THE RADIO EXPERIMENTER'S MAGAZINE

SHORT WAVE CRAFT

HUGO GERNSBACK
Editor

Combined With

OFFICIAL Short Wave Listener MAGAZINE

October

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IN THIS ISSUE: PROMINENT SHORT-WAVE AUTHORS

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SHORT WAVE CRAFT

HUGO GERNSBACK
Editor

H. WINFIELD SECOR
Managing Editor

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Associate Editor

Combined With

Official SHORT WAVE LISTENER

Contents for October, 1936

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A Crack German Ham Station and Its "CQ" Machine.

The Fan's Own—A 2-Tube "Space-Charge" Receiver, by Stanley Johnson.

6-Tube "Band-Spread" All-Around Receiver, by Guy Stokely, E.E.

Plate Power for Mobile Sets and Farm Radio, by Maurice E. Kennedy, W6KQ-W6BGC.

New 6L6 Modulator—Every "Ham" will want one! by W2AMN.

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OUR COVER

● THIS month our cover illustration is a composite drawing, made up of a number of the International shortwave hookups shown on pages 328 to 331. The Hookup "fan" will find many other interesting diagrams, including those for television receivers, in this issue.

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HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

SHORT WAVE CRAFT

The Future of Short Waves

An Editorial by Hugo Gernsback

● EVER so often, I receive letters from readers about the future of short waves, who are certain that the short-wave art has now settled into a state comparable to the butter-and-egg business; that from now on, there will be little, if any, advance.

These readers are not alone of this opinion. Frequently, people in the radio business—who really should know better—have an idea that public interest in short waves and, particularly, the interest of the experimenter in short waves, has become exhausted.

This always reminds me of the patent examiner in the United States' Patent Office who, about 1870, resigned his position because he felt that *everything important had been invented*, and who did not wish to waste his time in such a dead enterprise as the patent office! If he were still alive today, he could look back and contemplate the scene and find, probably, much to his amazement that the world's greatest inventions had been made *after* the time that he left his position. The telephone, motion pictures, the induction motor, the X-ray, radio, the airplane, and thousands of other revolutionary inventions have since been made.

Short waves have really been known for about twenty years; they have not been actively used much for more than five years. In other words, we have only just made a beginning in short waves! Tremendously important inventions which will use the instrumentality of short waves still lie in the future. **Ninety-nine per cent of the real accomplishments in short waves are still to come!**

As yet, we know pitifully little about short waves themselves. We know next to nothing of the propagation of these waves in our atmosphere and above it, and what takes place in the ground. Our instruments and devices which we use in short waves today are still so crude that even twenty years hence, we will look back to our present-day transmitters and receivers with smiles.

There is not a single instrumentality in short waves that we have today that will not be discarded as hopelessly obsolete fifteen years hence. The radio tubes which we call sensitive today, will be termed crude and inefficient ten years hence. And as far as the short-wave radio experimenter is concerned, a real short-wave paradise awaits him in the next few years.

Originally, radio started with *crystal sets* which required no energy of any kind. We then turned to *battery sets* because we required them to operate our tubes. Later on, we adopted the house current, AC and DC, for our receivers, discarding the batteries. During the next few years, the battery set will return as a *personal* receiver. In London, during the latter part of July, a young lady stepped up to a policeman on a busy thoroughfare. He pulled from his pocket a small hand-set, similar to our telephone, which had a telephone receiver and a microphone in the handle. The young lady then held a two-way conversation with police headquarters, the policeman in the meanwhile walking about his beat without any wire connection whatsoever.

The next cycle in short waves will, no doubt, be another battery-operated transmitter and receiver cycle, with more sensitive tubes than those designed so far, plus a *real* pocket radio set. Not only policemen but private individuals, bicyclists, automobilists, and professional men who must be outdoors a great deal, will be equipped with such *personal* short-wave sets. Such sets may either be receivers only, or may be *transceivers*. In the latter case, a person, no matter where he is, can keep in touch with a central 'phone office, and thence can talk with the whole world, if necessary, while walking or riding about.

In the completion of this cycle, we will perhaps not go back to the crystal set as we knew it twenty years ago, but it is quite possible that future sets of the "perambulating" type will not be operated either by batteries or from electric lighting circuits. It is quite likely that they may be operated by ordinary light, such as sunlight, electric light, or even candle-light. We have, as yet, not scratched the surface of photo-electric currents which are produced by converting light into electricity. Here alone is a tremendous field for exploitation, which we are just now beginning to use. Given sufficiently sensitive radio apparatus and efficient photo-electric devices, there is no reason why we will require either batteries or the electric lighting circuit for the operation of our radio receivers, particularly, those of the portable type. And this particular new art, that is, the combination of photo-electricity and radio, will make a tremendous appeal to the experimenter, in the not too distant future.

