuits where but little current is drawn. The meter used is a Simpson D'Arsonval movement with bridge type construction and soft iron pole-pieces. A copper oxide rectifier is built into the meter for A.C. voltage ranges and a battery is provided for both ohmmeter scales. The unit may be used as an output meter if an external condenser is used in series with the A.C. voltage ranges.

New Xmtr Coils

● BUD RADIO, Inc., is producing a new small air-wound coil for use in transmitters. This oscillator and buffer coil is designed for all sets with inputs of 50 watts or less, from 5 to 160 meters. The ceramic base is highly glazed and is designed to keep the coil a reasonable distance from the chassis. Coil spacing is maintained permanently accurate by means of acetate locking strips. These coils are available in center-linked and tapped models and end-linked untapped models.

(Continued on page 249)

New HAM Licenses

(*Continued from page 231*)

W5FO Fred W. Harris, 44 E. Main, West Point, Miss.
W5IDC Robert R. Brown, 301 Virginia Ave., Mc-Comb, Miss.
W5IDE John E. W. Spencer, 1733 N. 11th St., Abilene, Tex.
W5IDF Anne S. Duthie, 211 Upson Ave., El Paso, Tex.
W5IDG John S. Hollis, 611 College Ave., Lafayette, La.
W5IDI Ernest C. Cline, 4767 Tulsa Ave., Shreveport, La.
W5IDJ William F. Knebel, 932 Esplanade Ave., New Orleans, La.
W5IDK Jesse M. Hilton, Rt. 1, Jonesboro Rd., West Monroe, La.
W5IDL Julian Gilliam, Highway No. 1, North Forrest City, Ark.
W5IDM William V Taylor, 216 E. "J," Russellville, Ark.
W5IDN Robert S. Bond, 1745 N. 5th, Abilene, Tex.
W5IDO Joseph Caltagirone, 1222 Garland, Texarkana, Ark.
W5IDQ Raymond L. Stinnett, 1221 Commerce, Little Rock, Ark.
W5IDR Owen B. Harvey, 2207—10th, Lubbock, Tex.
W5IDX James D. Horney, 2601 County Ave., Texarkana, Ark.
W5IDT Madison K. Kuykendall, Crockett Rd., Harlingen, Tex.
W5IDU Reb M. Scoggins, Jr., 208 N. Vale, Jefferson, Tex.
W5IDV Jack S. Smith, Marks, Miss.
W5IDX Clettis L. Carwile, 3522 Clifton St., El Paso, Tex.
W5IDY Charles D. Catt, 3016 Wheeling, El Paso, Tex.
W5IDZ Cecil Miller, 1012 C. St., S. E., Ardmore, Okla.
W6BFD James H. Haughawout, 2229 N. Laurel Ave., Phoenix, Ariz.
W6BXN Ernest Howard Hale, Trustee, Turlock Amateur Radio Club, Radio Ave., 200 ft. off West Main, Turlock, Calif.
W6ET Alan N. Cormack, 5461 Encino Ave., Encino, Calif.
W6HJM Mike Milkis, 2710 Pomeroy Ave., Los Angeles, Calif.
W6QAL James F. C. Robertson, 636 Bush St., San Francisco, Calif.
W6RKZ Byron L. Hatherell, 6178 Rockridge Blvd. S., Oakland, Calif.
W6RMC Bruce Raymond Hansen, 1305 Arthur, Fresno, Calif.
W6RMD Warren Pinkney Henderson, Jr., 670 Pettis Ave., Mountain View, Calif.
W6RML Julius Aluisi, 707 Pottle, Fresno, Calif.
W6RMM Ronald Louis Bothna, 738 Richmond St., El Centro, Calif.
W6RMN Howard M. Beck 4434 Lockwood Ave., Los Angeles, Calif.
W6RMO Robert C. Brain, 1328—18th St., San Francisco, Calif.
W6RMP Richard William Graham, 1117 33d St., Sacramento, Calif.
W6RMS Richard L. Hayes, 6300½ Pasadena Ave., Los Angeles, Calif.
W6RMU Harold C. Lakes, 1517½ 11th St., Santa Monica, Calif.
W6RMW Lloyd L. Roe, 5720 S. Manhattan Pl., Los Angeles, Calif.
W6RMX Verdis J. Deacon, 2028 Bancroft Way, Berkeley, Calif.
W6RMY Truman O. Lamb, 755 Patterson Ave., Glendale, Calif.
W6RMZ Clair L. McHolland, 6123 Fountain Ave., Hollywood, Calif.
W6RNA John J. Schodron, Providence, Utah.
W6RNB Kenneth R. Greenwood, 1616 E. 6th, Tucson, Ariz.
W6RNC Carroll C. Howlett, 1346 Piamo, San Luis Obispo, Calif.
W6RND John P. Johnson, 1045 2nd St., Delta, Utah.
W6RNH Lorren Millhollin, 1119A Washington Blvd., Venice, Calif.
W6RNI William F. Craggs, 1023 Washington Blvd., Venice, Calif.
W6RNJ Randall E. Sorenson, Smithfield, Utah.
W6RNK Lawrence E. Tollefson, 107 S. Gramercy Pl., Los Angeles, Calif.
W6RNM Gareth C. Garner, 1265 Harrison Ave., Salt Lake City, Utah.
W6RNR Stuart F. Walmsley, 3948 Dalton Ave., Los Angeles, Calif.
W6RNO John W. Wardell, 131A W. Garfield Ave., Glendale, Calif.
W6RNP James H. Watson, 1711 Robbins St., Santa Barbara, Calif.
W6RNQ Ronald J. Forestal, 1349 W. 59th St., Los Angeles, Calif.
W6RNR Thomas W. Haislip, 320 E. Fern Ave., Redlands, Calif.
W6RNW Dwaine R. Henderson, 214 W. 60th, Los Angeles, Calif.
W6RNT Jack A. Paisley, 1511 E. Monroe St., Phoenix, Ariz.
W6RNU Thomas F. Pollock, 1010 5th, Coronado, Calif.
W6RNV George J. Rogers, 1244 Calif. St., San Francisco, Calif.
W6RNW Robert E. Alleman, 1904 Newport Blvd., Costa Mesa, Calif.
W6ROA Charles J. Leipert, 912 Kacawa St., Pacific Palisades, Calif.
W6ROB Albert W. Morris, 560 N. State St., Sandy, Utah.
W7EDJ Casper Joe Trescl, 109 5th West St., Roundup, Mont.
W7FMC Spencer D. Collins, Room 418, Y.M.C.A., Spokane, Wash.
W7HOZ Earl M. Wilton, 116 N. 36th St., Billings, Mont.
W7HPI William E. Clyne, 3815 S. E. 28th Ave., Portland, Ore.
W7HPJ Allan H Walsh, Race Lowrey St., Port Angeles, Wash.
W7HPK Harley A. Payne, 1202 N. 42d St., Seattle, Wash.
W7HPM Dale G. Buffington, 634 S. 1st, Douglas, Wyo.
W7HPM James R. Carper, 524 S. Ferrall St., Spokane, Wash.
W7HPO Robert D. Church, 1713 2nd Ave., Orchard Ave., Spokane, Wash.
W7HPP George R. Dickinson, 3044 Dillon Ave., Cheyenne, Wyo.
W7HPQ Roger O. Loken, 903 W. 62d, Seattle, Wash.
W7HPR Eldred K. Reid, 1101 State, Chehalis, Wash.
W7HPT John R. Hall, 7923 N. E. Glisan, Portland, Ore.
W7HPU Harold L. Kiesel, 1721 S. 54th, Tacoma, Wash.
W7HRH Robert A. Gregory, R. F. D. 2, Emmet, Idaho.
W8AUK Charles M. Kugel, 2422 E. 74th St., Chicago, Ill.
W8CRY George Roger Gardner, 1474 Wagar Ave., Lakewood, O.
W8DFC Owens A. Hutcheson, 902 Straley Ave., Princeton, W. Va.
W8GKA Robert Henry Geresiman, Montville, O.
W8KJD George J. Klettke, 4319 Archwood Ave., Cleveland, O.
W8KW Edwin C. Miller, 236 Boston, Buffalo, N. Y.
W8NZA John C. Mundorff, 248 Donner Rd., North Canton, O.
W8PHS Virgil M. Brotton, 309 Dorceter, Ashland, O.
W8TLO Harold Marshall Gruener, 2099 Martindale Rd., Cleveland Heights, O.
W8TLP John Havula, 3583 E. 105, Cleveland, O.
W8TMC John Bretelson, 3113 W. 92nd St., Cleveland, O.
W8TMD Hal F. Foyer, 1645 Robinwood Ave., Lakewood, O.
W8TME Harry B. Gerts, 3306 Bosworth Rd., Cleveland, O.
W8TMF Albert Chester Bassett, 1058 Lima Drive, Cleveland, O.
W8TMG Fred Wayne Bratten, 612—4th S. W., Canton, O.
W8TMH Thomas Charles Groat, 1670 Chandler, Lincoln Park, Mich.
W8TMK Thomas Burns, 215 Perry Pl., Wyandotte, Mich.
W8TML Cleo Allen Briley, 820 Lansing, Detroit, Mich.
W8TMM Earl Carter, 12216 Taft Ave., Cleveland, O.
W8TMN Bernard D. Fellows, 1836 Pine Crest Drive, Ferndale, Mich.
W8TMO James A. Stepro, 206 Raleigh St., Beckley, W. Va.
W8TMP Sherwood Glenn Espenschied, West Maysle, Hartville, O.
W8TMQ Richard P. Burson, 453 Vinewood, Wyandotte, Mich.
W8TMR Wilbur W. Claypoole, 22604 W. McNichols Rd., Detroit, Mich.
W8TMS Arthur L. Iverson, 2916 Rochester Rd., Royal Oak, Mich.
W8TMT Peter F. Kantor, 1713 St. Elmo Ave., Canton, O.
W8TMU James C. Randall, R. F. D. Star Rt., Stony Creek, N. Y.
W8TMW John W. Mills, 312 Arthur Ave., Endicott, N. Y.
W8TMY Stuart J. Tuma, 10 National, N. W., Grand Rapids, Mich.
W8TNB Philip G. Dilorio, 1000 Evangeling Rd., Cleveland, O.
W8TND Robert J. Lieber, 606 Shorb Ave., N. W., Canton, O.
W8TNE Carl F. Lustic, 1120 Parkdale Drive, Akron, O.
W8TNF Howard O. McCall, 1207 3rd S. E., Canton, O.
W8TNG Robert D. McCartney, 247 S. Oakland Ave., Sharon, Pa.
W8TNH Robert L. Mills, 1335 California, Ave., Akron, O.
W8TNI Clifford Morrow, 801—5th N. W., Canton, O.
W8TNJ Howard R. Munding, 2632 Norwalk, Toledo, O.
W8TNK Ronald G. Potts, 967 Locust St., Williamsport, Pa.

(*Continued on page 234*)

W8TNL Charles W. Plilius, 712 Warren Ave., Youngstown, O.
W8TNM Paul J. Reynolds, 1812 18th, Nitro, W. Va.
W8TNN Kenneth E. Robinson, 1414 Webster, Bay City, Mich.
W8TNO Leon M. See, 3405 Mill, Auburn Heights, Mich.
W8TNP Wayland L. Shepard, 557 Thompson St., Elmira, N. Y.
W8TNQ Howard C. Hendrickson, 117 Wescott, Jamestown, N. Y.
W8TNR Vincent C. Henophy, 119 Garfield, Rochester, N. Y.
W9ARO Orville L. Hilligoss, 3621 St. Charles, Anderson, Ind.
W9ARY Arlo Almeron Kirkpatrick, 2826 S. Hackeley, Muncie, Ind.
W9ASA Charley R. Leigh, 3933 Charlotte St., Kansas City, Mo.
W9ASB Leonard V. Anderson, 1216 5th St., Rockford, Ill.
W9ASI Ira R. Bourland, 4023 N. Osceola, Chicago, Ill.
W9AST Ernest M. Patchman, 4835 Euclid Ave., East Chicago, Ind.
W9ASU Charles J. Smalley, 1342 N. Dearborn St., Chicago, Ill.
W9ATA Lyell E. Cook, 1202 Charles St., Streator, Ill.
W9ATW Donald E. Laughlin, New Providence, Ia.
W9AUU Russell W. Hammer, R. R. 3, Polo, Ill.
W9AVA William B. Harris, 6516 S. May, Chicago, Ill.
W9AVD Richard R. Hawk, 6533 S. Sangamon, Chicago, Ill.
W9AVE William A. Karraker, 5815 Drexel Ave., Chicago, Ill.
W9AVK August H. Krivitz, 2024 West Pierce St., Milwaukee, Wisc.
W9AVR Richard P. Mates, 4302 N. Kildare Ave., Chicago, Ill.
W9AVY Joseph P. Nakutis, 2511 W. 46th St., Chicago, Ill.
W9AWD Edmund A. Parsons, High School Bldg., Pierce, Colo.
W9AWK George A. Alley, 129 W. Monroe, Villa Park, Ill.
W9AWW George S. Porter, 3131 Harlem Ave., Berwyn, Ill.
W9AXE James M. Gerrits, 517 N. Durkee, Appleton, Wisc.
W9AXG Elroy V. Friberg, R. F. D. 1, Boyd, Minn.
W9AXU Hoyt I. Peterson, 128 S. Ash, Yuma, Colo.
W9AXX Stanley A. Nelson, 312 Dodge, Janesville, Wisc.
W9AYK Fred E. Hempt, 1111 Niagara, Denver, Colo.
W9AYV Frank W. Kullman, 4307 Winona St., Denver, Colo.
W9AZO Charles L. Yeager, 315 4th Ave., S. W., Rochester, Minn.
W9AZS Wesley C. Brase, Radcliffe, Ky.
W9BAJ Frederick W. Thorp, 129 S. Oakland, Green Bay, Wisc.
W9BAK Leslie D. Gilliland, 941 Vermont, Lawrence, Kans.
W9BAN Leonard M. Frederick, 716 Wesley Ave., Oak Park, Ill.
W9BAR Robert G. Faliis, Shell Lake, Wisc.
W9BAT Frank L. Doner, Shell Lake, Wisc.
W9BAX Alfred C. Dille, 66th & Glenwood, Overland Park, Kans.
W9BAY Roy C. Stegemiller, 49 McEldowney Pl., Chicago Heights, Ill.
W9BBD Clarence A. Holritz, 1233 11½ St., N. Fargo, N. D.
W9BBO John H. Mullaney, 235 1st Ave. E, Dickinson, N. D.
W9BBT Claude B. Harman, 1404 E. 8th St., Pueblo, Colo.
W9BBV Charles F. Patton, 271 W. 3d St., Paintsville, Ky.
W9BBY Ernest R. Piercy, 122 Pine Ave., Flaxton, N. D.
W9BCZ Wesley N. Richardson, 118 E. Kellogg, Wichita, Kans.
W9BDJ Billy E. Swarts, N. 2nd, Natoma, Kans.
W9BDN Peter A. Simich, 13240 Burley Ave., Chicago, Ill.
W9BDQ Richard H. Barthuly, 904 W. Q., Lincoln, Nebr.
W9BDZ Walter B. Bills, Rt. 2, Eaton, Colo.
W9BER Edward B. Russell, 3543 Fremont, Chicago, Ill.
W9BEV Stanley J. Kucinski, Hq. Trp. 13th Cavalry, Ft. Knox, Ky.
W9BEY Mae Hirt, Deerbrook, Wisc.
W9BFF Henry Y. Hoskin, Burlington, Colo.
W9BFG Horace S. Shaw, 204 E. St. Clair St., Indianapolis, Ind.
W9NYN Albert Bradt, 1211 8th, Greeley, Colo.
W9UDC Michael W. Healy, 7139 Woodlawn, Chicago, Ill.
W9USH Robert M. Mattison, 1025 5th St., Brookings, S. D.

Television—22 Miles

(Continued from page 199)

area, even slight interference causes distortion or interruption. Diathermy machines and automobile ignition systems are the worst offenders in this regard. Howell believes that if the power were stepped up to 10,000 watts, reception would be tremendously improved. Within five miles of the station, however, little interference is now being experienced by lookers-in.

Howell has found that a vertical dipole antenna with a parasitic reflector, 70 feet above the ground, helps greatly to overcome the lack of power in signals received. Images on his set are sufficiently bright to permit excellent photographs to be taken of them, with fast film and ten-second exposure.

Keen interest of the California television fans shows itself at the meetings of the Hollywood Television Society. Recently, at one of the society's gatherings, 100 spectators watched a program being received on a nine-inch tube. Most of those 100, as should be expected, went away even more keenly interested in television.

Frank Andrews, "Around the World" commentator on W6XAO, planned and executed recently a program believed to be the world's first attempt at visual education in the public schools by television. Members of the Hollywood Television Society installed receivers in public school in Los Angeles and Long Beach, the University of Southern California, Pomona College and other schools, for reception of a telecast dramatization of the crossing of the Pacific by Pan-American Airways clipper. The Los Angeles Board of Education and the Pan-American company cooperated in the venture, which was outstandingly successful.

World Wide Radio Digest

(Continued from page 201)

of overtones. Thus the machine splits the voice into twenty parts and uses them in varying proportions in remaking speech, according to a writer in the *New York Times*. A sentence uttered in a normal way may be reproduced exactly as the speaker has said it, as a monotone chant, or in various other ways. The voice of a man may be made to sound like that of a woman and vice-versa, and voices which are not musical may be improved. The machine may permit multiple conversations over standard phone wires.

Television Antennas

(Continued from page 206)

matter of interest, the horizontal scanning speed of the electron beam in this particular case is about 8,500 miles per hour in traveling from left to right. In the illustration of Fig. 1, the reflected wave is delayed a difference of 1/93,000 second from the direct wave because its transmission path is two miles longer. It should be apparent then that the reflected signal will cause a second image displaced 93,000/150,000 of an inch, or about ⅝-inch to the right of the primary or wanted image.

New York City. This particular illustration is an unretouched photograph of an image obtained from a signal that contained no reflections or "ghosts" due to multi-path reception.

Figure 3, on the other hand, shows the same test pattern seriously impaired by a reflected signal. Needless to say, a televised program would be likewise impaired and would be unsatisfactory to the owner of a television receiver. Reflections of much less intensity and negligible delay to be

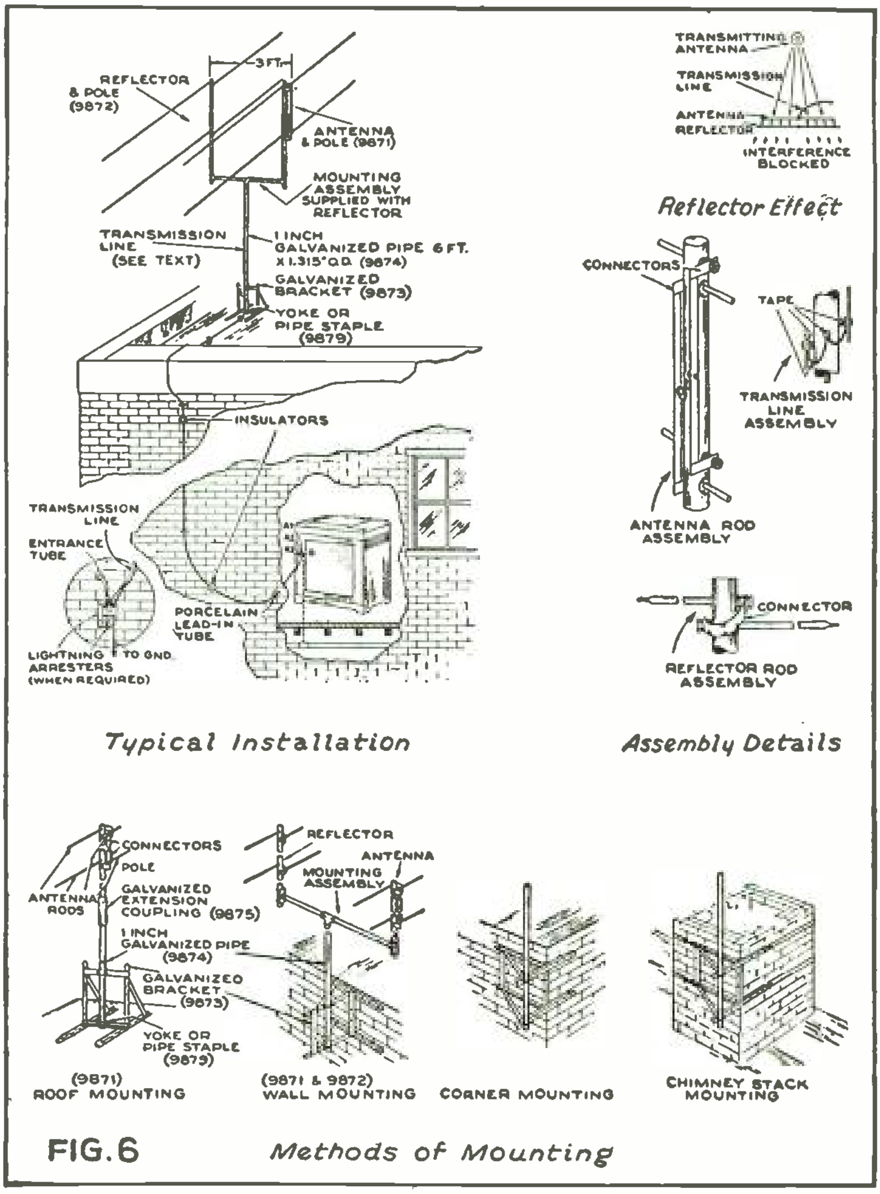


Fig. 6. Typical installation details of RCA Double Di-pole reflector antennas.

The reflected signal image may be white or black, depending on its polarity. Its intensity may vary from almost as intense as the primary image to a point where it is just noticeable. Any difference in relative intensities is due to the attenuation the reflected waves may encounter in their transmission path.

Ghost Images

In Fig. 2 is shown the test pattern which the National Broadcasting Company transmits at periodic intervals from its transmitter W2XBS, Empire State Building, hardly noticeable in themselves will cause the wanted image to appear fuzzy with consequent loss of observable detail of the finer portions of the received picture.

If the receiving antenna of Fig. 1 could be designed to reduce pick-up of the reflected wave signal, or signals, then the impairing of the received image may often be reduced or entirely eliminated.

Engineers studied the problem as based on seven years of RCA-NBC field test experience of *television reception* in the New York City area. Development work

(Continued on following page)

indicated that the ordinary di-pole could be made more directive by the addition of a parasitic *reflector* spaced about ¼ to 1/10 wavelength behind the antenna proper. This materially reduced pick-up from the direction opposite to the transmitter location. However, this occurred at a sacrifice in frequency response. It must be remembered that a television channel for high definition television occupies 6 mc. of which over 4 mc. is necessary for the picture modulation. Even the ordinary di-pole alone was found to have insufficient frequency response, particularly for the contemplated use of the television spectrum. It was early recognized that in suburban areas reflection phenomena were not usually present so little need for a di-pole reflector assembly would be expected.

Double Di-pole Television Antenna

The outcome of the development was the design of the Double Di-pole Television Antenna, which could also be used as part of a special di-pole-reflector assembly. The Double Di-pole Television Antenna Assembly is shown in Fig. 4. The double di-poles used improve the frequency response to cover the contemplated use of the television spectrum. This antenna is recommended for suburban locations or any location where reflection phenomena are not present. Its sturdy construction and corrosive protection of its metal parts provide added safety when installed in high locations. The use of a round pole for support readily adapts the assembly for rotating the antenna so it will be broadside to the transmitter location for maximum signal pick-up. A compromise from the broadside position may at times be necessary so advantage of the null plane of reception can be taken to minimize local interference.

Double "V" Wire Antenna: A similar antenna of lower cost and requiring two supports, is available as the Double "V" Wire Television Antenna illustrated in Fig. 5.

For more efficient operation on the higher television bands the lengths of the antenna rods or wires should be changed in accordance with the instructions accompanying the antennas.

For congested city areas the combination of Double Di-pole and Reflector is recommended. Multi-path reception (causing "ghost" images) due to *reflections* can often be reduced materially or entirely eliminated with such an antenna installation. Reflections coming from such a direction as to form a broad angle with respect to the direction of the direct wave will usually be attenuated due to this antenna having a comparatively narrow zone of reception. The directional feature is obtained at negligible sacrifice of frequency response band and is a function of its unique design. The installation of the Double Di-pole and Reflector, as well as the use of other accessories are shown in Fig. 6.

The Double Di-pole and Reflector, while reducing pick-up from the direction opposite to the transmitter also increases the signal pick-up from the transmitter. Compared to a simple di-pole, the gain in signal strength is about 1.5 times. Reception from the transmitter location to that from the opposite location is in the ratio of about 3 to 1. Where low signal strengths are liable to be received due to distance or shielding effects, the installation of the Double Di-pole and Reflector will give an improved signal-to-noise ratio that may be sufficient to obtain satisfactory results. In some locations, sufficient signal strength may be available to permit rotating the antenna from the normal *broadside* position so advantage of the antenna's directional characteristic can be taken to minimize any serious noise interference.

Two New Types of Transmission Line

For maximum efficiency the RCA Television Antennas should be used with corresponding type Transmission Lines of which there are two types. The type 9882 (1000 ft. roll) is a special low-loss weatherproofed line having only 4 db. loss at 50 mc. per 100 feet. The standard weather-proofed line, No. 9881 (1000 ft. spool) has a loss of 8 db. at 50 mc. per 100 feet. Interior finish lines of the proper surge impedance are also available in brown and white colors. Use of improper lines may result in excessive loss or may lead to *line reflections*. Use of the RCA Television Antennas and Transmission Lines with balanced input receivers, such as the RCA Victor Television Receivers, provides reduction of noise picked up on the transmission line.

For transmission line runs excessively long, such as over 200 feet, or where the receiver is located in an area of weak field strength, the low-loss line, type 9882, is to be recommended. For the average residential installation, the standard line, type 9881, is suggested.

Notes on Installing the Antenna

The primary requisite for the *antenna location* is to place it in a "line of sight," or as near a "line of sight" as possible and broadside position to the transmitting antenna. This usually means that the antenna should be placed near, or on, or above the roof of the residence or apartment house. The location on a suburban dwelling may usually be decided upon from the standpoint of roof accessibility, availability of support, and shortest possible transmission line run. Reflection phenomena are not often present in the suburbs, so it is not likely that the antenna location need be changed once it is decided upon.

Obviously, as the horizon distance from the transmitter is approached, many objects may intervene to destroy the "line of sight." Usually, the *higher* the antenna is erected under such conditions the greater will be the received signal. The actual received signal intensity under any conditions is a function of the receiving antenna height. The antenna should be placed as high as possible and as far removed from highways, hospitals, doctors' offices, etc., to reduce effects of auto ignition and diathermy interference. Such locating of the antenna may be offset by the added line losses and consideration must be given to the type line used.

In the congested city areas, the antenna should be installed permanently on the apartment or residence roof *only* after actually observing results on the television receiver. A temporary transmission line can be run between receiver and the antenna allowing sufficient slack to permit rotating or moving the antenna. Then with a portable telephone system connecting an observer at the receiver and an assistant on the roof at the proposed antenna location, the antenna can be positioned to give the most satisfactory results. *A shift of only a few feet in antenna position may effect a tremendous difference in picture reception.*

The only positive check of television receiver operation is to use the test pattern signal from the television transmitter. Field strength and interference conditions will be different at every location. Even though the antenna and receiver installation might be tested with a local R-F oscillator, there is no assurance that the antenna and receiver location will be satisfactory until the received test pattern is actually observed on the receiver's Kinescope.

(Continued on page 237)

In mounting any antenna, care must be taken to keep the antenna rods or pick-up wires at least ¼ wave length (at least 6 feet) away from other antennas, metal objects; such as, metal roofs and gutters, etc. Local fire regulations may require a certain distance between antenna and roof.

Under certain unusual conditions, it may be possible to rotate or position the antenna so it receives the cleanest picture over a *reflected path.* If such is the case, the antenna should be so positioned. However, such a position may give variable result with the weather, as a wet surface has been known to have different reflecting characteristics than a dry surface.

In short, a television receiving antenna and its installation must conform to *much higher standards* than an antenna for reception of International Short Wave and Standard Broadcast signals because:

(1) Intervening obstacles have a pronounced shielding effect on the ultra high frequency waves producing low intensity signals. Severe trouble with multi-path reception may often be experienced, especially in congested city areas.

(2) The picture signal is comprised of a very wide band or range of frequencies, all of which must be received with good efficiency.

(3) It must be continually remembered that the discernment of the eye is much more critical than that of the ear. More than ever, it can be said—*"The finest television receiver built may be only as good as the antenna design and installation."*

Hints on Installing Transmission Lines

After the antenna and receiver locations have been decided upon, the residence or apartment should be carefully surveyed to determine the best method of running the transmission line. The most important consideration is to keep the run as short as possible consistent with other factors such as appearance and availability or accessibility of support.

The transmission line should be supported on outside runs every 8 to 12 feet. Telephone bridle rings are a convenient and inexpensive means of line support. Number 14 Rawl or similar plugs should be used for support of the rings when masonry is encountered. Clearing obstructions, such as rain gutters, may be readily done by using 6 inch or 12 inch screw-eye insulators. The line should be secured to avoid vibration. Slack in the line should be taken up wherever a turn is made by appropriate taping. Use of ½ inch loom will provide protection to the line where abrasion might occur.

Entrance to the receiver location in a suburban residence may be neatly made by passing the line through a porcelain tube installed in a basement window and running the line in the basement to a location below the receiver, where a small hole may be drilled in the floor with the owner's permission. In order to maintain proper impedance relations, the free ends of the transmission line should never be fanned apart. *At the conclusion of the line installation it should always be checked for continuity and short circuit.*

It is extremely important that a *good* GROUND connection be provided for the television receiver. This is necessary to protect the user in case of a primary to secondary breakdown of the high voltage transformer.

What Do YOU Think?

(Continued from page 221)

A Good Idea

(Continued)

tions appreciate reports, so why not concentrate on them for verifications?

My best DX for 1939 is as follows: PK6XX, VLR, JZJ, JZK, VR6AY, TAP, EA9AH, ZRK, VUD2. These were all received on an RCA 1938 Superhet and a peak preselector using a 40-meter half-wave doublet.

Please devote more space to *What Do You Think?* and why not ask readers to vote on the subjects that they desire most to be published. I will be pleased to hear from all SWL's and Hams and will send my card, pictures and correspond 100%, so what say OM's and YL's?

ERNEST PAVLIDIS,
139 W. 7th Avenue,
Conshohocken, Penna.

CWL's Can Help

(Continued)

dred miles away with a loud second harmonic.

Mr. Gant's statement was well put, that amateurs don't need SWL cards because they can get all the reports they need from the stations worked. Although I attempt to give as complete a report as possible, I know that even those are not much help to the Hams. But can any one blame the boys for not answering SWL's when they get reports such as "u were R.S.T. 5—8—7x hr in West Wixtree, Ohio" or "ur sigs R.S.T. 5—9—9— on all five bands"? And I know plenty of C.W. operators who have gotten phone reports with no evidence that their calls were being bootlegged. SWL's who want cards, whether they deserve them or not, have gotten the entire fraternity into disrepute by their acts, and as long as a person is willing to remain in their ranks, he might as well become resigned to the fact that he is going to send out a lot more cards than he receives.

Some phone listeners only rarely become licensed. How can amateurs be expected to spend time and enough money in a year or two to buy them a nice piece of apparatus when for all their trouble they are really doing nothing to further the art?

I would like to see RADIO & TELEVISION publish, as received, the calls of those C.W. operators who would *volunteer* to answer verifications of their signals. I know their QSL's would be encouraging and would help many beginners to know that they are copying code correctly and at about what approximate speed.

ALLAN MURPHY,
107 South 21st Street,
Paducah, Ky.

What He Likes

Editor,

After reading your magazine for five years, I think it is about time for me to tell you what I think of it.

There are some extra good points in your magazine. The *"Kinks"* department, the *"Question & Answer"* department, *"World Wide Radio Review"* (I like this very much) and Joe Miller's *"Let's Listen In"* column. *"On the Ham Bands"* is also okay with me, but I think it would be better if it was in paragraph form instead of column form.

Mr. Hooton is my favorite author in your magazine.

JOHN MOSKAL,
85 Gardner Ave.,
So. Attleboro, Mass.

Building and Using a Wheatstone Bridge

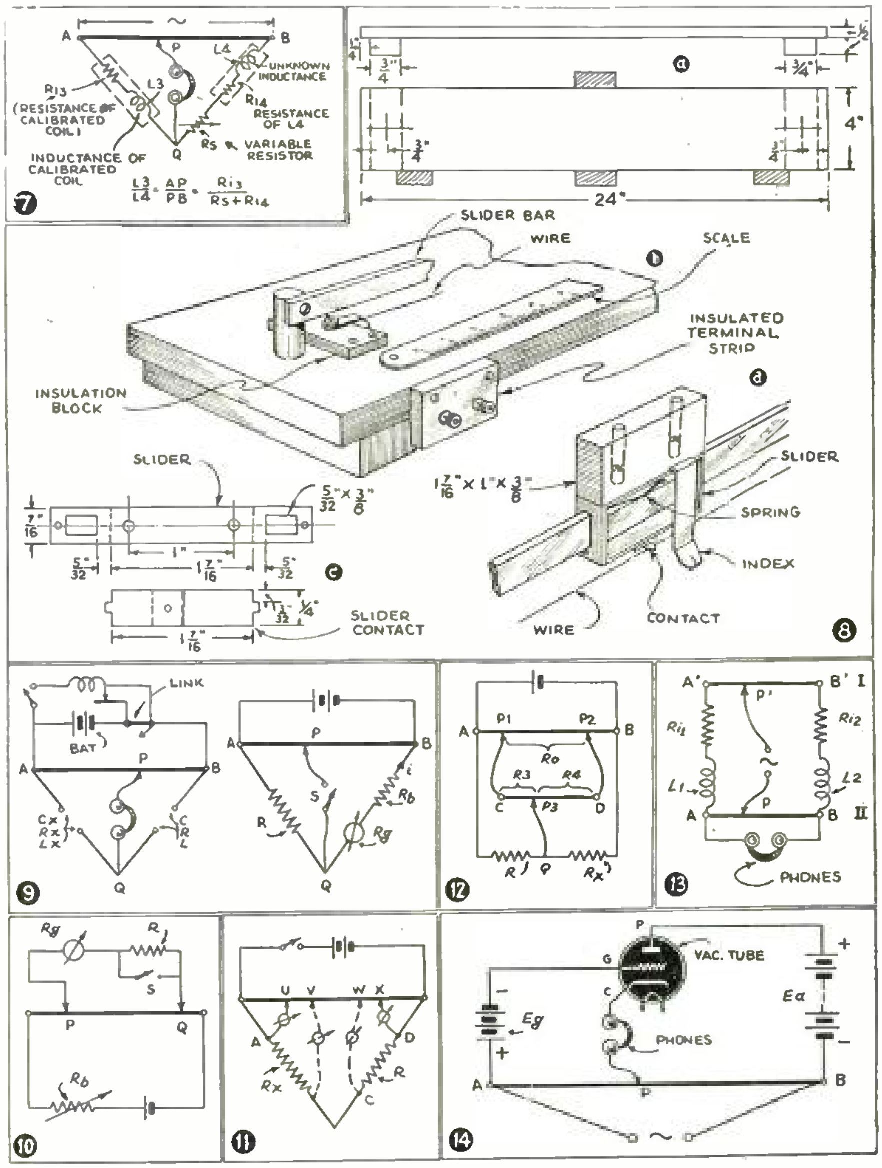
(Continued from page 211)

R_3 is known, the value of R_4 is found through the equation $R_4 = R_3 + PB/AP$.

To measure a resistance with a Wheatstone bridge, it is necessary to have a known resistance and to find the relation of PB/AP for which a balanced condition is obtained. This will be found, as we said before, by sliding the contact P until the voltmeter reads zero between points P and Q.

flows through the voltmeter and therefore any value of resistance may be measured without any possibility of errors which might be caused by voltage drops within this measuring instrument.

Great care must be taken to secure firm and clean contacts at points A and B (see Fig. 5B), as otherwise any contact resistance added at these points would interfere with the proper operation of



It is preferable to use a double swing voltmeter, one having its zero setting in the middle of the scale, because before balance is reached, the voltmeter needle may swing either to the right or to the left, according to the position of contact P over the length of the potentiometer wire.

Assembly and Method of Operation

In order to avoid certain defects, a very strong wire having a high resistance must be used.

Heating of the wire must be as low as possible to prevent its deterioration and therefore a source of low potential is more practical. Similarly, a very sensitive voltmeter is needed, more so for the measurement of very high resistances.

When the balance is perfect, no current

the bridge to obtain exact measurements.

We have explained that the mechanical resistance of the wire must be high, but we must add that the total electrical resistance of this length of wire is only a few ohms.

It is evident that whenever the contact resistances are higher than the resistance of the wire, the distributed resistance of the latter would not be proportional to its length.

It will be found useful to also eliminate as much as possible the resistance of connecting wires and other points of contact.

For the resistance wire of the potentiometer, we must select a non-oxidizable metal such as chromium-nickel or nichrome.

When the bridge is supplied by a

source of alternating current, the voltmeter may be replaced by a pair of headphones.

Measurement of Inductances and Capacities

The source of voltage which up to now has been a small 4 to 8 volt storage cell, is replaced by a buzzer or a transformer.

The neutral point-indicating balance, or matching of values, is found when the buzzer sound of the A.C. hum has been completely eliminated by displacing the contact P.

This method is much more satisfactory than the voltmeter and may be used for measurements of resistances, capacities, inductances, or combinations thereof as long as the corresponding calibrated units are available.

We know that a capacity has an impedance which is its resistance in an alternating current circuit, and that its value may be calculated in the following manner:

$$R_c = \frac{1}{2\pi fC}$$

or

$\pi = 3.1416$

R_c = Resistance of capacity in ohms

f = Frequency of the alternating current flowing through the condenser, in cycles per second.

C = Capacity of the condenser in farads.

When we assume that the internal ohmic resistance of the dielectric is negligible, the balance of the bridge may be represented by the following equation:

$$\frac{C_3}{C_4} = \frac{AP}{BP}$$

Therefore the unknown capacity C_4, corresponding to resistance R_4 (Fig. 4), will be

$$C_4 = C_3 \times \frac{PB}{AP}$$

C_3 being a calibrated capacity.

For measuring a larger capacity, a 1 mf. condenser for example, a frequency of 60 cycles supplied by the secondary of a small transformer, is enough to produce an audible sound in the headphone receiver.

However, if the capacity to be measured is small, its capacitive resistance becomes too high for the sensitivity of the receiver and a higher frequency must be used, such as 600 cycles, which may be supplied by an oscillator or a buzzer.

Due to the increase in frequency, the capacitive resistance decreases as is shown by the equation, and the sensitivity of the receiver will be satisfactory even for very small values of capacities. On the other hand, the use of a buzzer requires a high resistance for the measuring (potentiometer wire), as otherwise the buzzer might stop.

Measuring Inductances

This is more difficult because an inductance consists of two or three components. Ordinarily, only the inductive and the ohmic components are considered. An ideal case is represented by the equation

$R_L = 2\pi fL$

$\pi = 3.1416$

R_L = Inductance (inductive resistance in ohms)

L = Coefficient of self-induction in Henrys.

f = Frequency of alternating current passing through the coil

This equation is correct if the ohmic resistance of the coil and its capacitive resistance are negligible, compared to its inductive resistance.

In a general manner, the ohmic resistance must not be ignored completely, as a neutral point of balance cannot be found on the bridge without compensating for the ohmic resistance of the coil.

The equation for an inductance is:

$$R_2 = \sqrt{R^2 \times (2\pi fL)^2}$$

R = ohmic resistance of the wire forming the coil (in ohms).

Remember also that the total resistance depends upon the ohmic resistance component and that the square root of the equation indicates that there will be *dephasing* between the voltage and the current. In order to balance the bridge, it is then necessary to equalize dephasing not only by balancing the absolute values of resistances and inductions, but also by aligning the relation between ohmic resistance and self-induction.

We must not forget that the relation of the lengths of the wire has ohmic resistance characteristics and that it is impossible to attempt a comparison between two circuits when they are out of phase.

When dephasing is equal in both circuits, the relation is independent of the phase and it depends only upon the absolute values.

To match an inductance, it is first of all necessary to measure the ohmic resistance of the calibrated inductance and that of the unknown inductance to be measured. For this purpose, the bridge shall be supplied by direct current, and after this preliminary test, it will be supplied by alternating current.

When measuring a large iron core inductance, it is preferable to use the transformer, but for a small inductance without iron core, the buzzer will do.

In order to obtain rapidly a balanced condition on the bridge, it is recommended to always use a calibrated inductance not differing too much in value from the inductance to be measured.

Whenever the ohmic resistances differ greatly, they must be equalized approximately by adding a variable ohmic resistance in series with the inductance having the lowest resistance. During the balance of the bridge, it will be noticed that the sound in the receiver does not disappear entirely; this is because the dephasing is not complete.

By varying the additional series resistance together with the contact on the bridge, a neutral point of complete silence will be found.

We can now determine the inductance:

$$\frac{L_3}{L_4} = \frac{AP}{AB}$$

The resistances are related as follows:

$$\frac{R_{13}}{R_{14} + R_{15}} = \frac{L_3}{L_4} = \frac{AP}{PB}$$

Construction of the Bridge

Knowing the theory, we shall now proceed with the construction of the bridge with all the necessary precautions for obtaining perfect results.

Fig. 8 shows all the parts separated, several of them can be home-made. The approximate dimensions of the parts are shown in this illustration. The bridge, consisting of a stretched resistance wire, a sliding contact and a ruler or scale, may be assembled as shown without difficulty.

We shall not recommend any method of construction, as the reader may use his own ideas or ingenuity to assemble the parts. The main precautions are neatness, solid construction, and a firm clean contact.

(*Continued on following page*)

2-Band Vacation Portable Receiver

(Continued from page 225)

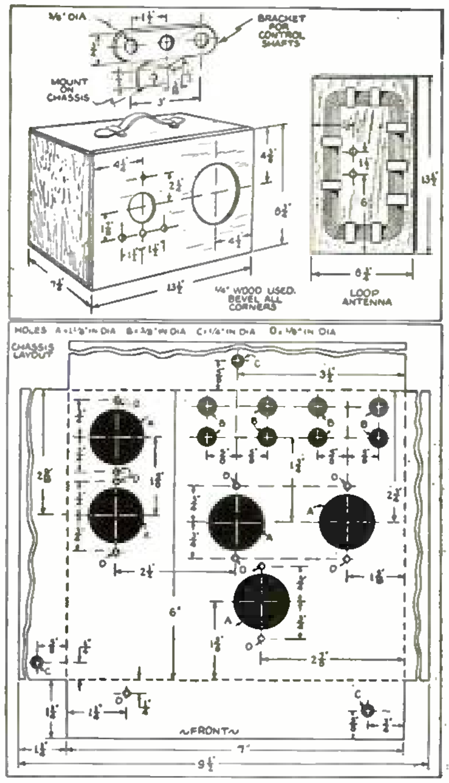
from the service oscillator and then adjusting the oscillator trimmer in the oscillator coil can (the upper one) at about 3500 kc. Do not attempt to trim the aerial circuit as this will throw the broadcast band out of adjustment. If further trimming of the short-wave band is desired, a sewing needle and a short length of wire stuck into the loop at several points and used as the "grid" connection in place of the 6-turn tap will indicate the point of greatest signal strength, from a 3500 kc. oscillator signal. However, this will not be necessary in most cases.

If a service oscillator is not available, tune in broadcast signals at the top end and bottom end of the broadcast band for padding and trimming adjustments turning I.F. and tuning condensers to maximum signal.