Then, of course, we will have *television*, of which I have spoken frequently during the past years. And I again wish to emphasize the importance of short waves in the television art, because, as it appears now, television without short waves seems unthinkable. Television on short waves is just now getting under way.

A skeptical reader of SHORT WAVE CRAFT writes me, stating that he does not believe that television will ever be practical. He feels that when television comes, he must sit in a darkened room in order to view it, and that alone, he claims, makes the entire thing impractical.

Not so fast, Mr. Doubter! In the first place, the semi-darkness now prevailing in television tests is caused by only one deficiency, and that is *insufficient light intensity*. As I have frequently pointed out, I do not believe that the present type of cathode-ray tube or mechanical television is the answer to the real and future television. When the great television invention finally comes along, there will be no trouble with light intensity. Indeed, the time will come when you will sit in the full sunlight and enjoy the finest television programs. You will use a tiny television receiver placed right on your very nose—a device which I term "television eyeglasses." These will be regulation eyeglasses, but instead of having the normal lenses, they will have a small projection of one or two inches which will house the entire television receiver. There will be two such receivers working in unison, giving you thereby a *stereoptical television view*. Attached to the eyeglasses will be a tiny ear-piece fitting right inside of your ear. The future device thus will give you sight and sound, the entire apparatus not weighing more than four or five ounces. With this device, you can sit in plain daylight or darkness and enjoy the world's best television programs to your heart's content.

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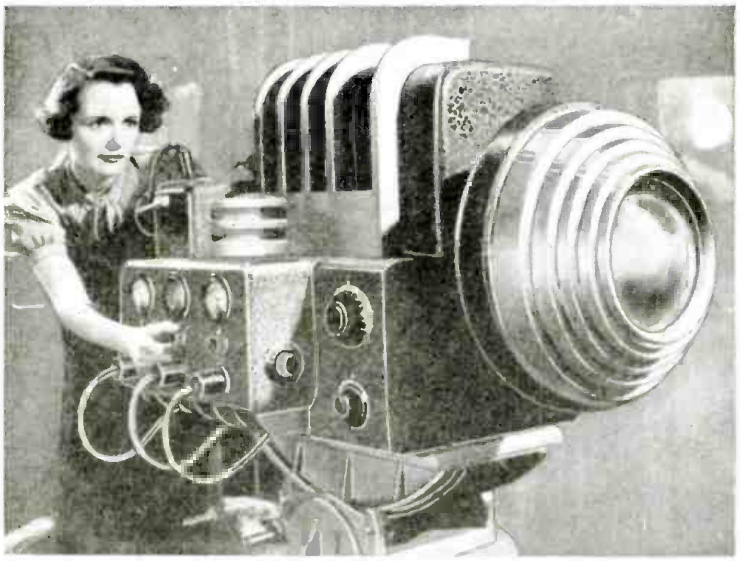
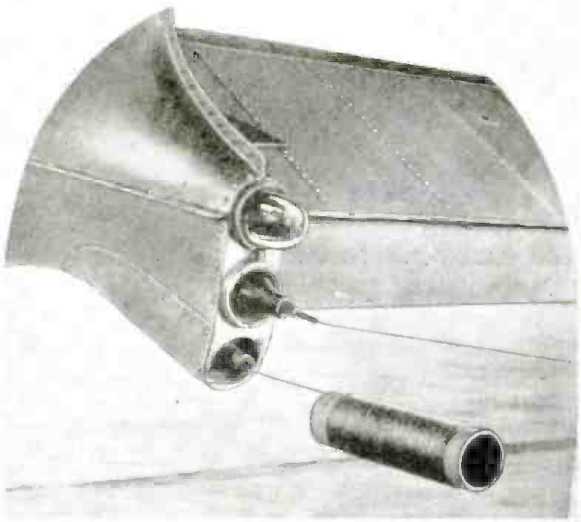
Short-Wave SNAPSHOTS

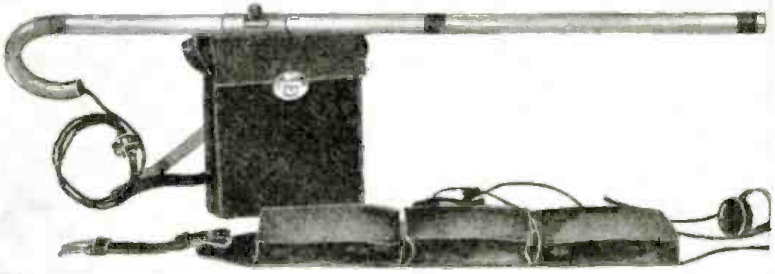


The photo above shows Mary Astor, well-known Hollywood actress, with the latest movie conception of what a "Television machine" should look like. This picture is from the photo-play production, "Trapped by Television."