On the *short-wave* band, adjust for greatest signal strength, using the dial only as an approximation, unless a station on a known frequency can be picked up, then this can be used to align the dial at this one point.

With the alignment completed, the set can be installed in the case. The batteries are placed on either side of the chassis, one "B" battery on the speaker side and two on the opposite side—to keep the weight balanced. The "Loop" back can then be screwed in place, using small screws. It is well to pack corrugated cardboard around the batteries, or fasten them to the inside of the case to prevent them from shifting in transit.

This completes the construction of the receiver—the parts used in the original model are listed below, for the convenience of the builder.



Details of chassis and cabinet.

Building and Using a Wheatstone Bridge

(Continued from preceding page)

Measuring the Resistance of a Measuring Instrument

Between P and Q, we now add an interrupter; a balance is obtained when the deflection of the instrument is the same for an open circuit as for a closed circuit. We calculate the resistance as follows.

$$R_g = R \frac{PB}{AP} - R_b$$

For very sensitive instruments, a double bridge circuit may be used, as shown in Fig. 11. The formula is:

$$R_g = R \times \frac{a_2}{a_2 - a_1}$$

In this case, the bridge being a plain potentiometer, the resistance of the wire must be very small compared to the resistance of the instrument measured. The unknown resistance will be:

$$R_x = R \times \frac{UV}{WX}$$

The Thomson bridge is especially practical for extremely small values of resistances (see Fig. 12). The formula is:

$$R_x = \frac{R\,(P_2B + CP_3/l^2)}{AP_1 + P_2D/l^2}$$

In Fig. 13, two single bridges are used for very accurate measurements of inductances or capacities. The formula is:

$$L_1 = L_2 \frac{R_{l1} + R_{ap}}{R_{l2} + R_{ab}}$$

R_{ap} and R_{pb} are the two resistances of the wires between AP or PB, which is calculated by

$$R_{ap} = R_{ab} \frac{AP}{AB};$$

and

$$R_{pb} = R_{ab} \frac{PB}{AB}$$

Measuring Amplification Factor of a Tube

The circuit is shown in Fig. 14. The bridge is fed by alternating current, one part to the control grid, another to the plate circuit. When the sound in the receiver disappears, the amplification factor is:

$$V = \frac{PB}{AP}$$

(J. Fasal; courtesy "Radio-Constructeur," Paris, France.)

Correction

RADIO & TELEVISION is glad to publish this letter from Mr. Seldes to correct a statement attributed to him last month.

Editor, RADIO & TELEVISION:

I did not say that the Government "should make some funds available" for television. I never discussed the finances of television, which are totally outside my department.

I did say that I have heard people talk about the Government making some kind of investment in television, but it would be totally impossible for me to make the specific statements that are attributed to me in your July issue.

Faithfully yours,
Gilbert Seldes,
Director of Television Programs, Columbia Broadcasting System, Inc.

Xmitter- Receiver for the Ham Beginner

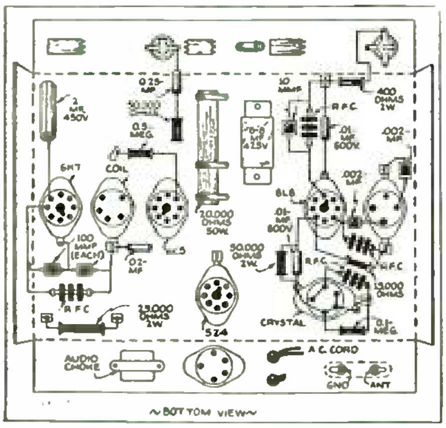
(Continued from page 230)

A 6-volt storage battery can be connected to this power socket in place of the two filament leads from the A.C. power-supply. A number of 45-volt "B" batteries, or a genemotor or vibro-pack type of power-supply can then be connected to the positive and negative terminals of this power socket corresponding to the positive and negative terminals of the A.C. power supply which is built in the station. It will be necessary for any battery type source of power supply (such as "B" batteries or a genemotor) to provide at least 350 volts at 100 milliamperes for efficient operation of the transmitter, although the receiver itself may be operated with plate supply voltages as low as 250 volts.

Assuming that you have completely assembled and wired the Knight Junior Amateur station, and that you have wound the receiver and transmitter coils according to the coil data given later, the next step will be to put up an antenna.

The Antenna

This antenna should be of the doublet type, consisting of a straight wire 132 feet in length. Cut this length of wire in the exact center and insert a 3- or 4-inch antenna insulator. Then attach a length of twisted pair transmission line to the antenna, connecting one side of the transmission line to one-half of the antenna at the center insulator, and the other wire of the transmission line to the half of the antenna which is fastened to the other end of the center insulator.



Plan view of set.

In order to transmit, the antenna switch must first be placed in the position which connects the transmitting antenna to the transmitter portion of the station unit. Now obtain a small six volt pilot light bulb such as is used in most radio sets, and a piece of wire about 6" long. Make a loop of this wire and solder one end to the shell of the pilot light bulb, and the opposite end to the center connection of the pilot light bulb. Now suspend this loop around the coil in the transmitter, press the key and rotate the tuning dial to the spot where the light bulb lights up. You will find that perhaps it is easier to get the bulb to light if the antenna is disconnected from the transmitter (that is, turned over to the receiving position) before you tune the transmitter to the point where the pilot bulb lights up. This lighting up of the pilot bulb indicates that the transmitter is oscillating properly. Then by flipping the antenna switch back to the transmitting position, the pilot light bulb should dim considerably. This indicates that the antenna is drawing power from the transmitter. In order to be sure that the transmitter is operating properly however, you should slightly re-tune the transmitter by moving the tuning dial a very slight amount in order to find the point where the pilot light bulb will be the brightest.

The transmitting key should never be pressed while you are listening to the receiver. If the transmitting key were pressed while the receiver were in operation, the radio frequency field set up by the transmitter would "block" the receiver, entirely preventing any signals from being heard. Likewise when the antenna has been connected by means of the change over switch to the transmitter, and while keying the transmitter, a series of rapid clicks or thumps will be heard in the headphones. This condition can be eliminated by always turning the regeneration control back to the zero position while transmitting, and this control can be advanced to the proper position as soon as transmission has stopped.

Essential Coil Data—Transmitter

The coil for the transmitter section should be made on a 4-prong coil form, by winding on 38 turns of No. 22 double silk covered wire. At a distance of 1/4" from the bottom of this winding, wind on 3 turns of wire which will be the link coupling circuit for connection to the antenna.

By using separate crystals and coils of the proper type, this transmitter may also be operated on the amateur 160 meter, 40 meter and 20 meter bands. A 160 meter crystal can be used with the same coil which is used for 80 meters. However, for operation on 40 meters, the coil should consist of 20 turns of No. 22 double silk covered wire and should have only a 2 turn link. The 20 meter coil requires only 10 turns of No. 18 double cotton covered wire spaced out to cover 1 3/16" on the coil form, and a separate 2 turn link winding.

Coil Data—Receiver

The primary winding of the 80 meter coil for the receiver should have 10 turns of No. 24 D.S.C. wire. This antenna winding should be spaced approximately 1/8" below the main or secondary winding. The secondary winding should have a total of 27 turns of wire, with the cathode tap 1 1/4" turns up from the bottom or ground side on the secondary winding. The band-spread tap or the tap on the coil where the band-spread condenser connects to the coil will be 2 turns from the top of the secondary winding.

(This article prepared from data supplied by Allied Radio Corporation.)

JUNIOR AMATEUR STATION

Receiver Section

(All parts numbers are Knight catalog numbers)

2—Octal sockets—E1520
1—5-prong socket—E1516
1—**Hammarlund** MC-35-S—E5301
1—**Hammarlund** MC-140-S—E5299
3—.0001 mf. mica condensers—E7830
1—2 mf. 450 volt condenser—E3777
1—5 mf. 25 volt condenser—E3790
1—5 meg., 1/2 watt resistor—E5008
1—500,000 ohm, 1/2 watt resistor—E4947
1—2,000 ohm, 1 watt resistor—E5067
1—25,000 ohm, 2 watt resistor—E5185
1—50,000 ohm potentiometer—E3043
1—R.F. choke—E2163
1—Single-circuit jack—E8982
1—Audio choke—E11654
1—S.P.S.T. toggle switch—E5450
2—Bar knobs—E3760
1—Dial plate—E5677
1—Dial—E5734
1—Twin binding post—E4058
1—Grid clip—E6335

1—Metal tube cap—E5290
1—8" x 17" x 12" chassis base—E12441
1—7" x 18" panel—E9756
1—6K7 tube—E1071
1—6C5 tube—E1066
1—.01 mf. 400 volt tubular condenser—E7921
1—.25 mf. 400 volt tubular condenser—E7928
1—50,000 ohm, 1 watt resistor—E5088

Transmitter Section

1—100,000 ohm, 1 watt resistor—E5091
1—400 ohm, 2 watt resistor—E5156
1—15,000 ohm, 10 watt resistor—E8292
1—50,000 ohm, 2 watt resistor—E5188
1—.0001 mf. mica condenser—E7830
1—Hammarlund MC-100-S—E6305
2—.01 mf. 600 volt tubular condensers—E7937
1—.002 mf. mica condenser—E7839
1—Octal socket—E1520
1—4-prong socket—E1515
1—5-prong socket—E1516
1—4-prong coil form—E5371
3—R.F. chokes—E2163
1—Dial—E5734
1—Key jack—E8983
1—Crystal holder—E2533
1—80-meter crystal—E2511
1—6L6G tube—E237

Power-Supply Section

1—A.C. line cord—E2447
1—T13R15 transformer—E11252
1—T13C30 choke—E12761
1—Octal socket—E4511
1—8-8 mf. condenser—E3819
1—20,000 ohm, 50 watt resistor—E4767
1—S.P.S.T. toggle switch—E5450
1—Pilot light bracket—E6388
1—6.3 volt bulb—E1256
1—5-prong plug—E1631
1—Ft. 5 conductor cable—E3503
1—5-prong socket—E4507
1—D.P.D.T. toggle switch—E5459
1—5Z4 tube—E1063

Hardware

3—Dozen ½" 6/32 machine screws—E7012
3—Dozen 6/32 nuts—E7005
12—Insulated tie lugs—E6513
4—2-lug terminal strips—E6305
1—25-ft. roll No. 18 hookup wire—E3394
1—Length spaghetti—E2895
1—Spool No. 24 D.S.C. wire—E2775
1—Spool No. 22 D.S.C. wire—E2774
1—Complete kit, including all parts for receiver, power supply, transmitter, and accessories —E9537

BOOK REVIEW

TELEVISION CYCLOPEDIA, 64 pages, size 5½" x 8¼", illustrated. Published by Supreme Publications, Chicago.

M. N. Beitman, the author of this book, is Radio Instructor in Englewood High School, Consulting Engineer of Allied Radio Corporation, and B.S. in Mathematics of the Lewis Institute.

In addition to definitions of television terms from "Aberration" to "Work Function" there are numerous illustrations of television sets and circuits with graphs to illustrate special points. The latter portion of the book gives an explanation of the principles of television, and the articles throughout go far enough beyond mere definitions to make the name "Cyclopedia" truly appropriate.

AUDEL'S NEW RADIOMANS GUIDE, published by Theo. Audel & Co., New York, N. Y. This book consists of 34 chapters; 750 pages, size 4¾" x 6½"; 400 diagrams, charts and photos.

The author is E. P. Anderson, the well known electrical engineer. The contents are progressively arranged, beginning with the basic fundamentals of radio explained through numerous analogies, and ranging all the way through aircraft radio, automatic radio alarms, short-wave receivers, 47 pages are devoted to Television alone with up to the minute technical information and illustrations. Several sections are devoted to trouble shooting, antenna systems, vacuum tubes, electrical measuring instruments, phonograph pick-ups, etc.

The book will form a handy reference volume, particularly for the experimenter and others who wish to get a broad background of radio. Detailed index is supplied.

LOOK AND LISTEN (The Television Handbook), published by Norman W. Henley. Publishing Company, New York, N. Y. Contains 96 pages, 6½" x 9", illustrated.

M. B. Sleeper, the author of this book is a member of the Institute of Radio Engineers and is, at present, actively engaged in the television business. He is certainly an authority on the subject and fitted to write upon it, if anyone is. This opinion is proven by an inspection of his book which is practical, understandable and handsomely illustrated.

The first book on television published since American television left its experimental stage to become a regular service, its contents are up to the minute. They give the reader a thorough picture of just what has been done in television and of the steps which will doubtless follow. The operation of receivers and transmitters is explained clearly and simply, and detailed instructions are given for assembling the Andrea KTE-5 television kit. Other chapters deal with the erection of a television antenna, installation and operation of a completed receiver, "trouble shooting" when things go wrong, and a television dictionary. In fact, any one who is interested in television either from the academic end or for practical purposes cannot be without Mr. Sleeper's book.

TELEVISION, published by Radio Corporation of America, 18 pages, size 8¼" x 3¾".

This little book has a foreword generally explanatory of the television situation in New York and of RCA's part in providing visual entertainment. The section following answers thirteen general questions pertaining to television; next comes a section of twenty-three questions and answers on television receivers. Six answers to questions on television transmitters follow, after which come four questions, together with answers, regarding television programs. A glossary of television terms, a chronological outline of the early activities leading to television, and a summary of RCA television contributions complete the book, which is profusely illustrated.

THE RADIO MANUAL, 3rd edition, by George E. Sterling. 1107 pages, plus index, size 5⅜" x 8". Published by D. Van Nostrand Co., Inc., New York City.

First published in October, 1928, this volume has now reached its third edition and already the first and second printings have been run off. The author, who is Assistant Chief of the Field Section for the Engineering Department of the Federal Communications Commission, and a member of the Institute of Radio Engineers, commences his book with elementary electricity and magnetism, explaining the fundamentals of radio operation.

In extremely well-organized style, he follows with motors, generators, storage batteries, vacuum tubes and their uses, modulation systems, etc., and devotes large sections to broadcasting apparatus and operating technique, antenna design, modern aircraft and police radio, etc. He not only describes apparatus but gives data as to procedure. Appendices give further information on the examination for aeronautical operators (a field which is daily growing in importance), U. S. Coast Guard distress instructions, and medical aid to radio vessels at sea. The index occupies 11 pages and is arranged so that one may quickly find any subject on which information is desired. The book is illustrated with photographs, diagrams and graphs. It is a volume which should be on every radio experimenter's book-shelf.

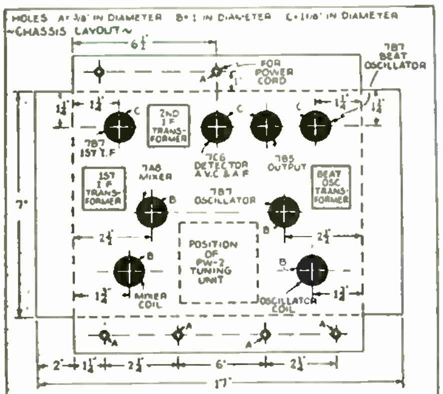
The LT-6 Loktal Superhet

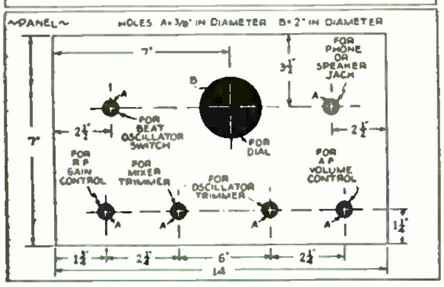
(Continued from page 223)

and try to tune-in a fairly strong signal. Rotate the R.F. trimmer condenser for best reception and carefully "peak" each I.F. trimmer for the loudest signal. Do not, under any circumstances, turn either the dial or the gain controls during the I.F. adjustments. Always have a good reliable signal tuned in before making any adjustment of the trimmers; otherwise, the I.F. circuits may be thrown so far out of alignment that it will be impossible to hear a signal no matter how strong it may be.

R.F. Circuit Adjustments

The alignment of the R.F. circuit is extremely simple. The oscillator padding condenser, "CP," is used on the 40, 80 and 160 meter coils only; the tuning circuits track quite evenly over the 10 and 20 meter ranges, so the use of padding condensers in this region is not necessary. The padder values listed with the oscillator coil data are not at all critical and the same size, 500 mmf., may be used on all three of the low-frequency bands if desired. Tune-in the test signal, "rock" the tuning dial back and forth and at the same time adjust the padding condenser for greatest sensitivity.





Repeat the process on each of the three low-frequency bands. Alignment of the mixer circuit is not required as the 35 mmf. trimmer takes care of any small difference which may exist during tuning.

The power supply is built on a separate chassis and is not shown in the photographs. The R.F. choke in the positive "B" circuit, and the bypass condensers across the primary and the high voltage secondary windings of the power transformer, help to eliminate noises.

Either a single-wire or a doublet antenna may be used with this receiver. For best results the antenna should be erected well in the clear and at least 25 to 50 feet in length. If a doublet antenna is used, open the link, which is indicated by the dotted line in series with the antenna coil in Fig. 1, and attach the two wires of the twisted pair to the free ends of the coil. A good ground is connected to the chassis in the usual manner.

Parts List—"LT-6" Ham Receiver

NATIONAL CO.

1—PW-2 Tuning Unit, 50 mmf., double-spaced condensers
2—Iron-core I.F. transformers, 450-550 kc., Type IFC
1—Air-core Beat Oscillator transformer, 450-550 kc., Type IFCO
6—Isolantite "loktal" sockets (recommended)
2—Isolantite sockets, 4 prongs (for coils, see text)
1—Set XR-1, 4-prong coil forms (two for each band desired)
1—Mica trimmer condensers, Type M30
2—"HRO" type dials

HAMMARLUND MFG. CO.

1—"MC" Tuning condenser, 35 mmf.
1—"MC" Tuning condenser, 20 mmf.
2—"CHX" R.F. chokes, 2.1 mh.
1—"TS-50" tube shield (see text)

I.R.C. (Resistors)

3—250,000 ohm resistors, 1 watt
3—100,000 ohm resistors, 1 watt
4—50,000 ohm resistors, ¼ watt
3—500,000 ohm resistors, ½ watt
2—10,000 ohm resistors, 1 watt
1—25,000 ohm resistor, 1 watt
4—1 megohm resistors, ½ watt
1—500 ohm resistor, 1 watt
1—300 ohm resistor, 1 watt
1—5,000 ohm resistor, 1 watt
1—500 ohm resistor, wire-wound, 10 watts
1—5,000 ohm volume control, with S.P.D.T. switch
1—500,000 ohm volume control, with S.P.ST. switch

CORNELL-DUBILIER (Condensers)

3—.0001 mf. mica condensers, Type 1W
1—.006 mf. mica condenser, Type 3L
1—.00025 mf. mica condenser, Type 3L
1—.0005 mf. mica condenser, Type 1W
1—.001 mf. mica condenser, Type 3L
7—0.1 mf., 600 volts D.C. working volts, paper, Type SM
4—0.05 mf., 600 volts D.C. working volts, paper, Type SM
1—10 mf., 50 D.C. working volts, electrolytic, Type JR
1—25 mf., 25 D.C. working volts, electrolytic, Type JR

NATIONAL UNION (Tubes)

3—Type 7B7 "loktal" tubes
1—Type 7A8 "loktal" tubes
1—Type 7C6 "loktal" tubes
1—Type 7B5 "loktal" tubes

BRUSH DEVELOPMENT CO.

1 Pair Brush crystal headphones

WRIGHT DECOSTER

1—Model 682 "Nokoil" P.M. dynamic speaker, 8" suède finish case

MISCELLANEOUS

2—Notched knobs
1—Steel cabinet and panel, 7 x 14 inches
1—Steel chassis, 7 x 13 x 2 inches
1—S.P.S.T. toggle switch and plate
1—Output choke, 30 henries, 75 ma.

POWER-SUPPLY UNIT
(Halldorson Transformers)

1—Power transformer, 275 volts D.C., 70 ma. after filter. Type 67
2—Filter chokes, 30 henries, 80 ma. Type C4-967
1—R.F. choke (75 turns of No. 30 enameled on a ½" form)
3—8 mf., 450 volts D.C. electrolytic condensers
2—0.1 mf., 600 volt paper condensers, tubular
2—0.05 mf., 600 volt paper condensers, tubular
1—15,000 ohm, 25 watt fixed resistor, wire-wound
1—Chassis, 7 x 16 x 2 inches
1—5Y4G tube (National Union)

COIL DATA

Mixer Coils

L2	*Spacing*	*Tickler*	*L1*	*Wire*	*Dia.*	*Band*
4 t.	1"	3 t.	3 t.	20 E.	1"	10 m.
12 t.	1"	4 t.	3 t.	20 E.	1"	20 m.
17 t.	1¼"	6 t.	4 t.	22 E.	1½"	40 m.
37 t.	1¾"	9 t.	7 t.	22 E.	1½"	80 m.
58 t.	1¾"	14 t.	10 t.	28 E.	1½"	160 m.

L1 can be wound over center of L2 (grid coil) for Ant. & Gn'd. or near "cold" end of L2 for "doublet."

Oscillator Coils

L3	*Spacing*	*Tickler*	*Wire*	*Dia.*	*Band*	*"CP"*
4 t.	1"	3 t.	20 E.	1"	10 m.	None
12 t.	1"	4 t.	20 E.	1"	20 m.	None
15 t.	1¼"	6 t.	22 E.	1½"	40 m.	.001 mf.
32 t.	1¾"	9 t.	22 E.	1½"	80 m.	.0007 mf.
52 t.	1¾"	16 t.	28 E.	1½"	160 m.	.0004 mf.

The mixer coils are wound on four- or five-prong forms; the oscillator coils are wound on four-prong forms. All ticklers are wound on "cold" or ground end of form.

2½ Meter Acorn Transceiver

(Continued from page 227)

set is a half-wave vertical, and was made from a cut down 5-meter unit. It fastens onto the panel insulators with wing nuts and should be adjustable from 2.5 to 4 feet in height.

How to Operate the Set

Operation of the rig is quite simple. The *receiving* side should be tried first. With no antenna connected, advance the regeneration control towards maximum till a hissing is heard. The hiss should be smooth but quite loud and the plate meter should register not more than ½ ma. or so. Then install the antenna and put the coupling clip from the antenna condenser one turn away from the RFC clip. The latter, by the way, is not very critical, but seems best near the center of the coil. It should be tried in different positions before soldering fast. It will be found that oscillation can be controlled by the setting of the antenna condenser as well as by the regeneration control. A point will usually be found for best adjustment of these two to give loudest and clearest signals.

On the transmitter side, the plate meter will indicate about 1.5 ma. with no antenna and when the antenna is coupled, it may be run up to 3 ma. but not much over. A point of maximum plate current for each length of antenna around 3.5 feet will be found, and the rig should always be operated at this point for best efficiency. The same point will hold for reception and will give greatest signal strength.

An accurately calibrated absorption type wavemeter may be used to set the rig to the proper frequency. A wide band may be covered by spreading or crowding the turns of the coil until the desired frequency range is covered.

List of Parts

HAMMARLUND

1—25 mmf. trimmer condenser, APC25
1—15 mmf. trimmer condenser, HF15
2—Isolantite octal sockets, S9

RCA

1—Acorn tube, No. 958
1—Acorn tube, No. 957

I.R.C.

1—10 megohm insulated resistor, BT1
1—.2 megohm insulated resistor, BT½
2—.5 megohm insulated resistors, BT½
1—50,000 ohm insulated resistor, BT½

CORNELL-DUBILIER

2—100 mmf. bakelite condensers
1—.003 mf. bakelite condenser
3—.1 mf. 400 volt paper condensers

TRIPLETT

1—Metal case milliammeter, 2" size, 0-5 ma. range, No. 223

UNIVERSAL MICROPHONE COMPANY

1—Handset with S.B. carbon mike and 2000 ohm phone

BURGESS

2—45 volt B batteries, No. X30BP
1—1.5 midget dry cell, No. 4

UNITED TRANSFORMER COMPANY

1—Mike transformer, No. 0-14
1—A.F. choke, No. A30

UTAH

1—.5 meg. variable resistor, No. JP500 M
1—3 circuit plug, No. 6
1—3 circuit jack, No. 502 B
1—Single-circuit jack, No. 1
1—4-pole, double-throw switch, No. 312 B

MISCELLANEOUS

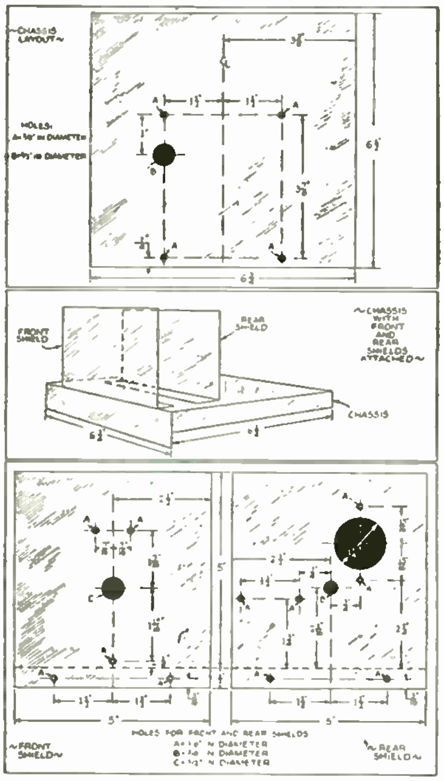
1—NATIONAL vernier dial
1—AMERICAN RADIO HARDWARE 5 meter, 3 section antenna, No. 279-1
2—Small knobs
4—Butt-in insulators
Case material and hardware

1-Tube Television Converter

(Continued from page 210)

All resistors and condensers are grouped around the socket, making for extremely short leads. All grounds are brought to the No. 1 terminal of the socket, and this in turn is grounded through the upper brass stand-off to the shield.

The oscillator tuning condenser must be insulated from ground. Using the new Bud Tiny-Mite condensers, this is greatly simplified because they have a pair of tapped metal stand-offs fastened to the Alsimag insulating plate. The condenser is therefore mounted on the shield by means of these small stand-offs, making certain that the hole in the front shield is large enough to clear the condenser shaft without shorting. Two flexible shaft couplings and a short length of bakelite rod are used to couple the two tuning condensers.



The output coil L4-L5 is unshielded. It might be preferable to shield this coil if a metal cabinet is not used. Mounted inside the 1¼" diameter coil form is a 75 mmf. condenser for adjusting to the I.F. frequency.

Power Supply for the Converter

The converter derives its power from the receiver with which it is used. Practically any receiver can supply the additional current necessary for its operation. However, if the receiver is of the A.C.-D.C. type where all the filaments are in series, it will be necessary to rewire the receiver filament circuit so that the converter tube filament can be placed in series with the receiver tube filaments. Alternatively, a separate power-supply can be built for the converter. The B plus lead from the converter should preferably be connected to about 200-250 volts, although lower voltage will suffice where necessary. If, in the receiver, one side of the filaments is *grounded* (instead of the center tap of the filament winding being grounded), then one side of the 6K8GT filament can be grounded at the tube socket, thus allowing the use of only three wires for power connection.

A pair of twisted wires should be used for connecting the *output* of the converter from L5 to the antenna terminals of the regular receiver. These leads should be shielded in order to prevent pickup of stations operating on the I.F. frequency. If, with the antenna disconnected from the receiver, stations can still be heard, a different intermediate frequency (that is, receiver frequency) should be carefully chosen so that no station can be heard with receiver R.F. gain wide open.

An effective antenna with a single wire lead-in can be clipped onto the detector grid coil L2. An antenna with a two-wire lead-in will require an antenna coupling coil. The writer didn't mount this coil on the chassis because it is intended to place the converter in a cabinet and the antenna coil will be supported from a pair of binding posts. This coil may consist of about 4 or 5 turns of hook-up wire wound inside the grid coil.

With the converter hooked up to the regular receiver, and the receiver tuned to a frequency between 1600 and 2500 kc., vary the condenser across L4 until the noise output from the receiver peaks up, indicating that the condenser-coil is tuned to the receiver frequency. Now uncouple the detector tuning condenser from the oscillator tuning condenser, and with the detector condenser set at about 2/3 its maximum capacity, vary the oscillator condenser until the noise output of the receiver once more peaks up. Two peaks will be heard. Referring only to the peak at the higher oscillator condenser capacity, note whether there is any great difference in oscillator and detector condensers. If there is, then vary the inductance of the detector coil by spreading apart or squeezing together the turns. If the detector capacity is higher than the oscillator capacity, decrease the detector inductance, while if the detector capacity is lower than the oscillator capacity, increase the detector inductance. This will require a little experimenting until the coils are so adjusted that the two tuning condensers will have the same capacity, when the frequency difference between the two circuits is equal to the intermediate frequency. This done, tuning for the desired stations can be accomplished.

At the lower capacity settings of the tuning condensers, amateur stations on the 5 meter band will be heard. So, if the television station is *off the air*, the converter can be tried out by tuning in this "ham" band. Incidentally, this converter makes an excellent unit for amateur use. For this purpose it might be well to use 15 mmf. tuning condensers for greater band-spread.

Television Sound Converter—Parts List

BUD RADIO

1—No. 524 chassis
2—1642 Tiny-Mite condensers, 25 mmf.
1—75 mmf. Tiny-Mite air padder, No. 1683
1—Isolantite octal socket, No. 959
2—Ceramic flexible couplings, No. 795

I.R.C.

2—50,000 ohms; 1—25,000 ohms; 1—300 ohms; ½ watt (BT½)

SOLAR

4—.01 mfd. paper condensers, type SO-221
1—.0001 mfd. mica, type MT-1316

HYTRON

1—Type 6K8GT bantam tube

Coil Data

L1—3 or 4 turns hook-up wire wound inside L2
L2—7 turns No. 14 wound 9/16" diameter, 1" long (approximate)
L3—7 turns No. 14 wound 9/16" diameter, ⅞" long (approximate)
L4—88 turns No. 30 D.S.C. wound on 1¼" diameter form
L5—5-10 turns No. 30 D.S.C. wound at one end of L4

Efficient U.H.F. Doublets

(Continued from page 217)

particular wave are best found by calculation—followed by experimentation.

The transmission line is ordinary twisted pair lamp cord, run at right angles to the antenna for at least ten feet, in order to avoid capacity effect to the lower half. This affords a good match to the doublet, and must be used with a correctly designed coupling transformer to feed the set.

Note in Fig. 2 how a coupling transformer may be applied directly to the doublet, in order to feed a standard broadcast receiver as well as the television receiver, as pointed out in *Wireless Retailer and Broadcaster*, London. The primary tap on this transformer makes the doublet act as an ordinary "T" type antenna, as far as the broadcast receiver is concerned, while it retains its doublet characteristics for the other set, for the tuned coupler acts as a choke, blocking the 7-meter waves. Fig. 3 shows the doublet's cycle in free oscillation, with the current reaching its maximum in the center, and the voltage variation greatest at both ends.

In working with 5 meters, two 4-foot lengths of duralumin tubing or, as a substitute, number 12 copper wire, may be mounted on a mast with stand-off insulators, in the position previously described. A variation of this method calls for the use of a single 8-foot length of wire or tubing, with the ends of the twisted pair connected across the center, as shown in Fig. 4, the distance between them being from 6 to 9 inches.

Even more efficient is the antenna shown in Fig. 5. The upper end of the doublet is connected to the center wire of a shielded conductor, the lower end to the shield, as indicated. The shielded lead is run parallel to the lower branch, at a distance of 3 inches from it. Instead of 4 feet, each arm of this doublet should be 37 inches, for 5 meter reception.

Fig. 6 illustrates another variation. In this installation, the arms of the doublet are each 4 feet long; the shielded lead is kept 5 inches from the lower arm which is connected to the center wire, the upper arm being connected to the shield.

A piece of number 12 copper wire is connected 1 inch from the upper end of the lower arm, and at right angles to it. At 7 inches from this joint the wire is bent, and is continued parallel to the lower arm of the doublet for 47 inches. It is then bent at right angles again and soldered to the shield of the cable, which is led to the set.

A "DX" Aerial for S-W Fans

(Continued from page 217)

feeders. The two joints and, in fact, all splices are well soldered and in some instances also taped. The leads are of heavily insulated *(Bare wire should serve just as well*—EDITOR.) number 14 copper wire, spaced about every 12 inches by flat simple little porcelain insulators with the nails taken out. In this way you get two spreaders from one insulator. The leads are run through the nail holes and drop as far as possible straight down and then run to the window. These spreaders are held in place by binding twine, which is tied around each spreader and drawn tight at the bottom of the drop. The spreaders are allowed to slide on the wire and are held in place only by the twine. This proves much more effective if the feeders are allowed to swing freely. At the end of the lead-in, a D.P.D.T. switch is connected with the antenna leads from the receiver soldered to the center taps on the switch. The antenna feeders are then soldered to one of the two pairs of outside jaws on the switch. Thus far you have one complete rhombic antenna with feeders to the west.

Now for the switch at the top of the east mast. (c). Another D.P.D.T. switch is screwed to the top of mast C, as indicated in the diagram. The antenna is "broken" and the loose ends are soldered onto the center taps of the switch. An 800-ohm 1-watt resistor is soldered across the top taps. This is optional, but does help a lot in getting rid of QRM. Another pair of feeders is soldered to the lower taps and brought down to the switch at the receiver. Be sure that when you fix this second pair to the open taps on the inside switch, that you do not fix the north wires parallel on the switch, as shown in the drawing. In this way you have two end-fed V antennas. I have never seen an end-fed V yet, but these two work very well and seem rather *directional*. The outside switch on mast C is worked by a system of pulleys with a double length of twine dropping to the bottom of the mast. A bracket is placed on the top of the mast and the switch far enough below it so that there is sufficient leverage to work the blade of the switch both ways. By splitting the blades of the switch at the receiver and using the lineup I have just given, you have eight different antennas; 2 V's fed from the ends; 4 straight wires, end-fed, which really are V's also; and 2 rhombics, each fed from a different direction. By interchanging one pair of wires on the inside switch, you have two other antennas.

Light-Storage in Television Transmitters

(Continued from page 204)

the raster element is built up of transparent insulated crystal layers having an electro-optical effect in the direction of the field. This element is at an angle to the electron beam, and polarized light is passed through it, as shown.

An improved method is seen in Fig. 14D where the metallic coating of the raster screen is made reflecting and the light is passed twice through the crystal layer. This achieves a double polarizing effect with a corresponding decrease in operating voltage.

Your "Mike" Problem Solved

(Continued from page 212)

which acts as a dielectric between the ribbons and plate. To make this glue, dissolve a quantity of celluloid shavings in acetone, which can be purchased at the druggist's. Make sure it is not too thick as it may cause lumps on the surface or clog up the holes.

When the glue has thoroughly dried (it takes about five or ten minutes to dry) take the two strips of mica and punch two 1/8" holes in each strip corresponding to the two larger holes at each end of the plate. Glue one strip across each end of the plate so that the holes in the mica coincide with the centers of the larger holes in the brass. The four strips of bakelite and aluminum must be drilled similarly so that two 6-32 screws will slip into place right through the various strips at each end *without touching the brass backplate.* (Figs. 2 and 3.)

The unit is now ready for the ribbons to be assembled. These are corrugated after they are put on. By experimenting with common metal foils the writer had best results from that obtained from an old paper condenser, but whatever is used make sure it is *not* lead foil or the "mike" will be dead.

Cut a piece of the smooth aluminum foil, about 1/8" narrower than the plate for clearance on both sides and from 3¾" to 4" long.

Instead of cutting each ribbon separately it is by far the easiest plan to leave all the ribbons in one piece by cutting out slots down the length of the foil, thus forming a row of ribbons all joined together at both ends. With this prepared, cut out a piece of fairly smooth resilient paper the same width as the backplate and 3" long. Newspaper can be used but when it is being withdrawn from under the ribbons the rough surface tends to pull them. Place this paper rectangle on the face of the plate between the two strips of mica and lay the ribbons over it so that about ¼" of foil overlaps both pieces of mica as indicated by the dotted line in Fig. 2. The foil should be glued to the mica right across, sufficiently to hold the ribbons in place while the clamps are screwed down at each end. There must be a certain amount of slack in the ribbons and to insure this you can place a match or something of similar proportions across the middle of the plate and glue the ribbons down over it. Then remove the match gently without dragging or tearing any of the ribbons and the most ticklish part of the job is over.

Next come the clamps. Take one of the aluminum strips, place it over one of the pieces of mica and on the opposite side of the plate place the corresponding strip of bakelite. If the holes were correctly drilled you can drop a ½" 6-32 screw in each hole and tighten them up, thus clamping them down at one end permanently. These two bolts must not touch the brass backplate or the "mike" will be *shorted* out, so be sure to center the bolts in the large holes (Fig. 1). The other end is done exactly the same way only ¾" bolts are used instead. When fastening down this end place a soldering lug on the head end of one of the bolts, and place a narrow strip (¼" wide) of copper weather stripping between the backplate and the bakelite. These are the two "mike" connections, one for the ribbons and one for t'e plate. Finally tighten up the bolts and the unit is finished except for *corrugating* the ribbons.

To do this, taking for granted that the rectangle of newspaper is still under the ribbons, place the unit on a firm horizontal surface with the ribbons upward. Next take a steel ruler and press it across the center of the ribbons. Press down firmly, but not hard enough to cut through the foil or bend the backplate and don't let the edge of the ruler slide or the ribbons will tear. Do this again at each end, subdividing the ribbons until each one is divided into eight loops. When this is finished, carefully remove the piece of paper underneath and the job is complete.

The nodes should touch the surface of the backplate so if it is not well insulated with the glue, the mike will "leak," causing a sound much like a carbon hiss.

Casing the "Mike"

The only remaining part of the construction is the case, which is 2½" wide and 6¼" high overall. It is built in two sections, the bottom section to which the unit is bolted, and the top section or screening which fits over the unit as a protector.

The bottom section is built around a piece of copper rod ¼" x ¾" and about 5¼" long, which is bent into a U 2½" across. Two brass plates are made the same shape as the copper horseshoe and fit over each side forming a small U-shaped box. These brass plates extend about ¼" above the prongs of the horseshoe. To fit them on, holes must be drilled through each plate into the copper which is tapped for 6-32 bolts. The unit is bolted to one of these plates so that it comes exactly half way between the two. A hole is drilled in the other plate and a rubber grommet is inserted to protect the "mike" cable. In the bottom or bent part of the copper U another hole is drilled so a "mike" stand adapter can be bolted on. If a stand is handy the adapter can be screwed into it. If not, a length of aluminum tubing threaded to fit the adapter and provided with a heavy base does a good job. On the outer side of each leg of the U, a slot is filed 1/8" deep and 5/8" wide to accommodate the two ends of the metal band over the screening.

For the screening section of the case a strip of copper rod 1/8" x 5/8" and 14" long is bent to form three sides of a rectangle. The two legs should be 5¾" long and 2½" apart, being sure to make the corners as square as possible. Two holes are drilled 1½" apart in the top or short side of this frame and four holes are drilled down each leg. The first one is ½" from the top, the rest are 1" apart. Next a piece of fairly heavy brass screening 3¾" x 9¼" must be procured. In the middle of this screening on each side a square ½" wide by 7/8" deep is cut out, thus allowing it to fit between the prongs of the copper frame. To make the rest easier the screening can be bolted at the top and by bending the two flaps of screening down on each side and folding the edges in, the job begins to take shape. A certain amount of clipping and shaping is necessary still, but if the model illustrated is followed a fairly nice looking "mike" should be the result. When the side flaps have been fitted, clipped and bent they can be tucked inside the copper legs and clamped there by the nuts. The screening should only extend down 4" from the top, thus leaving 1½" of bare copper prong on each side at the bottom. These fit into the slots cut in the sides of the bottom section of the case.

Assemble the whole microphone now and connect a length of shielded rubber cable to it. It will be found that the ribbons are grounded to the frame of the "mike," so connect the shielding conductor to the frame and the wire to the backplate. Incidentally, the photographic illustrations were taken with no ribbons on the unit in order to give a clear idea of the plate.

If the bass response is preferred, for close speaking, the polarizing voltage should be low (from 50 to 150 volts). This bass may become exaggerated. When the polarizing voltage is increased the ribbons are attracted to the plate thus breaking them into sections and so reducing the bass frequencies. This also has the effect of increasing the output of the microphone up to 200, 300 and even 400 volts.

The Radio Beginner

(Continued from page 207)

same as those shown in Fig. 1, except that there is a mid-tap on the secondary of the input transformer and on the primary of the output transformer.

The voltage impressed on the primary is the same as the voltage on a regular audio transformer, but since the secondary is tapped in the center, the voltage placed on the grid of each of the two tubes in push-pull, is only *half* of the voltage which would be impressed on the single tube of an ordinary audio amplifier. For this reason we must impress upon the primary of such a transformer *twice* the voltage that we would impress on the regular audio transformer. The divided voltage is united again in the output transformer. In such a system of amplification we get a balancing effect between the two tubes which permits us to work the tubes at a higher output without distortion than the same tubes in a straight audio amplifier.

Resistance-Coupled Circuits

The transformer coupled amplifier is very efficient, but is not always the most satisfactory where a very high degree of quality is desired; the range of audio frequencies is quite broad, and a transformer must be very well designed in order to pass every audio frequency with equal fidelity. In order to avoid this difficulty, a system of *resistance-coupled* audio frequency amplification may be used. This type of amplifier, as shown in Fig. 3, takes advantage of voltage drops across resistances. In order to understand more completely how this amplifier functions, let us examine the circuit in Fig. 4. Here we have two resistors, one variable, and the other fixed, in series with each other, and the two resistors thus connected, placed across a small battery. Let us assume for the moment that the two resistors have the same value; then the voltage drop across each will be the same, the sum of these voltage drops being equal to the voltage of the battery. Now let us decrease the value of the variable resistor. This will mean that there will be less of a voltage drop across the variable, and consequently a greater drop across the fixed resistor. If we were to reverse the procedure and increase the value of the variable resistor, there would be a greater voltage drop across it, and a smaller drop across the fixed resistor. We have an analogous situation in Fig. 5, simply by substituting a vacuum tube in place of the variable resistor. Because the resistance of the space between the filament and plate will vary depending upon the voltage on the grid, the voltage drop across the fixed resistor will vary.

It will be noted that the plate of the detector tube in Fig. 3 is connected to the positive side of the "B" battery, through a fixed resistor. It is essential to keep this voltage from reaching the grid of the next tube, but at the same time the alternating audio frequency currents must be allowed to pass. This may be accomplished by placing a "C" battery in series with the grid, in such a manner that it places a small negative charge on the grid, while the positive side opposes the positive potential of the "B" battery. The varying voltages from the preceding tube will either add to or subtract from the fixed grid voltage, making the grid alternately more or less negative, and in this fashion regulating the electron flow in the second tube.

While the circuit showing the resistance-coupled amplifier using the "C" battery is fundamentally sound, yet the awkwardness of using the battery and other undesirable factors may be overcome by using the circuit shown in Fig. 5. The small condenser allows alternating audio currents to pass to the grid of the tube, but prevents the positive plate potential of the first tube from passing. The second resistor connected to the grid of the tube at one end, and the negative side of the battery at the other end, places a small negative charge on the grid, thus eliminating the battery.

Impedance Coupling

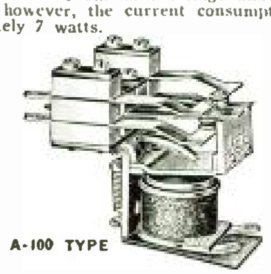
One of the disadvantages of the resistance-coupled amplifier lies in the fact that rather high values of plate potential are required. In order to overcome this difficulty, a type of amplifier known as *impedance* coupled is sometimes used. This is shown in Fig. 6. The circuit is very similar to that of the resistance-coupled type, the only change being the insertion of an impedance in place of the plate resistance. This impedance is simply a coil of wire wound over a laminated iron core, and closely resembles the primary of an audio transformer.