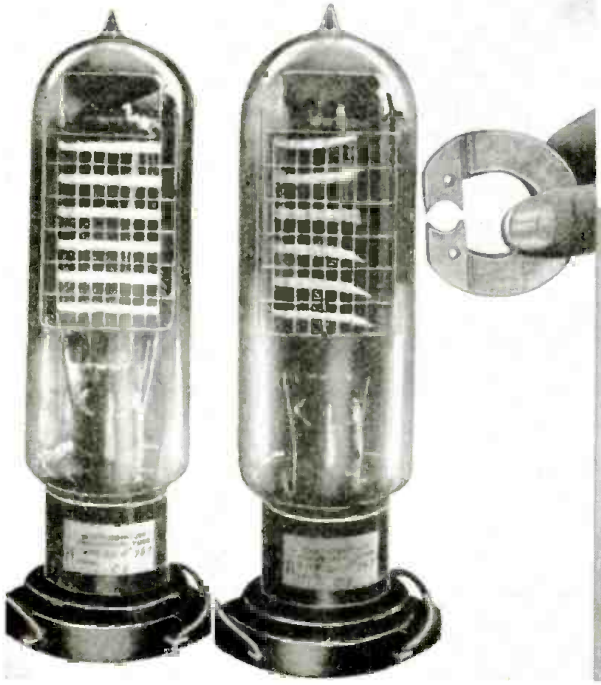
Right: Robert Trout, of the CBS System, demonstrating the very newest style in ultra-short wave transmitters for "spot news" pickups. It is built into a cane. Batteries and auxiliary equipment are carried in the special belt and case shown. The transmitter employs Acorn tubes and the "mike" is strapped on the wrist. The metal cane acts as the antenna as well as the concentric resonant-line circuit.

Below at left: New auxiliary antenna for airplanes, consists of a cylinder having a compression spring and trigger. When the pilot presses a release button the "antenna cartridge" is shot out and a switch also closes, connecting the auxiliary aerial into the circuit. The "cartridge" contains 35 feet of steel cable which acts as an aerial when unwound. The unit is covered by a wax paper cover which is torn open when the trigger is in use. A special loading tool is used to replace a new antenna cartridge.—Photo courtesy Transcontinental and Western Air, Inc.

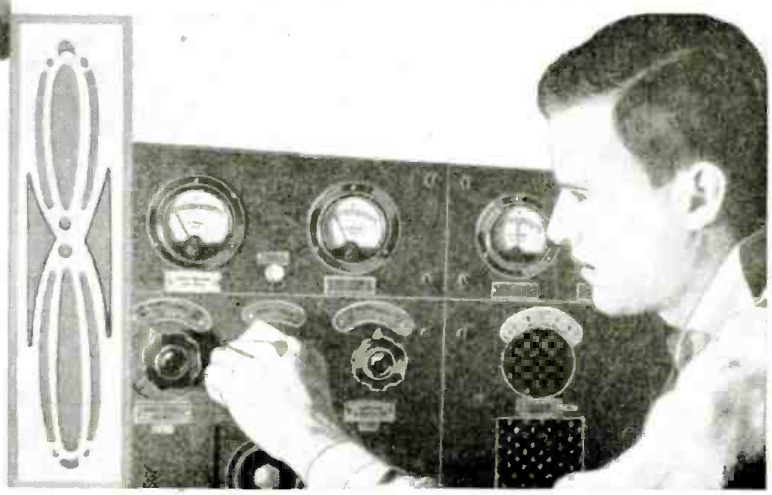




New Tube Visualizes Electrons! The two photos to the left show a very interesting new demonstration tube developed by the Westinghouse experts. This tube has a fluorescent coating on the plate that makes the electronic bombardments visible for demonstration purposes before students, etc. Electrons striking this coating on the plate are transformed into "visible bands," whose widths depend directly on the electronic beam intensity. By means of a magnet the magnetic properties of electronic phenomenon may be readily demonstrated, the pattern of the electron flow being distorted as one of the photos shows.