Newest Radio Apparatus

(Continued from page 232)

New Relays

● A RECENT bulletin issued by the Guardian Electric Manufacturing Company shows many new types of relays. Among the most interesting is model A-100, an antenna relay designed for the amateur who wants compact, convenient change-over control, with large contact points of silver, to insure long life even under heavy overload. The insulation is low-loss AlSiMag 196, and the design of the instrument is such that there is low capacity between the switch points. This relay will control up to one kilowatt in either A.F. or R.F. circuits, and all frequencies up to and including 28 mc. The coils used to actuate the contacts operate on 110 volt 50-60 cycle A.C., but coils for other voltages and currents may be had at a slight increase in price. At the standard voltage and frequency ratings, however, the current consumption is approximately 7 watts.



A-100 TYPE

The models U-100 and U-200 are adjustable underload relays, sensitive, precise, and well constructed. Each is enclosed in a black metal container to protect it from dust, dirt, and accidental misadjustment. The contact points are of silver and oversized to take care of overloads. The insulation is bakelite and the switches are single-pole, single-throw, normally open. These units will control the A.C. primary of any power supply delivering up to and including 500 watts. The standard coil operates over an adjustable range of 100 to 200 mils D.C. on the U-100 model, and from 200 to 400 mils on the U-200. The release current value is 75% of the attract current value. The latter is obtained by a screw adjustment of the spring tension. At these ratings, the voltage drop through the small model is 10.5 volts; and through the larger, 9 volts.

U-100 TYPE

The New RCA Tubes

RCA-1624 Transmitting Beam Power Amplifier. Filament voltage, A.C. or D.C., 2.5; filament current, 2 amps.; transconductance (for plate current of 50 ma.) 4000 micromhos; direct inter-electrode capacitances, grid-plate (with external shielding) .25 mmf., input, 11 mmf.; output, 7.5 mmf. Uses: As push-pull Class AB_2 audio amplifier—D.C. plate voltage 600; max. signal D.C. plate current 90 ma.; plate dissipation 25 watts. As grid-modulated R.F. power amplifier, Class C telephony—plate voltage, same; plate current 75 ma.; plate dissipation, same. As plate-modulated R-F power amplifier, Class C telephony—D.C. plate voltage 500; D.C. plate current, same; plate dissipation 16.5 watts. As R.F. power amplifier and oscillator, Class C telegraphy—D.C. plate voltage 600; D.C. plate current 90 ma.; plate dissipation 25 watts. Note: In this case, modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

Types 2050 and 2051 Hot-Cathode Gas Tetrodes are sensitive, gas-filled tetrodes of the indirectly heated, hot-cathode type, designed for grid-controlled rectifier service. The tubes are highly sensitive and may be operated directly from a vacuum-type phototube. Heater voltage A.C. or D.C., 6.3; heater current .6 amp.; grid-anode capacitance .2 mmf. The following are the characteristics for the type 2050: peak forward anode voltage 1300 max.; peak inverse anode voltage 1300 max.; shield grid (grid No. 2) voltage, 0; peak anode current 500 ma. max.; average anode current 100 ma. max. (averaged over a period of not more than 30 seconds); tube voltage drop (approx.) 8; grid resistor .01 meg. min., 10 meg. max.

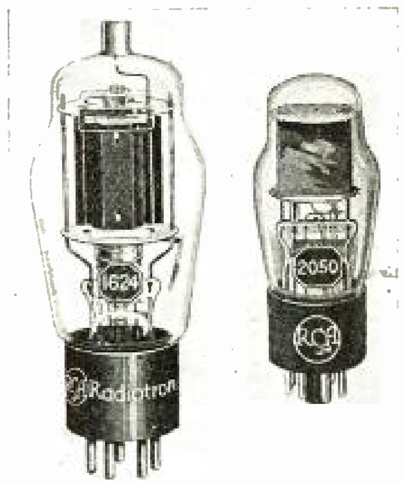
The following are the characteristics for the type 2051: peak forward anode voltage 350 max.; peak inverse anode voltage 700 max.; shield grid (grid No. 2) voltage, 0; peak anode current 375 ma. max.; average anode current 75 ma. max. (averaged over a period of not more than 30 seconds); tube voltage drop (approx.) 14; grid resistor .01 meg. min., 10 meg. max.

Several new 1.4 volt tubes have just been announced. These include the **1A7-GT Pentagrid Converter, the 1H5-GT Diode High-Mu Triode, the 1N5-GT R.F. Amplifier Pentode**, all of which operate on .05 amp. filament current, and the 1Q5-GT which requires .1 amp.

The triode unit of the 1H5-GT is for use as a Class A_1 amplifier; the diode is independent of the triode except for the common filament, which is located at the negative end of the filament. The 1N5-GT is likewise for use in a Class A_1 amplifier, but the 1Q5-GT is to be used in a Class A amplifier.

A 50-volt filament **Beam Power Amplifier** is the **50L6-GT.** Its heater current is .15 amp. and its plate may be operated on 110 volts maximum. The maximum power output of this tube is 2.2 watts.

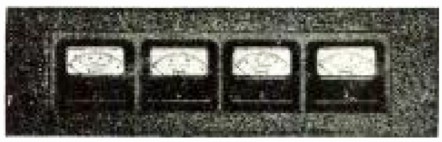
The 6AG7 Video Beam Power Amplifier is a heater-cathode type of metal tube intended for use primarily in the output stage of the video amplifier of television receivers. It may also be used advantageously in television transmitters as a coupling device between video-frequency stages and transmission lines.



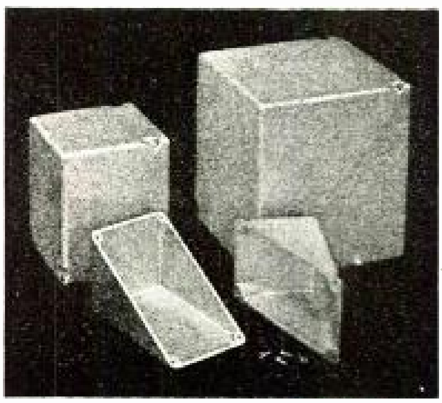
The design of the 6AG7 features not only an exceedingly high value of transconductance but also high plate-current capability. As a result, a large voltage for modulating a Kinescope can be built up across the relatively low load resistance required for coupling the 6AG7 to the Kinescope.

New National Products

● IN the National Company's new radio bulletin No. 291-I, are described many of this well-known manufacturer's products. Among the interesting items, in addition to receivers featured in this catalog, are a *safety meter panel* to make it safe and easy to connect meters into high-voltage leads rather than into ground leads. It is available either blank or punched with 2, 3 or 4 holes for 2" meters. End screw slots are included.



Rugged cast aluminum shields are also featured in the catalog. These, though particularly designed for use as stage shields in high-gain equipment, may also be used as cases for small wavemeters and the like. They are available in three sizes, from 5" x 3" x 3" to 6¼" x 6" x 6".



Silver Trophy Award

(Continued from page 208)

Note These Important Rules

The photos must be sharp and clear and preferably not less than 5" x 7".

The pictures will be judged for the general layout of the station, the quality of workmanship exhibited, and the appearance of the photograph itself. The judges will also consider neatness as an important point.

When you submit the photograph of your Ham station, send along a brief description not longer than 300 words, describing the general line-up of the apparatus employed, the size, type and number of tubes, the type of circuit used, name of commercial transmitter (if not home-made), watts rating of the station, whether for c.w., or phone, or both, etc., and give the name of receiver.

State briefly the number of continents worked, the total number of stations logged or contacted, and any other features regarding the station which you think will be of general interest. Mention the type of aerial system used, especially any unique or new features about it, and which type of aerial you use for transmitting and receiving; also what type of break-in relay system, if any, is used. Include a photo of yourself.

Address all photos and station descriptions to Editor, Ham Station Trophy Contest, c/o RADIO & TELEVISION, *99 Hudson Street, New York, N. Y.*

I Cover the Pacific Coast!

By Lyle M. Nelson

(All time is in P.S.T.)

● DAYTIME reception of the more powerful European short wave stations has showed marked improvement during the past month here on the Pacific Coast. Programs from Berlin, London, Rome, Paris, Moscow and many other cities are now booming through with excellent volume.

Perhaps the most noticeable improvement has been from the Moscow stations. As reported in this column last month, a new station announcing as RAL is heard daily on 15.18 megacycles. In addition to this station, Soviet authorities are using RKI on 15.08 mc. and RAL on 9.6 mc. during the program for North America from 4 to 6:15 p.m. daily.

A trio of Guatemalan stations continues to hold forth with excellent signal on Saturday nights from 9 to 11:30 p.m. TGW on 15.20 mc., TGWA on 9.87 mc. and TGWB on 6.49 mc. are heard with the regular Saturday night broadcasts advertising Guatemala coffee.

The Kanimba's floating broadcaster 9MI has shifted frequency from 9.82 megs. (where it was heard last winter) to 6.06 mc., according to word from New Zealand. The new frequency will make it difficult for Pacific Coast listeners to receive 9MI.

Typical South Sea Island music with all the romance that singing guitars and native voices can give it can be enjoyed by Pacific Coast listeners every Tuesday and Friday night by tuning to Tahiti's popular short-waver, FO8AA on 7.10 megs. FO8AA has been reported by several listeners as broadcasting from 8 to 9:30 p.m. Occasionally code interference blots out reception from this station.

Kendall Walker of Yamhill calls our attention to the fact that neither JVN on 10.66 nor JVW3 on 11.73 is carrying the Saturday night baseball games from Tokyo as reported in this column in the June issue. Mr. Walker is right, the ball games have been shifted to JVH on 14.60 mc. He also reports an unidentified station on 11.53 mc. announcing its location as the Philippine Islands. Heard daily near 6 a.m., he says.

JFO of Taihoku, Taiwan, has moved higher in the 31 meter band and is now heard on 9.68 mc., according to George Goehring of Oakland. Japanese war news is given at 6 a.m. daily.

Two other changes on the 31 meter band have been the appearance of Costa Rica's TIPG on 9.61 mc. and the disappearance of Colombia's popular HP1ABP from that frequency. A short time ago TIPG appeared on this frequency broadcasting from 4 to 7 each night, relaying the broadcasts of long wave station TIX. It was not long after that HP1ABP disappeared from the band. HP1ABP was heard to announce that they were shifting to 4.92 mc.. Jack McCliment of Portland reports.

In addition to regular North American programs from 1:50 to 7:50 p.m. each night, the German short wave stations are heard here with excellent volume on the program for Australia and the Far East, from 9:05 p.m. to midnight. Both DJB on 15.20 and DJN on 9.54 mc. carry the program.

London's GSD on 11.77 mc. continues to boom forth daily with the program for western America from 6:20 to 8:30 each night. This station is also on the air from 9 to 11:15 p.m. with fair volume. Mr. McCliment writes. GSP on 15.31 mc. was heard with good volume from 9:25 to 10:15 a.m. by T. S. Hite of Los Angeles.

ROUND 'N' ABOUT—From listener's reports.

New station HNF on 9.70 mc. in Baghdad, Iran, heard once near 6 a.m. Signal was weak. Iran is almost on the other side of the world from the Pacific Coast. Java stations PMN on 10.26, PLP on 11.00 and YDB on 9.54 coming in well from 3 to 7 or 8 a.m. daily. COCQ is back on 8.85, but continues to shift frequency. "Radio Hanoi" on 11.90 mc. heard irregularly near 5 a.m. on 11.90 mc. CB970 of Valparaiso, Chile, heard broadcasting as late as 9 p.m. on 9.70 mc. Good reception.

"Hawaii Calls" program now being relayed by KKP on 16.03 mc. from 2:30 to 3 p.m. on Sunday. HP5J heard on 9.59 mc. near sign-off at 7:30 p.m. SP25 of Warsaw, Poland, breaks through to coast irregularly on 11.74 mc. near 6 p.m. with weak volume. VFB of Colombo, Ceylon, is no longer broadcasting on 6.13 mc. Has changed this station over to code. HS8PJ heard here Mondays from 5 to 7 a.m. on 19.02 mc. with weak volume. HS8PJ on 9.51 mc. very irregular from 5 to 7 a.m. daily except Monday.

Antennas for the HAM

(Continued from page 212)

rapidly after being out in the open for a little while. If it is at all possible, the writer would even advise the amateur to cover the entire line with one or two layers of rubber and friction tape. The better the insulation between the wires and the better the protection against the elements, the longer will the line remain without increasing losses.

Recently there has been placed on the market a commercial brand of twisted pair called EO-1, which has much better insulation than the home-made line described above.

A feature of twisted pair lines is the ease with which it can be run around corners. Sharp bends have no ill effects on operation. Coupling these lines to the transmitter is done merely by connecting the line to a one-to-three turn loop and coupling this coil to the ground end of the final tank coil. Vary the coupling between the coils until the final amplifier draws its rated plate current. Coupling can be varied either by varying the number of turns in the link coil, or preferably by changing the distance between the two coils. If the antenna is cut for the center of the amateur band on which it is desired to operate, there will be practically no loss in efficiency when operating at the edges of the band.

This type of antenna makes an ideal system for receiving because of the inability of the transmission line to pick up any signals, thereby discriminating against noise, most of which is generally picked up by the lead-in. A double-pole, double-throw switch will enable the operator to use the same antenna for *transmitting and receiving.* Although it works best at the approximate frequency for which it has been cut, this antena can also be used for receiving on other bands as well. If used exclusively for receiving, it should preferably be cut for the lowest frequency band to be employed.

The writer would be interested in hearing from readers as to the types of antennas they would like to see described in this series. A postcard will do.

Amateur Frequency Meter

(Continued from page 213)

cate the revised model of this instrument.

All in all, the addition of the crystal greatly adds to the convenience and accuracy of the frequency measurements.

Additional Parts Required for the Added Crystal Control

BLILEY ELECTRIC CO.
1—SMC-100 100-1000 kc. crystal

HAMMARLUND
1—8 mh. R.F. choke coil, No. CH-8
1—25-100 mmf. trimmer condenser, No. CTS-85
1—20 mmf. tuning condenser, No. MC-20S

CORNELL-DUBILIER
1—.1 mf. 400 v. condenser, No. DT-4P1

New DX'ers League

Editor,

The American League of Negro DXers is now having a membership campaign. We are asking all colored SWLs and Amateurs, who wish to join our organization, to send for application blanks. There is no joining fee, we only request a 3c stamp for return mail.

James W. Cheek, Director,
William Lewis, Ass't. Dir.
2047 Llewellyn Ave.,
Baltimore, Md.

COMMERCIAL NOTICES 10¢ A WORD

Under this heading only advertisements of a commercial nature are accepted. Remittance of 10c per word should accompany all orders. Copy should reach us not later than the 10th of the month for the second following month's issue.

AGENTS WANTED

300% PROFIT SELLING GOLD Leaf Letters for Store Windows; Free samples. Metallic Co., 446 North Clark, Chicago.

CORRESPONDENCE COURSES

CORRESPONDENCE COURSES and educational books, slightly used. Sold. Rented. Exchanged. All subjects. Satisfaction guaranteed. Cash paid for used courses. Complete details and bargain catalog Free. Send name. Nelson Company. H-210 Manhattan Building, Chicago.

INSTRUCTION

ALGEBRA PROBLEMS SIMPLIFIED $1.30; Low Voltage Transformer Construction $0.60; Data on 500 to 20,000 Volt Step-up Transformer Construction $1.35 (Prepaid). H. Ackerson. Box 322-D. Ramsey, N. J.

METAL LOCATORS

RADIO METAL LOCATOR (TREASure Finder) custom-built to order. Guaranteed sensitivity of 10-foot penetration. More efficient, less expensive than many commercial instruments. Write for details and special offer. Not obligated to buy. A. Stuart. 1015 Wilson Ave., Teaneck, N. J.

PATENT ATTORNEYS

INVENTORS — PROTECT YOUR rights before disclosing your invention to anyone. Form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions sent free. Lancaster, Allwine & Rommel, 436 Bowen Building, Washington D. C.

QSL—CARDS—SWL

100 NEAT SWL CARDS PRINTED with your name and address sent postpaid for $1. Bunch of samples and RST Chart for five cents in stamps. W1BEF. 16 Stockbridge Ave., Lowell, Mass.

SWL'S QSL'S, 150 FOR 75c OR $1.00. Any 2 colors, free samples. W3DEE. Maple Shade. N. J.

SHORT WAVE

1¼ AND 2½ METER RECEIVERS and transmitters constructed and for sale. For information U.H.F. Service. 64 Zeigler Street. Roxbury, Mass.

SPECIAL EQUIPMENT

CALL LETTERS. 2¼ IN. POLISHED aluminum mounted for studio or license plate $1.00 each, per pair $1.50, add 10 cts. per plate for red edging. Money back if not satisfied. E. Bailey, West Newton, Pa.

MOUNT THOSE UNATTACHED meters in M.E. portable mounts. Standard type with closed sides, crackle finish, binding posts. 90c postpaid in U.S. Markli Engineering, Annapolis, Md.

FOR SALE (NON COMMERCIAL) 3¢ A WORD

Under this heading we accept advertisements only when goods are offered for sale without profit. Remittance of 3c per word should accompany all orders. Copy should reach us not later than the 10th of the month for the second following month's issue.

FOR SALE! RIDER MANUALS—Vols. 1, 2, 3 and 4. New in original cartons—$6.00 each. F.O.B. Colorado City—cash or money order. H. E. Manlss. Colorado City. Texas.

HAVE TEST EQUIPMENT; LATEST SW-3; 4 tube PA system; and other apparatus for sale only; all letters answered. Write John Womack, Box 89, Dimmitt, Texas.

FOUR TUBE FIVE METER SUPER-regenerative receiver. complete with power supply and speaker in cabinet. $7.50. Hansen. 826 S. 4th St., Aurora, Ill.

EXCELLENT 50T $8.00 POSTPAID. Insured. W9WJB. Verona, Wisconsin.

RME-69 $89.00. PR-15M $79.00. SX-16 $79.00. NC100 $69.00. NC80X $69.00. Breting 14 $59.00. Breting 12 $49.00. Sky Champion $39.00. Sky Chief $24.00. Howard 430 $19.00. FB7 $19.00. Sky Buddy $15.00. SW3 $9.00. practically all other models of receivers. All sets shipped on ten day trial. List free. Terms. W9ARA, Butler, Missouri.

FOR SALE: ULTRA STRATOsphere 10 transmitting receiver $18.00. Atwater Kent superhet 9 tubes with cabinet $12.00. Gross 3 tube short wave battery receiver using 3 volt tubes $5.00. Riders Manuals 4-5-6 also Riders Resistance Measuring, also Ghirardi's Modern Radio Servicing and Field Service. also 20 Radio & Television mags., Radio Call Book, also many other radio books. Sell all books $15.00. 2-B eliminators Majestic and All American $6.00. Jensen. 211 East 200 St., Bronx. N. Y.

SKY-BUDDY, PERFECT CONDItion. $11.50 including tubes. Edward Bird. 4340—6th Avenue N.E., Seattle.

BARTER AND EXCHANGE — FREE!

NO ADVERTISEMENT TO EXCEED 35 WORDS, INCLUDING NAME AND ADDRESS

Space in this department is not sold. It is intended solely for the benefit of our readers, who wish to buy or exchange anything in the Radio and Television fields for Radio and other merchandise.
As we receive no money for these announcements, we cannot accept responsibility for any statements made by the readers.
Use these columns freely. Only one advertisement can be accepted from any reader in any one issue. All dealings MUST be above board. Remember you are using the U. S. mail in all these transactions and therefore you are bound by the U. S. Postal Laws. Describe anything you offer accurately and without exaggeration. Treat your fellow men the way you wish to be treated.
We welcome suggestions that will help to make this department interesting and helpful to our readers.
Copy should reach us not later than the 10th of the month for the second following month's issue.

HAVE 410 AND 16 GAUGE SHOTguns, also other guns, peep sights, parts. Want Sky Buddy, Guthman U17, 16 gauge Ithaca pump shotgun, Savage 410 single shotgun. R. Welker, 406 No. Harvey, Oak Park, Ill.

HAVE 6L6 XTAL CONTROLLED transmitter with built-in power supply. Mounted on metal chassis, complete with meter, tubes, xtal and coils. Swap for good Sky Buddy receiver, typewriter or fast camera. Beacon Radio. Saugus. Calif.

WILL SWAP ONE PHILCO 7 TUBE battery receiver in good condition, with A Battery, for wireless record player, or P. A. equipment or what-have-you. Joseph S. Dawson. Kenbridge, Virginia.

HAVE ALL KINDS XMITTING parts, Teleplex, Morris coil winder, signal gen. Swap for T55, TZ20, TZ40. 7.5V.-6.5 amp. fil. xformer. xtal mike. 0-10000 200 mill 9" Triplett M. A. What have you? Wm. A. Hoelker, W9ZHO. Oldenberg, Ind.

HAVE GENERAL ELECTRIC CARbon mike, also have 350 volt. 75 mill power supply. Would like to trade for good fast camera or electric phono motor with table and pick-up. E. E. Bateman. Saugus, Calif.

WANTED—PLATE CAMERA. BUG or typewriter. Have 28 ft. shielded rubber covered mike cable, speakers, B eliminators, meters and new tubes including 6L6, 83, 2A3, 59 etc. Send for complete list. W9FOC. Beecher, Ill.

TO SWAP—ONE COMPLETE TRIPlett Master 4 unit test lab. in carrying case. Will swap complete or any part, make trade offer. R. I. Gardner. 2689 L St., San Diego, Calif.

SWL CARD COLLECTORS! SEND me ten used U.S.A. commemorative postage stamps, or fifty used U.S.A. common postage stamps, and receive fifty FB foreign QRA's by return mail. Frank Tooker, 1329 Albany Street, Schenectady, N. Y.

TO SWAP—18 COPIES QST—DEC. 1937—May 1939. 15 copies Radio—Dec. 1937—Apr. 1939. Want photography textbooks and equipment. J. R. Hanson, Box 550, Rome, N. Y.

WANTED A McMURDO SILVER Masterpiece V or VI. State price. J. C. Furey, 807 Reed St., Olean, N. Y.

TRADE 7-TUBE SINGLE-SIGNAL superhet, just built, for 35 mm. enlarger, developing equipment, or Univex 8 mm. motion camera and projector. All replies answered. Edward Wooten, Varita Court, Apt. I, Wilson, N. C.

HAVE 5-TUBE SUPER, 4 ELECTRIC motors, speakers and radio parts, assortment of recvr. and xmittr tubes. 2 carbon mikes. Want used motorcycle or what have you? Gilbert Hannon, 1000 Main St., Green Bay, Wis.

WANTED—U.S. AND FOREIGN stamps. Will swap midget radio, power transformer, condensers, resistors, meters, service manuals, B eliminator etc. David Rudolph, 84 West 188 Street, Bronx, New York City, N.Y.

SWAP JEWELL VOLT-METER FOR volt meter kit reads 0-7-0-160 V. D.C. Meter is jewelled movement. Want 82 type tube and 3 (8mf) 450V. condensers. Ship prepaid. W9MIO. 919 W. 4th St., Mount Carmel, Ill.

HAVE $95 DEVRY 16-MM. MOVIE outfit, $125.00 Agfa-Ansco 16mm. camera, with $20.00 case. Will exchange for modern radio tester or what have you? Walter Wiesneki. E. Grove St., Nanticoke, Pa.

WANTED: ANY TRANS. HIGH pwr. parts or bug or what have you. Will swap a 6' cabinet, standard, finished in gray and black. Cabinet is of masonite. Peter Bencini, 1359 Allerton Avenue, Bronx, N. Y.

HAVE HUNDREDS OF RADIO parts, tubes, eliminators, magazines, cameras, golf clubs, tools, etc. Send your list. Describe fully. I will send mine. G. F. Roby, 6303 Kenwood Ave., Chicago, Ill.

EXCHANGE FEDERAL ENLARGER, or Argus focus camera, developing tank, and Schick razor (electric) or complete Sears-Roebuck spraying outfit value $40 for 1938-9 commercial ham receiver that includes 10 meters. Howard or Hallicrafter prepaid. I. Brody, W2JAP, 1163 Wheeler Ave., Bronx, N. Y.

WANTED: 40 METER BLILEY xtals, 4 prong Isolantite sockets, NC800, two Triplett 301 MA 0-100 es 0-300, 100—100 mmf cond. revr. type. Trade: 80 meter xtals, B.F.O., tubes, new radio bug. Dawson, 1308 F. The Dalles, Oregon.

SWAP 10 POWER TELESCOPE, code oscillator, Atwater Kent battery speaker, postmarks and stamps. Trade for old coins. Barrett, P.O. Box 186, Jeannette, Pa.

WANT VIBRAPACK DELIVERS about 200 volts or 5 meter crystal, any kind of 5 meter parts, Johnson Q5 meter antenna. Have swap list. Swap 200 tubes, speakers. A. Branzanskas, 105 Elizabeth St., Athol, Mass.

HAVE S.W. AND B.C. RADIO parts, meters and tubes all types, tools and radio magazines. What am I offered in exchange. Answer all. Ruby Rodman, 605 Woodland Park, Chicago, Ill.

WANTED — "ULTRA STRATOSphere 10" in A-1 condition, complete with all coils. Address—Charles Burwell, Magnolia D-X Club, Magnolia, Ohio.

HAVE WESTINGHOUSE LIGHT meter—like new—lists at $35.00. Want good microscope—please give complete descriptive details in first letter. Jack Potter, 14 Lincoln Pl., Maplewood, N. J.

HAVE A FEW RADIO PARTS TO trade for precancels, or will trade precans, U.S. commemoratives for others especially Presidentials. A. Eidschun, 455 Summit Ave., Carlstadt, N. J.

WANTED: MEISSNER TUNING unit #7512 in exchange for an RCA piezo-electric calibrator. Joseph Jorden, 907 N. State St., Chicago, Ill.

HAVE MIDGET EMERSON, RADIO parts, 2 speakers, 12 tubes, violin with case bow and 4 books. All used. What have you? J. Doroshenko, 483 Cleveland St., Brooklyn, N. Y.

WANTED: INFORMATION AND diagrams on buried treasures and treasure locators. Have radios and parts. John Haynes, Doe Run, Missouri.

(Continued on opposite page)

DX on the Ham Bands

(Continued from page 219)

Call	Freq.	R	S	Where Heard
CP2BP	14.16	5	6	Mich.
HC1AZ	14.035	3	3	Conn.
LU2HF	14.3	5	6	Penna.
LU5AG	14.1	5	7	Penna.
LU5AN	14.302	5	7	Penna.
LU8AB	14.15	5	7	N. Y., Penna.
LU9BV	14.18	5	8	Fla.
PY2AC	14.24	5	7	Ore.
PY7EI	14.26	4	5	Conn.
VP3CO	14.065	5	8	Quebec
YV1AQ	14.115	5	7	N. J.
EUROPEANS				
CT1PK	14.26	5	8	Conn.
CT1CK	14.25	5	8	N. Y.
EA7BA	14.295	4-5	7-9	Mich., Penna., N. J., Quebec
EA9AH	14.03	5	7	N. Y.
EI2L	14.005	5	7-8	Md.
F3OS	14.2	5	7	N. Y.
F8VP	14.01	5	5	N. Y.
F8LX	14.1	4	7	N. J.
F8NT	14.035	4-5	5-7	Ariz., Nebr.
G2PU	14.02	4-5	8-9	Md., Nebr., Fla.
G2UT	14.035	4	7	Wash.
G5ML	14.115	5	7-8	Mich.
G5LU	14.05	5	6-7	Md., Kans.
G5JO	14.1	5	4	N. Y.
G5BJ	14.19	5	7	Fla.
G6VX	14.32	4	7	Fla.
G6LK	14.12	5	8	Wash.
G6PC	14.1	5	8	Md.
G8TX	14.07	4	6	Md.
G8IL	14.1	5	6-7	Kans.
G8IG	14.13	4	6	Ariz.
GI5ZY	14.06	5	7	Quebec
GM2UU	14.07	3	7	Wash.
GM3OL	14.116	3	6	Nebr.
GM6MN	14.07	5	7	Kans.
GM6RG	14.2	5	7	Md.
GM8MN	14.095	5	7-8	Md., N. Y.
GW3KY	14.038	5	6	Nebr.
HA1K	14.26	5	7	Ala.
I1MP	14.08	5	7	N. Y.
I1TKM	14.04	5	5	Ala.
LA8C	14.13	5	6-7	Ala., N. Y.
LX1AI	14.03	5	6	Quebec
ON4HS	14.08	5	8-9	Mich.
ON4TO	14.05	4	7	Fla.
PA0EH	14.1	5	7-9	N. Y., Quebec
SM6WE	14.27	5	5	Ala.
SV1KE	14.02	4-5	6-9	N. Y., Mass., Mo.
OCEANICS				
K6NYB	14.2	5	7	Conn.
K6NVD	14.26	5	7	Penna.
K6BNR	14.162	5	8	Penna.
K6OKH	14.298	5	4-8	S. Dak.
K6PPR	14.42	4	5-7	S. Dak.
K6NYD	14.49	5	8	S. Dak.
K6OJ1	14.488	4	7	S. Dak.
K6OJR	14.315	4	8	N. J.
KA1ER	14.25	4	7	Mass., Nebr.
KA1ME	14.205	3-5	5-8	Mass., Mo., Nebr.
KA1JM	14.24	5	7	Ore.
KA1LB	14.245	5	6	Ore.
KA1AF	14.14	4	7	Ariz.
KA1AP	14.145	5	8	Ariz.
KA1HS	14.26	5	8	Ariz., Nebr.
KA2OV	14.255	5	8	Ariz.
KA4LH	14.12	5	9	Wash.
KA7EF	14.12	5	8	Ala., Mo., Nebr.
KA7HB	14.27	4-5	5-8	Wash., Kans.
PK1VY	14.35	5	7	Tex.
PK2AY	14.03	4-5	5-8	Ia., Wash., Mo.
PK2LZ	14.04	4	5-6	Kans.
PK3AA	14.3	4	6	Tex.
PK3WI	14.045	5	4-6	Ia., Tex., Ala.
PK4KS	14.06	4	6-7	Kans.
PK6XX	14.095	4-5	6-9	Mass., Ia., Mich., Mo., Wash., Conn., Quebec
VK2ADE	14.005	5	7	Ia.
VK2ADU	14.035	5	6-7	Ia., Quebec
VK2AGH	14.06	4-5	6	Ore., Ariz.
VK2UC	14.05	4	7	Mo
VK4AB	14.01	5	7	Ia.
VK4MW	14.0	5	6-7	Ia., Tex.
VK4KH	14.03	4	7	S. C.
VK4KO	14.04	5	7	Mo.
VK4JP	14.	5	7	Ore.
VK4HG	14.1	5	7-8	Ariz.
VK5CS	14.075	4-5	6-8	Ia., Tex.
VK5VF	14.18	5	9	Mo.
VK5QR	14.045	4	7	Nebr.
VK5GM	14.155	4	7	Mass.
VK6MW	14.11	5	7	Kans.
VK7AB	13.996	5	6	Mich.
ZL1HY	28.2	5	6	Calif.
ZL1AM	28.2	4	6	Ariz.
ZL2BE	14.09	4	7	Mo.
	28.42	5	7	Calif., Ariz.
ZL3BV	28.17	3	4	Calif.
ZL3KZ	28.3	5	7-8	Kans.
ZL4BK	28.25	4	5	Calif.

World S-W Stations

(Continued from page 220)

Mc.	Call	
6.324	COCW	**HAVANA, CUBA**, 47.4 m., Addr. La Voz del Radio Philco, P. O. Box 130. 6.55 am.-12 m. Sun. 9.55 am.-10 pm.
6.310	HIZ	**CIUDAD TRUJILLO, D. R.**, 47.52 m. Daily except Sat. and Sun. 11.10 am.-2.25 pm., 5.10-8.40 pm. Sat. 5.10-11.10 pm. Sun. 11.40 am.-1.40 pm.
6.295	OAX4G	**LIMA, PERU**, 47.63 m., Addr. Apartado 1242. Daily 7-10.30 pm.
6.280	HIIG	**TRUJILLO CITY, D. R.**, 47.77 m. 7.10-9.40 am., 11.40 am.-2.10 pm., 3.40-9.40 pm.
6.243	HIIN	**CIUDAD TRUJILLO, D. R.**, 48 m., Addr. "La Voz del Partido Dominicano." 12 n.-2 pm., 6-10 pm.
6.236	HRD	**LA CEIBA, HONDURAS**, 48.12 m., Addr. "La Voz de Atlantida." 8-11 pm.; Sat. 8 pm.-1 am.; Sun. 4-6 pm.
6.210	—	**SAIGON, INDO-CHINA**, 48.28 m., Addr. Radio Boy-Landry, 17 Place A. Foray. 4.30 or 5.30-9.15 am. 11.45 pm.-1 am.
6.200	HI8Q	**CIUDAD TRUJILLO, D. R.**, 48.36 m. Irregular.
6.190	JLK	**TOKYO, JAPAN**, 48.47 m. 8-9.30 am.
6.190	HVJ	**VATICAN CITY**, 48.47 m., Mon., Wed., Thur., Sat. 2-3.30 pm., Tues., Fri. 2-3 pm. Thur. also 3-3.30 pm.
6.190	TG2	**GUATEMALA CITY, GUAT.**, 48.47 m., Addr. Dir. Genl. of Electr. Commun. Relays TGI Mon.-Fri. 6-11 pm., Sat. 6 pm.-3 am. Suns. 7-11 am., 3-8 pm.
6.185	HI1A	**SANTIAGO, D. R.**, 48.5 m., Addr. P. O. Box 423. 7 am.-5 pm.

49 Met. Broadcast Band

Mc.	Call	
6.170	W2XE	**NEW YORK CITY**, 48.62 m., Addr. Col. B'cast System, 485 Madison Ave., 11 pm.-12 m. Sat. & Sun.-10.30 pm.- Mid.
6.153	HI5N	**MOCA CITY, D. R.**, 48.75 m. 6.40-9.10 pm.
6.150	HJ4DAE	**MEDELLIN, COLOMBIA**, 48.78 m., 9.30 am.-1 pm., 5-11.30 pm.
6.150	VPB	**COLOMBO, CEYLON**, 48.78 m., 7-11 am.
6.150	CJRO	**WINNIPEG, MAN., CANADA**, 48.78 m., Addr. (See 11.720 mc.) Daily 6 pm.-12 m., Sun. 5-10 pm.
6.150	ZP14	**VILLARRICA, PARAGUAY**, 48.78 m. 4-6 pm.
6.148	ZTD	**DURBAN, SOUTH AFRICA**, 48.8 m., Addr. (See ZRO, 9.753 mc.) Daily 12.40-3.45 pm., Sat. till 4 pm., Sun. till 3.20 pm.
6.147	ZEB	**BULAWAYO, RHODESIA, S. AFRICA**, 48.8 m. Mon., Wed., and Fri. 1.15-3.15 pm.; Tues. 11 am.-12 n.; Thurs. 10 am.-12 n. Sun. 3.30-5 am.
6.140	W8XK	**PITTSBURGH, PA.**, 48.83 m., Addr. Westinghouse Electric & Mfg. Co. Relays KDKA 10 pm.-12 m.
6.140		**LEOPOLDVILLE, BELGIAN CONGO**, 48.83 m. Suns. 5.35-7 am.
6.140	SP48	**WARSAW, POLAND**, 48.83 m., 3-5.30 pm.
6.137	CR7AA	**LAURENCO MARQUES, PORT. E. AFRICA**, 48.87 m. Daily 12.05-1, 4.30-6.30, 9.30-11 am., 12.05-4 pm., Sun. 5-7 am., 10 am.-2 pm.
6.130	XEXA	**MEXICO CITY, MEX.**, 48.93 m., Addr. Dept of Education. Daily 8-11 am., 2.30-4 pm., 7.30 pm.-12.45 am. Sun. 1.30 pm.-12.45 am.
6.130	VP3BG	**GEORGETOWN, BRIT. GUIANA.** 48.94 m. 9-10 am., 2.15-6.30 pm., Sun. 5.30-11.30 am., 3-5 pm.
6.130	TIEM	**SAN JOSE, COSTA RICA.** 48.94 m. "El Mundo", Apartado 1049. 11 am.-11 pm., Sun. 10 am.-6 pm.
6.130	CHNX	**HALIFAX, N. S., CAN.**, 48.94 m., Addr. P. O. Box 998. 7 am.-11.15 pm. Sat. 8 am.-11.30 pm. Sun., Noon-11.15 pm. Relays CHNS.
6.130	LKJ	**JELOY, NORWAY**, 48.94 m. Noon-6 pm.
6.125	CXA4	**MONTEVIDEO, URUGUAY**, 48.98 m., Addr. Radio Electrico de Montevideo, Mercedes 823. 8 am.-Noon. 2-10 pm.
6.122	HP5H	**PANAMA CITY, PAN.**, 49 m., Addr. Box 1045. 10 am.-1 pm., 5-11 pm.

BARTER and EXCHANGE FREE ADS (continued)

WANTED RADIO TEST EQUIPment meters and supplies, or Riders manuals vol. 1 to 9. Will swap or pay cash. Send for list. S. J. Battory, 35 Potter Place, North Adams, Mass.

HAVE AMPERITE MIKE, P.A. AMplifier, phono motor, pickup, phonoradio combination, violin, thousand books, sporting goods, etc. Want recorder, or swap lists. M. Epstein, 2953 Ruckle, Indianapolis, Ind.

HAVE, PAIR SCIENTIFIC PHONES, straight radio telegraph key, 3 vernier dials, trade for 6L6 or 6L6G tube and socket and 100 mmf transmitting condenser. Write. Len Fitchett, 637 Pine St., Victoria, B. C., Canada.

WANTED A ½ OR ¾ HP AIR cooled gas motor. Trade a Keystone projector for what have you. Also unmounted 3904 Key xtal, also want a D.B. mike. J. O. S. Hunter, Box 165, Kensington, P.E.I.

WHO HAS A TRANSCEIVER TO trade for a new Lionel remote control whistling streamliner. Old Bing Bavarian typewriter, 1/75 h.p. motor A.C. roll up track, "O" gauge, wood ties. Donald Nelson, 138 Johnson Ave., Dumont, N. J.

EXCHANGE ALMOST NEW DOUble button mike in Bud ring with cable and plug, for TZ 40 HK 54 or what have you? QSL cards 100% answered. W. J. Weightman, 132 N. 5th St., Middletown, Indiana.

HAVE NATIONAL PW-2 UNIT, tubes 6" speaker 25-60 cycle power, filament transformers IFT's variable, fixed condensers, potentiometers resistors, key magazines, etc. Need 5-10 meter receiver, xmitter. Charles M. Edwards, 1108 Dougall Ave., Windsor, Ont., Canada.

CANADIANS—HAVE RADIO parts, tubes, radio books, camera, rock samples. Will exchange parts. for? Wanted: receiver, test-equipment, radio books or transmitter. (Send your list.) Steve S. Boychuk, 64 George Str., Sault Ste. Marie, Ontario, Canada.

SWAP—GREBE CR-9 BATTERY REceiver—150-2000 meters. Class "B" 46's transformers (new). 47-210 CW xmitter. Need watchmaking tools, photographic supplies, printing press, adjustable film tank, or? Stanley, 2748 Meade St., Detroit, Mich.

WANT, BATTERY OPERATED 3 TO 5 tube short wave radio receiver, good condition. Trade $63.00 N.R.I. Radio and Television course in good shape for same. Will answer all mail. H. M. King, Jr., R.F.D. 3, Mendenhall, Miss.

WANTED: RADIO AMATEUR Hand Book and SW radio plans. trade or buy. Have field glasses and radio parts. Answer all letters. Bob McNeill, Moorefield, W. Va.

HAVE RIDERS MANUALS 1 TO 4, W.E. 242A. socket, double button carbon mike, 80-160 trans. choke. Want —communications receiver with R meter, 10-550 meter 40 meter crystal. Grover S. Dale, W9RFD, Linton, Ind.

20 WATT WRIGHT-DeCOSTER AUditorium dynamic speaker A-1 condition, 1000 ohm field. What have you? Want T40's. Herbert Fisher, R.11, Box 1760, Houston, Texas.

BEST TRADE OFFER TAKES 150 watt phone or cw transmitter complete, 160 to 10 meters, send for full particulars. Columbus Emma, 6539 Gaviota Ave., Van Nuys, Calif.

WANTED: CODE PRACTICE MAchine, with tapes, for cash. Give full description. Arnold Badt, 169 Britain Ave., Benton Harbor, Mich.

HAVE 8 SHOT CLIP 22 REPEATing rifle with telescope sights. Would like Lafayette 6 volt transceptor or transceiver, with tubes. Roy Woodin, 522 Biddle St., Kane, Penna.

HAVE NO. 7½ GILBERT ERECTOR set, 250 v. factory-built power supply, 38 ARRL handbook, electric train, civil war muzzle-loader rifle, complete size 17 scout uniform. What have you? H. Patchen, 23 Grand St., Sidney, N. Y.

HAVE 8 ERECTOR; BACK COPIES Stamps and Avocations Magazines; 2 100 ft. 16 mm films. Cost $30. Want Readrite Ranger free point tester model 640 in excellent condition. Benson, 737 Regester Avenue, Baltimore, Md.

HAVE ELECTRO-VOICE HI-Z VElocity mike, cost $15.00, perfect condition; also N.R.I. course less apparatus; other radio parts, tubes; want crystal mike, what have you? William Locke, 222 N. 8th St., Spearfish, So. Dak.

HAVE 110 VOLT 60 CYCLE 150 watt power-AC fan belt generator, portable-mobile 10-160 meter fone xmtr, 160 meter portable fone xmtr, and parts. Trade for? Radio or camera line preferred. Wilbur Golson, % WJBO, Baton Rouge, La.

WANTED A USED SET OF "MARconi Victor Wireless Records" in good condition. Will buy used coils, condensers, resistors, etc. Send list. QRA, Jose E. Mesorana, 62 W. De Diego St., Aguadilla, Puerto Rico.

SWAP: HAVE MANY TRANSMITting and SW receiving parts (new and used). Would like to swap for crystals, condensers or other radio parts that I don't have. E. W. Earps, 1316 E. Bobe St., Pensacola, Fla.

WANT "NATIONAL SW-3" 2 VOLT battery model only. For new Fairbanks-Morse 4 tube 2-6 volt battery superhet, over 40 broadcast stations received on loudspeaker. Latest tubes and circuit. Alexander Podstepny, 217 Pine St., Phila., Penna.

WILL TRADE NEW SHURE CRYStal pickup model 99 black, used for high fidelity equipment, with powerful motor, 10" turntable, swing recordings. Want typewriter or test equipment. Irving Goldstene, 332 Alabama Ave., Brooklyn, N. Y.

WILL TRADE 200 WATT 16MM movio projector 400 ft. capacity with 1000 ft. film and other items, for television set or complete kit such as Fada. J. Winkler, 62 Bergen Ave., Clifton, N. J.

SWAP HAM STATION RACK transmitter 80 watts input, power supplies, GE 8 tube superhet, key, Triplett meter for 1931 Ford or Chevrolet roadster, good condition. W2LHC, George Fogarty, 407 W. 56 St., New York City.

WANTED — CLASSICAL PHONOgraph records. Electric recorded. New or used. Can give in exchange merchandise such as pick-ups, books, etc. Joseph Monahan, Old Frankfort Pike, Lexington, Ky.

MULTIMETER AND OSCILLATOR in case, tube tester, condenser tester, tubes, condensers and resistors, P.A. outfit, phono pickup, mike, speakers and other parts. Will trade for what have you. J. R. Reed, 2178 West 3d. St., Durango, Colorado.

SWAP NAMES OF 50 ENERGETIC swappers, Sylvania 53 tube (unused), old fundamental radio course, "Increasing Farm Profit", 100 valuable formulas, signal corps fundamental radio book. SWL cards appreciated. Bill Schroeder, 803 Wisconsin, Peoria, Illinois.