Below: John Anslow of Massachusetts, one of the four U.S. Navy radiomen on duty in Addis Ababa.—Universal Newsreel.

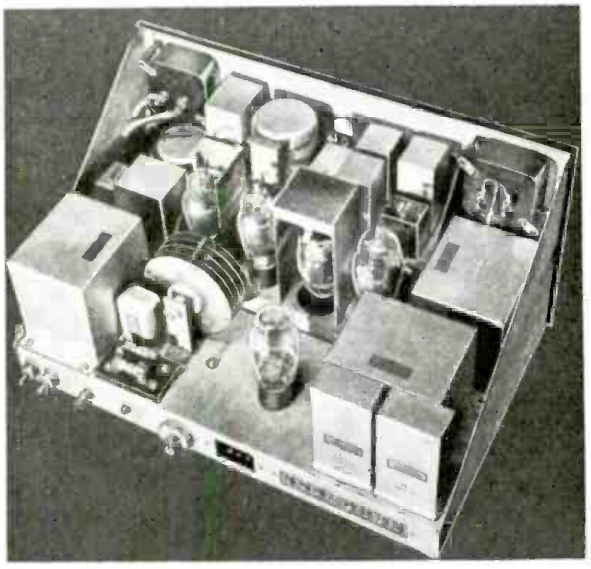


New Ultra Short Wave Police Radio For Small Cities

The new police radio telephone equipment for headquarters is as simple in operation and as effective in performance as the familiar telephone.

● WITH few exceptions, the large cities of the United States are now equipped with police radio systems, and their value has already been demonstrated to such an extent that the remaining few large cities no doubt soon will be equipped.

In the early days of police radio experience, the smaller cities and towns were at a disadvantage because of the cost of efficient and dependable equipment. However, this handicap has been removed. The Federal Communications Commission has opened up channels for police radio in the ultra-high frequency band, which makes it possible to employ low power transmitters, at correspondently low first and maintenance costs. Moreover, at these high frequencies, two-way communication becomes a practical and accomplished feat with a short antenna suitable for use on an automobile.



Rear view of the chassis of the type 21A radio telephone transmitter for police headquarters.

The new 216A radio telephone equipment for police headquarters employs a small and economical 5-watt transmitter and a companion superheterodyne receiver, both AC operated. This equipment is designed to furnish one or two-way direct communication between any suitable central point and cars cruising about through towns and small cities. It is also suitable for use in larger cities where it is desired to segregate various police districts or precincts into separate radio "zones." This arrangement is sometimes found more practical than employing one high power transmitter to cover the entire city. The equipment can be installed at an advantageous point, such as atop a tall building, with remote control lines running down to the offices below, for convenient operation. The "voice automatic" feature may be employed if desired, by means of which the voice of the operator automatically puts the transmitter on the air. The frequency (from 30,000 to 42,000 (*Continued on page* 367)

Two-Way S-W Talk Between Blimp and Car

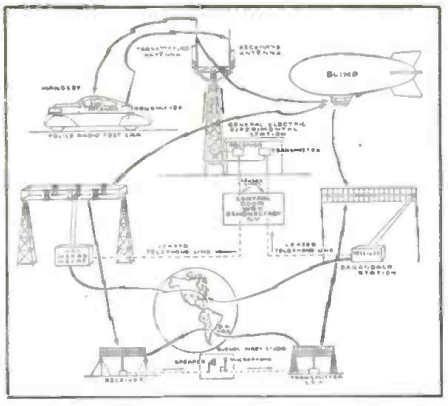
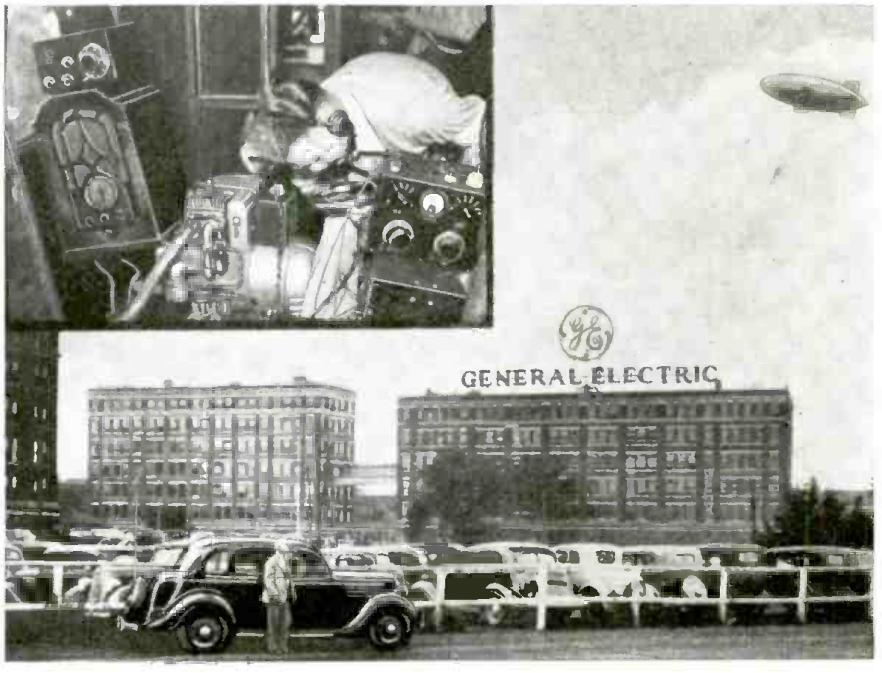