SWAP FOR WHAT HAVE YOU. Complete shortwave receiver—9½-1000 meters. "Leutz" 9 tube $325 SW-LW receiver, speakers, phones and radio parts. List. J. Wm. Anderson, M.W.D. Eagle Mt. Plant, Desert Center, Calif.

WILL SWAP—COOKE'S "ELECTRIcal Course" (62 lessons). Will send titles of lessons if requested. Want—Sky Buddy or similar receiver, radio or servicing course, or what have you? Robert Jones, 201 Walnut St., Westernport, Md.

HAVE COMPLETE SET POWERED wood working tools for home workshop. Oil paintings, tent for camping. Interested in complete ham radio rig, phone, CW. All communications answered. C. D. Journell, 3726 Morehead St., El Paso, Texas.

WANTED GAS ENGINE FOR MODel airplane, good candid camera and photographic equipment. Have radio parts, tubes, mags., S.W. converter, S.W. receiver, etc. Write for details to: Anthony Conlin, 83 Westfield Rd., Holyoke, Mass.

WANT SMALL PLATE CAMERA, exposure meter, developing tanks, binoculars, portable typewriter, Riders, Ghirardi's manuals. Have RCA auto radio, ¼ H.P. A.C. motor, revr. parts, books, coins, cash. W. J. Closson, 295 8th St., Troy, N. Y.

WANTED: RECEIVER AND TRANSmitter in good condition provided the price is right. Will pay cash for best offer. John Engratt, 31 Chipman St., Waterbury, Conn.

MOVIE PROJECTOR 8MM WANTED or other photo apparatus. Have Superior Allmeter 1150-S and S. tube tester 1140-S. What have you? F. W. Johnson, Antwerp, O.

BEGINNER IN RADIO WILL BUY or swap S.W. parts, circuit diagrams, etc., and would like to correspond with other beginners. Alfred J. Badger, 21 Leavett Place, Lynn, Mass.

WANTED—HALLICRAFTERS 5-10, or other commercial receiver. Trade—modulator, P.P. 6L6, modulator transformer, 1000 volt power supply with meter, or cash. Value $95. Write—James Wood, 1224 Kunkle Ave., N.S. Pittsburgh, Penna.

HAVE 5 TUBE EMERSON, 4 PUSHbuttons, almost new; exchange for factory built preselector. Would like to correspond with SWL's having Sky Buddy, S19-R. SWL's exchanged. Mail answered 100%. Daniel Platek, 225 Division Avenue, Brooklyn, N. Y.

WANTED: ANY KIND OF A transmitter or what have you. Have 1917 model one tube radio slightly used, also a 36, 37, 38 and 39 tube. All letters ans. Adrian Bernagozzi, Copeague, L. I., N. Y.

WANT LOW POWER SW TRANSmitter. Will trade typewriter, binoculars, books and postage stamps. Gail Harry Moreland, 326 North Walnut, Wichita, Kansas.

SWAP RME 510X EXPANDER FOR DB20 preselector. Or what? William Quigley, 102 Ave. S, Brooklyn, N. Y.

HAVE AC, 119 TRANC. VOLT. ohm, mill meter, 2 stage preselector code oscillator, couple single mic. Send your list for mine. What have you to swap? Steve Vargo, Jr., 2338 Riverview, Dayton, Ohio.

WANTED: SKY BUDDY, OR A good S.W. receiver. Have phonograph equipment or practically anything in radio parts or receivers. I would prefer to trade. Stanley Bartleman, Box 271, Graettinger, Iowa.

CANADIANS—WANT SKY BUDDY fairly new. Have new 6L6 20 watt, 80 meter xmitter less power supply, new $30 Spanish guitar, key and $500 cash. Write J. Davis, 27 Vernon St., Halifax, N. S., Canada.

HAVE STROMBERG CARLSON RAdio 8 tube separate speaker, good condition, also 64 chromatic harmonica with case new. Swap for bicycle or what have you. Russell B. Gurney, Jr., Box 81, Salem Depot, N. H.

WANTED—SCOTT RECEIVER 23 OR 30 tube model, state price and describe completely. Swap—Hallicrafter communication receiver, genemotor, RCA auto radio M34, oil condensers high voltage, parts. Oliver F. Klein, 2235-N. 39 St., Milwaukee, Wis.

WANTED: A USED EILEN, Doerle or Do-All Deluxe, or similar set either A.C. or battery. Have an Upco magnetic phono pickup, list of parts and cash. Write now. SWL? Don Yocum, Bettsville, Ohio.

5 TUBE AC SET AND PARTS TO exchange for stamps, coins. Will trade ten unused three cent stamps for duck stamps (no torn). Mervyn Reynolds, Dept. RT, Jefferson, Maine.

WANTED OLD TRANSMITTER AND receivers, mikes and bugs, no parts accepted. Also swap SWLs. QRA Mitchell Miller, Randolph St., Vandalia, Ill.

WILL PAY CASH FOR UTAH KIT No. 2 in good condition. All letters answered. B. E. Hegler, 310 N. "A" St., Arkansas City, Kansas.

HAVE WESTON PHOTRONIC PHOtocell, relay revolution counter, laboratory equipment, books, magazines, linoleum cutters, mikes and dials. Want meters, multitester or receiver. Will exchange lists. George Fried, 1764 Weeks Ave., N.Y.C.

HAVE — HOWARD MODEL 450 communication receiver, separate speaker, crystal filter, etc. Set cost $109, last year. Want Sky-Champion A-1 shape, jumbo meter and what have you. E. Rusconi, 6942 Ave. K, Houston, Tex.

HAVE 9 FT. GASOLINE MODEL airplane with Syncro ace motor. Valued at $30.00. Want fone transmitter, Hallicrafters receiver or what have you? Your description for mine. Answer all letters. Nelson Harrill, Ellenboro, N. C.

HAVE 10" UTAH SPEAKER, 5" RCA with output transformers. Also a two tube regenerative receiver of A.R.R.L. 1939. What have you? Robert C. Dole, 10 Clinton Ave., Rutland, Vermont.

WILL TRADE 2-47 TUBES AND 1-30 or 1-47, 1-25Z5, 1-31 for 1-58 and 1-56. Want a 40 meter crystal also. Write. Dick Conrad, Saco, Mont.

SWAP—SILVERTONE HOWARD 12 tube communications set with crystal and speaker 1938 model for moving picture machine 16 mm or what? H. Davis, Oconomowoc, Wis.

WANTED FOR CASH—LOOSE COUplers, tuners, 23, 43 plate table mounting variable condensers, spark coils, spark gaps. Give condition, particulars. George C. Starry, 210 N. Ligonier St., Latrobe, Pa.

HAVE UNUSED AND USED stamps, wood Bb clarinet, Buescher tenor saxophone (gold lacquered) and radio parts. Will trade for unused U. S. stamps or? All letters answered. Huddleston, 918 South 25th Street, Temple, Texas.

WANTED: MIDGET OR AUTO RAdio, binoculars, sleeping bag, 22 rifle; have fishing tackle, Taylor barometer and outdoor equipment. Waltz, 1211 Transverse, Carrick, Pittsburgh, Pa.

HAVE SIGNAL PRACTISE KEY; License Manual; How to Become a Radio Amateur; Radio Amateur Course; How to Draw by Murray; 175 viewcards. Want stamps, books, etc. Robert J. Grzeskowiak, 302 Adams Street, Alpena, Michigan.

SWAP—0-1 M.A. TUBETESTER METer, Hickock made; eleven assorted metal receiving tubes; 3-50; 2-81 tubes slightly used; Majestic G-10-B dynamic speaker with output transformer—for what have you. Albert Buckner, Charleston, Mo.

1939 HALLICRAFTERS SX-17 COMplete with speaker and xtal. Purchased 3-11-39 and in excellent condition and covered by original guarantee. Need modern B.C. console. P. O. Box 104, Tamaqua, Pa.

(Continued on following page)

BARTER and EXCHANGE FREE ADS (continued)

WANT LARGE LENS FROM OLD Jenkins or Baird television set, or similar. Give diameter and tell your wants in reply. Robert Eichberg, 782 West End Ave., New York, N. Y.

WANTED P.M. DYNAMIC SPEAKers any size. Have power transformers, input and output transformers and other miscellaneous parts. Byron St. Clair, 54 Selwyn Rd., Belmont, Mass.

WANTED — TYPEWRITER — GOOD make in good condition. Have brand new Sparton wireless record player with microphone attachments. Value twenty-five dollars. Julius Unger, 1349—50 St., Brooklyn, N. Y.

HAVE WEBSTER TELETALK INtercommunication system. 5 tubes, 2 speakers and main station; open for ten speakers. A.C. or D.C. Cost $79.50. Want amateur transmitting, receiving or transceiver, or what? R. B. Gurney, Rr., Box 81, Salem Depot, N. H.

MOTOR GENERATOR HAS OUTPUT of 450 volts at 1.75 amps., also 1.5 and 7 volts to be traded for condenser tester or other test equipment. H. Malik, Statesan, Wis.

WANTED — USED 8MM MOVIE films and 8MM accessories, telescopes, rifles, binoculars, cameras, auto radio, world war relics. Will pay cash or trade. Send for my list. Floyd Miller, 217 N. Main St., Towanda, Pa.

WANT ELECTRIC GUITAR, SMALL gas driven 110 volt 50-60 cycle charging plant, or converter for 6 volts dc to 110 volts ac. Also could use combination 6 volts dc and 110 ac amplifier. Orville Price, Hillsboro, Ill.

WANT 5 OR 6 TUBE SUPERHET. Have 160 meter xtal xmitter, Hawkins Elec. Guide vols. 2-10, 6V vibrator pack, 250 V. trans. converters, etc. All letters ans. Garth Henry, 911 Evans, Cheyenne, Wyo.

WILL SWAP RADIO PARTS FOR four midget wheels and tires. Also have battery charger and stamps. Terrence Genes, Fort Lawn, S. C.

NO. 7½ ERECTOR SET AND NO. 4 Chemcraft set, also 1 television book, slightly used. Want Sky Buddy or other short wave receiver, etc. T. Sekula, 2410 Cudaback Ave., Niagara Falls, N. Y.

HAVE JEWELL 3½" 0-5 MILLIAMpere meter, Weston 1-140 V. D.C. (301). Hoyt 0-200 A.C. meter, 5 mfg. manuals Crosley, G.E.—AK Strom. Carl. Gernsback 3-4 Manuals. Want—Sky Buddy or similar receiver. Robert Newman, 1700 E. 15th St., Brooklyn, N. Y.

TRADE 150 WATT PHONE AND CW transmitter. All band operation. Need TZ40s, high voltage transformers, chokes, condensers, etc. What have you? H. G. Gwinn, 935 W. 21, Anderson, Ind.

HAVE COMPLETE N.R.I. RADIO and television course and 1939 Sky Buddy. Want 16mm Keystone camera and projector in A1 condition. Exchange SWL cards. I QSL 100%. John Basta, 31 Lake Street, Brooklyn, N. Y.

HAVE N. W. SCH. OF TAXIDERMY course (worth $20) or cash for good A1 superhet. Sky Buddy or SW3. QRA: Bob Bennett, 618 Berkley Ave., Elmhurst, Ill.

WANT SKY BUDDY OR HOWARD 430 in good condition. Will trade excellent collection 1430 different stamps. (135 countries) mounted in swell album. Some of U.S. collection 70 years old. John Creamer, 423 Third, Chillicothe, Missouri.

WANTED—PARTS FOR 25 WATT c.w. transmitter. Trade new complete photo electric relay circuit with GM photo cell and high resistance relay. Also have Nokoil 6" PM speaker. All inquiries answered. Charles Schachle, Canute, Okla.

HAVE N.R.I. COURSE. GOOD. WILL trade for A1, 300 volt vibropack, Bliley crystals, bug key, or crystal mike. Phillip H. Barnhart, W7HPB, Valley Route, Cody, Wyo.

WANTED—ONE OR TWO METER generators 32—350 D.C. or 27.5—350 D.C. H. A. Keys, W5WN, Kinder, La.

I HAVE A 600 POWER THREE stage microscope, dissection instruments both in a wood case. I want Riders Manual number four or new tubes in sealed cartons. M. Rosen, 496 Stone Ave., Brooklyn, N. Y.

EXCHANGE 5 AUDIO TRANSformers, six inch dynamic speaker, 3 pair earphones, 13 note accordion, 1/75 H.P. motor A.C., 3 power binoculars with compass, Lionel remote whistle train set new. Want anything radio. Nelson, 138 Johnson Ave., Dumont, N. J.

HAVE MIDGET CAMERA, SMALL 5 tube S.W. radio and phone trans., parts. Want movie camera, proj. films or 22 cal. rifle. Al. Razzando, R.D. 1, Fayette City, Pa.

HAVE WESTON ANALYZER 660, Brownie No. 2 folding camera, Hammarlund dual .00014 cond., small amplifier 57-56-2A5-2A5-80 8 tube super (communications). Swap for Sky Buddy, accordion, etc. Stanley Garner, 29 W. Chestnut St., Norristown, Pa.

HAVE HIGH AND LOW POWER xmitting tubes to swap. Pair 805, 838, 807, one 803 and a new RCA 833. Want receiver, high voltage transformers, 250 watt class B equipment. W3HJR, 4500 Frederick Ave., Baltimore, Md.

HAVE OXFORD 8 INCH DYNAMIC speaker, amplifier, Weston model 506 voltmeter, Readrite 0-20-100 ma. and 30 adventure books. Want old model Itaco Clipper. State age. H. Hale, Jr., 1756 Wallen Ave., Chicago.

6 TUBE THORDARSON OSCILLOscope, 1 inch tube with 2 inch lens. Like new. Internal sweep. 12 controls, all variable. Want good camera or good shotgun. Eric Pohle, 151 Mahar Ave., Clifton, N. J.

HAVE LOADS OF POPULAR SCIence magazines, other magazines, telegraph set, pocket radio, etc. Want Argus camera, bicycle, United States stamps, watch in good condition, etc. Send list. L. Bernstein, 1071 Elder Ave., Bronx, N. Y.

HAVE: BRAND NEW INBOARD marine engine, radios, parts. Want power tools, art photo collection. SW radio, records, amplifiers, or make your own offer. J. Kubik, 37 Pine St., Gt. Barrington, Mass.

WILL SWAP 8 TUBE AC BROADcast receiver (Peerless) parts alone worth approximately $25, for a Hallicrafter receiver or what have you in radio apparatus! QSL and SWL cards answered 100%. A. E. Perry, Eddyville, Iowa.

FOUR-BAND A.C.-D.C. short-wave receiver. Swap for automatic 4-jaw chuck for "AA"-brand lathe; or power tools and machines. Write for list of other radio stuff. A. Stuart, 1015 Wilson Ave., Teaneck, N. J.

WANT A SHORT WAVE RECEIVER. Will give 1154 stamps. C. R. Johanson, 116 West 2nd St., Jamestown, N. Dak.

HAVE NEW PING PONG SET, 13 magazines for boys, 8 Geographic Magazines and about 1,000 stamps. Want good radio parts, old radios, or books on radio? All letters ans. Ross Mumaw, Millington, Tenn.

WANTED—8" DYNAMIC 2,500 OHM field. Have power transformers, bell transformer condensers, tubes, etc. Send your list for mine. Louis Mazzagetti, Crabtree, Penna.

TRADE RADIO PARTS, MIMEograph, amplifier, 110 volt DC to AC converter, 35mm motion picture projectors. Want—RCA 16mm sound camera, 16mm projector or what? Wm. Hansen, Niles, Mich.

HAVE 6L6-807 TRANSMITTER, 35 watts output C.W., including tubes, power supply. Less crystal. Swap for good 10 meter receiver or crystal mike. Have transmitting tubes, 211, 242. Leonard Wright, 59 Creighton St., No. Cambridge, Mass.

HAVE FIVE DOLLARS AND AN Ansco Memo 35 mm camera, F6.3 lens. What testing equipment can you offer? Tom Martinsek, Co. 575 CCC, Lewistown, Montana.

HAVE INSTRUCTOGRAPH SR. 10 tapes, also many books on radio What have you? All letters answered. Jack Butler, 508 Whitley Ave., Joliet, Ill.

WANT CODE INSTRUCTOR OR low powered transceiver. Have books on all subjects, radio, science, etc. Also stamp collection and coins. All offers considered. Write to Sidney Novogrodsky, 90 Orange Street, Chelsea, Mass.

SWL EXCHANGE

UNITED STATES

JOHN A. B. WERTZ, W4GAR, Co. 4468, CCC, Barnwell, So. Car.
MAURICE WYNNE, 210 Hector Ave., Metairie, Louisiana.
EDWIN NELSON, 1417 Monroe Ave., Racine, Wisconsin.
BOB HANSEN, 1414 Grove Avenue, Racine, Wisconsin.
T. P. SWOL, 30 Mill St., Middletown, Conn.
J. I. VAUGHT, P. O. Box 1424, New Orleans, La.
JOHN BALLIN, W4OH56, 40 East 66 St., New York, N. Y.
WM. C. PALMER, R#2, Brunswick, Ohio.
MRS. ALDEA BEAUCHEMIN, 231 Henry St., Manhattan, N. Y.
JOSEPH WASTAK, JR., 1748 W. 18th St., Chicago, Ill.
HARRIET KNIGHT, 1428 E. Jefferson St., Fort Worth, Texas.
JOHN BASTA, 31 Lake St., Brooklyn, N. Y.
G. T. BARRON, 1517 Ruan St., Fk'd., Phila., Penna.
BOB BIASE, 80 Greyrock Place, Stamford, Conn.
BOB JOHNSON, P. O. Box 146, Logan, West Virginia.
JAMES CRUM, Box 223, North Ridgeville, Ohio.
HAROLD BEICHEL, Highland, Ill.
LEO PSZENITZKI, JR., Box 146, North Ridgeville, Ohio.
VAN FIELD, Center Moriches, N. Y.
OLIVER ROBERTS, 7 Fairmount Avenue, Wakefield, Mass.
LOUIS H. JASON, JR., 57 Cleveland Street, Arlington, Mass.
PAUL HOFFPAUIR, Orange, Texas.
N. E. WHITON, 76 Green St., Greenwood, Mass.
JAMES COLE, 1321 No. Irving St., Arlington, Va.
WILLIAM LEWIS, 2047 Llewellyn Ave., Balto., Md.
FRANKLIN PEASE, 3160 Dodge, Omaha, Nebraska.
HENRY HECKERT, 910 Coolbaugh Street, Red Oak, Iowa.
WALTER McMAHAN, 320 Hunstock Ave., San Antonio, Texas.
DONALD BOCKO, V.P., Plymouth Radio Club, North 4th St., Plymouth, Ind.

CANADA

CHARLES TAYLOR, 4 Water St., St. Catharines, Ont.

CUBA

HELIO LOPEZ R. ECAY, P. O. Box 2325, Havana.

ENGLAND

ROY BROMELL, 303 Warwick Road, Solihull, Birmingham.
DENYS CRAMPTON, 35 York Road, Birkdale, Southport, Lancashire.
WILFRED TARBOTTON, BSW1,909, 28 Curzon Rd., Bradford Moor, Bradford, Yorkshire.
R. PITTILO, BSWL776, Queen Margaret St., Kinghorn, Scotland.
ANDY ROBERTSON, 5 York Rd., Southport.
EDDIE STROWBRIDGE, 11 Leigh Gardens, Kensal Rise, London.
RON JOHNSON, 11 Perry Mansions, Catford Hill, S. E. 6, London.

MALAY

TANBIN HUSSAIN, Municipal, Ipoh, Perak, F.M.S.

SWEDEN

GUNNAR SANDBERG, Drottninggatan 102, 111, o.go., Stockholm.

Let's Listen In with Joe Miller

(Continued from page 215)

reporter from the West Coast, adds that it has added 2 new relays, one on 9.69 mc., and another on a frequency varying from 7.30-7.34 mc. The latter is heard daily, 8-10:15 a.m., but the former is used only irregularly.

Radio Saigon, which operates on 6.116 mc., has added another frequency, 9.49 mc., adding another signal to the growing number emanating from this far-away land. Ashley Walcott also adds that often another frequency, 11.78 mc., is used after 8:30 a.m., taking over the program of the 6 mc. transmitter, which is scheduled from 6-8:30 a.m. daily. The 11 mc. transmitter carries on 'til 9:30 a.m. The 9.49 mc. signal operates simultaneously with the one on 6 mc. QRA is P.O. Box 412, Saigon.

MTCY, Hsingking, Manchukuo, was heard by Ashley Walcott, W6, on 2 occasions from 4-5 a.m., on 13.635 and 15.20 mc., simultaneously.

JVW, 7.257 mc.; JVW2, 9.675 mc.; JVW3, 11.725 mc.; JVW4, 15.235 mc.; and JVW5, 17.825 mc., will now relay JOAK programs to Manchukuo. At present, JVW3 broadcasts irreg. 4-7:30 a.m., and also, with JVH, 14.60 mc.

TPZ2, 8.96 mc., Alger, Algeria, often heard phoning Paris using side-band secrecy in mid-afternoon, now may be heard regularly, in clear speech, relaying a BCB program of Radio-Alger to Tunisia and the Near East, on Tuesday from 12:30-1:30 p.m.

KAX, 19.98 mc., Manila, Philippines, heard by Gus Gallagher, W6, transmitting a program to the NBC at 7 p.m.

HNF, Baghdad, Iraq, formerly on 9.83 mc., now is being heard on 9.685 mc., with a daily schedule of 10 a.m.-3 p.m.

XGOK, 11.81 mc., Canton, is the latest addition to the Chinese stations, and is apparently being operated by the Japanese, who have occupied Canton. Schedule is at present 5:30-8:40 a.m., with English used after 8 and news at 8:20 a.m., with English programs announced by a woman. Ashley Walcott sends this data, and reports XGOY, 11.90 mc., being nearer 11.89 mc., with a very strong signal.

Mc.	Call	
6.122	FK8AA	NOUMEA, NEW CALEDONIA, 49.00 m., Radio Noumea, Addr, Charles Gaveau, 44 Rue de l'Alma., Wed. & Sats. 2.30-3.30 am.
6.120	W2XE	NEW YORK CITY, 49.01 m., Addr. See 6.170 mc., 11 pm.-12 m., Sat. & Sun. 10.30 pm.-12 m.
6.117	XEUZ	MEXICO CITY, MEX., 49.03 m., Addr. 5 de Mayo 21. Relays XEFO 9 am.-1 pm., 7 pm.-2 am.
6,116	—	SAIGON, FR. INDO-CHINA, 49.05 m., 6 or 7 to 9.30 am., 11-11.30 pm.
6.115	OLR2C	PRAGUE, BOHEMIA, 49.05 m. (See 11.40 mc.)
6.110	XEGW	MEXICO CITY, MEX., 49.1 m., Addr. La Voz de Aguila Azteca desde Mex., Apartado 8403. Relays XEJW 11 pm.-1 am.
6.105	HJ6FAB	MANIZALES, COL., 49.14 m., Addr. P. O. Box 175. Dly. 5.30-10 pm. Sat. to 11 pm. Sun. 2.30-5 pm.
6.100	YUA	BELGRADE, JUGOSLAVIA, 49.18 m. 1-3, 6.30-8.30 am., Noon-6.30 pm.
6.100	W9XF	CHICAGO, ILL., 49.18 m., 4-6.50 pm. (Sat. to 5.30 pm.) 1-2 am.
6.100	W3XL	BOUND BROOK, N. J., 49.18 m., Addr. Natl. Broad. Co. 9 pm.-12 m.
6.097	ZRK	KLIPHEUVEL, S. AFRICA, 49.2 m., Addr. S. African Broad. Co., Johannesburg. Daily 12 n.-4 pm., Sun. 12 n.-3.20 pm.
6.097	ZRJ	JOHANNESBURG, S. AFRICA, 49.2 m. Addr. S. African Broad. Co. Daily exc. Sat. 11.45 pm.-12.50 am.; Daily exc. Sun. 3.15-7.30, 9-11.30 am. (Sat. 8.30-11.30 am.) Sun. 3.30-4.30 or 4-5 am., 5.30-7, 9-11.30 am.
6.095	JZH	TOKYO, JAPAN, 49.22 m., Addr. (See 11.800 mc., JZJ.) Irregular.
6.090	ZNS	NASSAU, BAHAMAS, 49.26 m., Addr. Dir. of Tel. East St., Nassau. 1.30-2, 8-9 pm.
6.090	CRCX	TORONTO, CAN., 49.26 m., Addr. Can. Broadcasting Corp. Daily 6.45 am.-4 pm., Sun. 9.30 am.-11 pm.
6.090	ZBW2	HONGKONG, CHINA, 49.26 m., Addr. P. O. Box 200. Irregular.
6.083	VQ7LO	NAIROBI, KENYA, AFRICA, 49.31 m., Addr. Cable and Wireless, Ltd. Mon., Fri. 5.30-6 am., 11.15 am.-2.15 pm., also Tues. and Thurs. 8.15-9.15 am.; Sat. 11.15 am.-3.15 pm.; Sun. 10.45 am.-1.45 pm.
6.080	W9XAA	CHICAGO, ILL., 49.34 m., Addr. Chicago Fed. of Labor. Ralays WCFL irregular.
6.080	CRY9	MACAO, MACAO, 49.34 m., Tues. 8.30-10 am.
6.080	HP5F	COLON, PAN., 49.34 m., Addr. Carlton Hotel. 7-9 pm.
6.079	DJM	BERLIN, GERMANY, 49.34 m., Addr., Broadcasting House. Irregular.
6.077	OAX4Z	LIMA, PERU, 49.35 m. Radio Nacional 7 pm.-1.30 am. Except Sun.
6.075	VP3MR	GEORGETOWN, BRI. GUIANA, 49.35 m. Sun. 7.45-10.15 am.; Daily 4.45-8.45 pm.
6.070	CFRX	TORONTO, CAN., 49.42 m. Relays CFRB 6.30 am.-11 pm., Sun. 9 am.-11 pm.
6.070	VE9CS	VANCOUVER, B. C., CAN., 49.42 m. Sun. 1.45-9 pm., 10.30 pm.-1 am.; Tues. 6-7.30 pm., 11.30 pm.-1.30 am. Daily 6-7.30 pm.
6.069	——	TANANARIVE, MADAGASCAR, 49.42 m., Addr. (See 9.51 mc.) 12.30-12.45, 3.30-4.30, 10-11 am., Sun 2.30-4.30 am.
6.065	SBO	MOTALA, SWEDEN, 49.46 m. Relays Stockholm 4.15-5 pm.
6.060	—	TANANARIVE, MADAGASCAR. 49.5 m., 12.30-12.45, 3.30-4.30, 10-11 am.
6.060	YDD	BANDOENG, JAVA, 49.5 m., 5.30 am. on.
6.060	W8XAL	CINCINNATI, OHIO, 49.5 m., Addr. Crosley Radio Corp. Relays WLW Sun. 7 am.-6.30 pm., Mon., Tues., Thur. 5.45-11 pm., Sat. to 10 pm. Other days to 10.30 pm.
6.060	W3XAU	PHILADELPHIA, PA., 49.5 m. Tues., Wed., Fri. 5.30-6.15, 6.30-11 pm. Sat. 11 pm.-1 am. Sun. 6.30-11 pm.
6.057	ZHJ	PENANG, FED. MALAY STATES, 49.53 m. 6.40-8.40 am., except Sun., also Sat. 11 pm.-1 am.

Mc.	Call	
6.050	GSA	**DAVENTRY, ENGLAND,** 49.59 m., 12.25-6 pm.
6.045	XETW	**TAMPICO, MEXICO,** 49.6 m. Irregular 7-11 pm.
6.040	W4XB	**MIAMI BEACH, FLA.,** 49.65 m. 1-3 pm., 9 pm.-2 am., Sun. 4-6 pm. Relays WIOD.
6.040	WIXAL	**BOSTON, MASS.,** 49.65 m., Addr. University Club. 7-9 pm. exc. Sat. & Sun. Sun. 2.30-6 pm.
6.033	HP5B	**PANAMA CITY, PAN.,** 49.75 m., Addr. P. O. Box 910. 10.30 am.-2, 6-10 pm.
6.030	CFVP	**CALGARY, ALTA, CAN.,** 49.75 m. Thur. 9 am.-1 am.; Sun. 12 n.-12 m.
6.030	RW96	**MOSCOW, U.S.S.R.,** 49.75 m. 1-3, 4-7 pm.
6.030	OLR2B	**PRAGUE, BOHEMIA,** 49.75 m. (See 11.875 mc.) Off the air at present.
6.023	XEUW	**VERA CRUZ, MEX.,** 49.82 m., Addr. Av., Independencia 98. 10 pm.-1 am.
6.020	DJC	**BERLIN, GERMANY,** 49.83 m., Addr. (See 6.079 mc.) 11.30 am.-4.30 pm.
6.020	HJ3CAX	**BOGOTA, COL.,** 49.83 m., Addr. Apartado 26-65. 12 n-2 pm., 5.30-11 pm., Sun. 6-11 pm.
6.017	HI3U	**SANTIAGO DE LOS CABALLEROS D. R.,** 49.84 m. 7.30-9 am., 12 n.-2 pm., 5-7 pm., 8-9.30 pm.; Sun. 12.30-2, 5-6 pm.
6.015	PRA8	**PERNAMBUCO, BRAZIL,** 49.85 m., Radio Club of Pernambuco, 4-9 pm.
6.010	OLR2A	**PRAGUE, BOHEMIA,** 49.92 m. Addr. (See OLR, 11.84 mc.) Irreg.
6.010	COCO	**HAVANA, CUBA,** 49.92 m., Addr. P. O. Box 98. Daily 7.55 am.-12 m., Sun. until 11 pm.
6.010	VK9MI	**S. S. KANIMBLA,** 49.92 m. (Travels between Australia and New Zealand). Sun., Wed., Thurs. 6.30-7.30 am.
6.010	CJCX	**SYDNEY, NOVA SCOTIA,** 49.92 m. Relays CJCB 7 am., 1.30, 4-8.30 pm.
6.007	XYZ	**RANGOON, BURMA,** 49.94 m., 6.30-10 am., 9-11 pm., Sat. 9.30-11 pm.
6.007	ZRH	**ROBERTS HEIGHTS, S. AFRICA,** 49.94 m., Addr. (See ZRK, 9.606 mc.) Daily exc. Sun. 9.30 am.-3.30 pm.; Sun. 9 am.-12 n., 12.15-3.15 pm. Daily exc. Sat. 11.45 pm.-12.50 am.
6.005	HP5K	**COLON, PAN.,** 49.96 m., Addr. Box 33, La Voz de la Victor. 7-9 am., 10.30 am.-1 pm., 5-11 pm.
6.005	CFCX	**MONTREAL, CAN.,** 49.96 m., Can. Marconi Co. Relays CFCF 6.45 am.-12 m.; Sun. 8 am.-10.15 pm.
6.005	VE9DN	**DRUMMONDVILLE, QUE., CAN.,** 49.96 m., Addr. Canadian Marconi Co.
6.002	CXA2	**MONTEVIDEO, URUGUAY,** 49.98 m. Addr. Rio Negro 1631. Relays LS2, Radio Prieto, Buenos Aires. 5.30-10.30 pm.
6.000	XEBT	**MEXICO CITY, MEX.,** 50 m., Addr. P. O. Box 79.44. 10 am.-1.45 am.
5.990	ZEA	**SALISBURY, RHODESIA, S. AFRICA,** 50.08 m. (See 6.147 mc., ZEB.) Also Sun. 3.30-5 am.

End of Broadcast Band

5.977	CS2WD	**LISBON, PORTUGAL,** 50.15 m., Addr. Rua Capelo 5. 3.30-6 pm.
5.975	OAX4P	**HUANCAYO, PERU,** 50.16 m. La Voz del Centro del Peru. 9-11 pm.
5.968	HVJ	**VATICAN CITY,** 50.27 m. Off the air at present.
5.950	HH2S	**PORT-AU-PRINCE, HAITI,** 50.37 m., Addr. P. O. Box A103. 7-9.45 pm.
5.940	OAX2A	**TRUJILLO, PERU,** 50.51 m., Tue., Thu., Sat., Sun. 7-10 pm.
5.900	ZNB	**MAFEKING, BRI. BECHUANALAND S. AFRICA,** 50.84 m. Addr. The Govt. Engineer, P. O. Box 106. 6-7 am. 1-2.30 pm. Ex. Suns.
5.900	TILS	**SAN JOSE, COSTA RICA,** 50.85 m. 6-10 pm.
5.885	HI9B	**SANTIAGO, D. R.,** 50.95 m. Irregular 6-11 pm.
5.875	HRN	**TEGUCIGALPA, HONDURAS,** 51.06 m. 1.15-2.16, 8.30-10 pm.; Sun. 3.30-5.30. 8.30-9.30 pm.
5.855	HI1J	**SAN PEDRO DE MACORIS, D. R.,** 51.25 m., Addr. Box 204. 11:40 am.-1.40 pm., 6.10-8.40 pm.

FREE CATALOGS and INFORMATION

By carefully reading the advertising columns, you will find many offers to furnish literature containing valuable technical information that will help you in your work. Use this list freely.

Firm	*Business*	*Offer*	*No.*	*Cost*	*Adv. Page*
Aerovox Corporation	Parts Mfr.	Catalog		Free	247
Allied Radio Corp.	Mail Order	Radio Catalog		Free	237
		Builder's Handbook		10c	
		Recording Book		10c	
American Radio Institute	Radio School	Booklet		Free	238
Amperite Co.	Parts Mfr.	Chart	AR	Free	235
Audel, Theo., & Co.	Book Publisher	Information		Free	229
Bliley Electric Co.	Parts Mfr.	Engineering Bulletin	E-6	10c	231
		Circular	A-6	Free	
		Bulletin	E-7	Free	
Brush Development Co.	Parts Mfr.	Catalog		Free	233
Burstein-Applebee Co.	Mail Order	Catalog		Free	241
Cameradio Co.	Mail Order	1939 Catalog		Free	241
Candler System Co.	Code Course	Book of Facts		Free	238
Chicago Wheel & Mfg. Co.	Manufacturer	64-page Catalog		Free	237
Cornell-Dubilier Elec. Corp.	Parts Mfr.	Catalog	165-A	Free	241
		Catalog	166-A	Free	
		Catalog	167-A	Free	
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Mc.	Call	
5.826	TIGPH	SAN JOSE, COSTA RICA, 51.5 m., Addr. Alma Tica, Apartado 800. 11 am.-1 pm., 6-10 pm. Relays TIX 9-10 pm.
5.813	TIGPH2	SAN JOSE, COSTA RICA, 51.59 m., Addr. Senor Gonzalo Pinto, H.
5.790	TGS	GUATEMALA CITY, GUAT., 51.75 m. Casa Preidencial, Senor J. M. Caballeroz. Irregular.
5.735	HC1PM	QUITO, ECUADOR, 52.28 m. Irregular 10 pm.-12 m.
5.460	YNOP	MANAGUA, NICARAGUA, 52.40 m., 8.30-9.30 pm. Sun. 2-3 pm.
5.300	ZIK3	BELIZE, BRIT. HONDURAS, 56.6 m., Tue., Thurs., Sat. 1.30-2, 8.30-9 pm.
5.145	OK1MPT	PRAGUE, BOHEMIA, 58.31 m., Addr. (See OLR, 11.84 mc.) Irregular.
5.145	PMY	BANDOENG, JAVA, 58.31 m. 5.30-11 am.
5.040	YV5RN	CARACAS, VENEZUELA, 59.52 m., 4-11.30 pm., Sun. 8.30-11.30 am., 3.30-10 pm.
5.020	YV4RQ	PUERTO CABELLO, VENEZ., 59.76 m., testing nightly. Off 9.20 pm.
5.010	YV5RM	CARACAS, VENEZ., 59.88 m., 3.30-10 pm., Sun. 8 am.-10.30 pm.
4.990	YV3RX	BARQUISIMETO, VENEZ., 60.12 m., 10 am.-11 pm.
4.970	YV1RJ	CORO, VENEZ., 60.36 m., Irreg.
4.960	VUD2	DELHI, INDIA, 60.48 m., Addr. All India Radio. 7.30 am.-12.35 pm.
4.960	YV5RS	CARACAS, VENEZ., 60.48 m., Irreg.
4.950	YV4RO	VALENCIA, VENEZ., 60.61 m., Noon-1, 6-10 pm.
4.940	YV5RO	CARACAS, VENEZ., 60.73 m.
4.930	YV4RP	VALENCIA, VENEZ., 60.85 m. Irreg.
4.920	YV5RU	CARACAS, VENEZ., 60.98 m., 6.30-7.30, 10.30 am.-1, 3.30-10 pm.
4.920	VUM2	MADRAS, INDIA, 60.98 m. Addr. All India Radio. 6.30 am.-12.10 pm.
4.910	YV1RY	CORO, VENEZ., 61.10 m., 6.30-9.30 pm., ex. Sundays.
4.905	HJ1ABG	BARRANQUILLA, COLOM., 61.16 m., 11 am.-11 pm., Sun. 11 am.-8 pm.
4.900	YV6RT	BOLIVAR, VENEZ., 61.22 m., Signs-off at 9.30 pm.
4.900	HJ3CAH	BOGOTA, COLOM., 61.22 m., 11.30 am.-2, 6-11 pm.
4.890	YV1RX	MARACAIBO, VENEZ., 61.35 m., 10.30 am.-1.30, 4.30-10.30 pm.
4.890	HJ7GAD	BUCARAMANGA, COL., 61.35 m., 5.45-6.30, 11.30 am.-1 pm., 6-11 pm.
4.885	HJ4DAP	MEDELLIN, COLOM., 61.42 m., 8 am.-2, 6-11 pm.
4.880	VUB2	BOMBAY, INDIA, 61.48 m. Addr. All India Radio, 7.30 am.-12.30 pm.
4.880	YV6RU	BOLIVAR, VENEZ., 61.48 m., 6.30-9.30 pm. except. Sundays.
4.875	HJ6FAH	ARMENIA, COLOM., 61.54 m., 8-11 am., 6-10 pm.
4.865	HJ2BAJ	SANTA MARTA, COLOM., 61.67 m., 5.30-10.30 pm.
4.860	YV1RL	MARACAIBO, VENEZ., 61.73 m., 11 am.-1 pm., 4.30-10.30 pm.
4.855	HJ3CAF	BOGOTA, COLOM., 61.80 m., 7 pm.-mid. ex. Sundays.
4.850	YV1RZ	VALERA, VENEZ., 61.88 m., 11.30 am.-1, 5.45-8.45 pm.
4.845	HJ3CAD	BOGOTA, COLOM., 61.92 m., 6-11.30 pm.
4.840	VUC2	CALCUTTA, INDIA, 61.98 m. Addr. All India Radio. 6.30 am.-12 n.
4.840	YV4RX	MARACAY, VENEZ., 61.98 m., 6-11 pm. ex. Sundays.
4.835	HJ1ABE	CARTAGENA, COLOM., 62.05 m., 7 am.-6, 7-11 pm.
4.830	YV5RH	CARACAS, VENEZ., 62.11 m., 5-9.30 pm. (Sun. to 10.30 pm.)
4.825	HJ5EAD	CALI, COLOM., 62.17 m., 7-11 pm. ex. Sundays.
4.820	YV3RN	BARQUISIMETO, VENEZ., 62.24 m., 11.30 am.-1.30, 5.30-9.30 pm.
4.815	HJ2BAC	CUCUTA, COLOMBIA, 62.31 m.
4.810	YV1RU	MARACAIBO, VENEZ., 62.38 m., 10.45 am.-12.45 pm., 4.30-10.30 pm.
4.800	YV1RV	MARACAIBO, VENEZ., 62.50 m. 10.45 am.-12.45 pm., 4.30-10.30 pm.
4.795	HJ6FAC	PEREIRA, COLOM., 62.57 m., 9 am.-noon, 6.30-10.30 pm. ex. Sun.
4.790	YV5RY	CARACAS, VENEZUELA, 62.63 m., 5.30-8 pm.
4.785	HJ1ABB	BARRANQUILLA, COLOM., 62.69 m., 4.30-10.30 pm. ex. Sundays.
4.772	HJ7GAB	BUCARAMANGA, COLOM., 62.87 m., Nightly to 10.45 or 11 pm.
4.560	HC2ET	GUAYAQUIL, ECUADOR, 65.79 m., Wed. & Sat. 8-10 pm.

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(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)

The
NC-100XA
RECEIVER

HIGH PERFORMANCE

National Receivers are designed with the single aim of producing maximum performance, long life, and rugged dependability. You will find them wherever maintenance of communication is vital, and wherever fine receivers are appreciated.

The receiver illustrated above, the Type NC-100XA, is representative. Its design includes a number of unique details, among them a range changing system in which the required coils are moved into position adjacent to the coils and the condensers, and there connected into the circuit. Such a mechanism, with its heavy cast aluminum coil shield sliding on a smoothly fitted track by rack and pinion drive, is far more machinery than one usually finds in a radio receiver. But its use permits short, direct wiring, ample space for the coils in use, and complete circuit shielding. The gain in performance is unmistakable. This is but one of the refinements that make the NC-100XA so outstanding.

A set of free booklets describing the NC-100XA and other National receivers will be mailed free on request. Though primarily instruction booklets, they contain a wealth of general information on receiver design and operation that will be of real value to anyone interested in fine instruments. Just ask for "Receiver Group Booklets." They will be mailed promptly, postpaid.

National builds a complete line of communication receivers, ranging from the Type HRO, in which cost is a secondary consideration, to the Type NC-44, designed for the lowest price which good performance permits.

NATIONAL COMPANY, INC., MALDEN, MASS.

In New York Rises Radio City–Lofty Symbol of

RCA World-wide Service!

The home of Radio Corporation of America —the headquarters of the only organization engaged in every phase of radio

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Basis of all is RCA Laboratories. In them vital research is carried on in radio and television. Great universities are usually thought of as the homes of research. The fact is that in RCA Laboratories there is now a group of research men who probably exceed in number and can certainly match in ability, those engaged in any one phase of research, in any university in the world.

RCA Services In Every Field of Radio

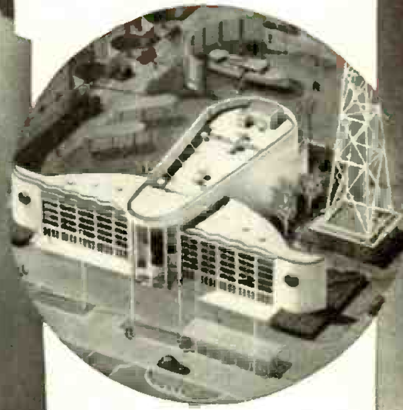
RCA serves the listening public through the Red and Blue Networks of the National Broadcasting Company. In the home, RCA Victor Radios, RCA Victrolas, and Victor and Bluebird Records afford the finest in radio and records. Now RCA Victor Television Receivers are bringing the thrills of television to families in the New York Metropolitan Area. And, added to these services for the home are those rendered in manufacturing a complete variety of radio equipment, sound equipment, and motion picture equipment such as RCA Photophone, the Magic Voice of the Screen.

Through R.C.A. Communications, world-wide communication service is provided to and from 43 foreign countries, and among leading cities in the United States.

Radiomarine, another of the RCA family, offers communication service to ships at sea. It also builds radio devices for safeguarding lives and property on ships.

Because of this background of experience in every field of radio, RCA keeps ahead, offering dealers an ever better and ever increasing opportunity to make more money by going "RCA All the Way."

See Radio's World of Tomorrow at New York World's Fair



Great crowds of visitors are enjoying the exhibits at the RCA Building at the New York World's Fair. And, across the country, many thousands are being thrilled by similar RCA exhibits at the San Francisco Exposition. Chief attraction is the demonstration of television which offers many visitors their first opportunity to see how television pictures appear on the screen of a television receiving instrument.

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