Diagram of short-wave hook-up employed for two-way conversation between the Goodyear blimp "Resolute" and the G-E police radio test car by Theodore Van Deventer and Ernest J. Berggren.

● A TWO-WAY conversation between the Goodyear blimp "Resolute" and the General Electric radio police car was successfully broadcast on June 11 over WGY and the *short-wave* station W2XAF. This is believed to be the first time in the history of radio that a broadcast has been made between an airship and an automobile.

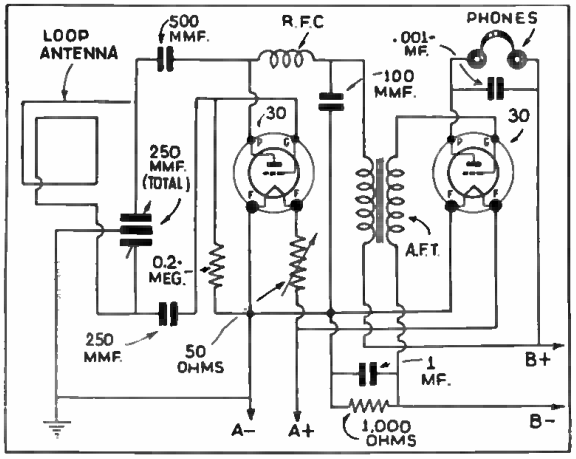
The blimp flew over Schenectady at a height of about 1000 feet while the radio car cruised through the streets of Schenectady. No difficulty was experienced in transmitting the broadcast, and reports from listeners indicated that reception both locally and at distant points was perfect.

Significantly enough, the conversation, which was carried on between two of Thomas Edison's former co-workers, Ernest J. (*Continued on page* 367)

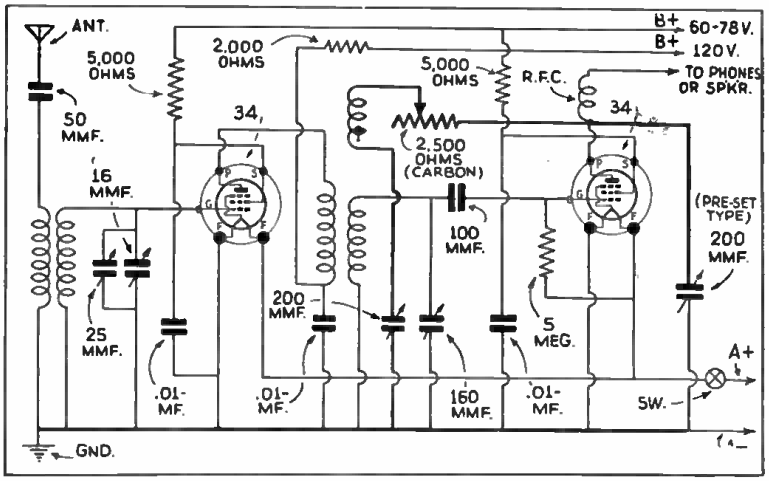


A two-way conversation between the Goodyear blimp "Resolute" and a G-E radio police car was being carried on as this photo was snapped and was broadcast internationally through WGY and its sister short-wave station W2XAF. The conversation was held between Theodore Van Deventer, seen in front of the car, and Ernest J. Berggren, riding in the blimp. They discussed the work done by Edison in 1875 on wireless telegraphy, and afterwards talked with station LSX in Buenos Aires, a distance of more than 6000 miles. The mobile radio equipment used in the blimp (see inset) and car operates on ultra-short waves.

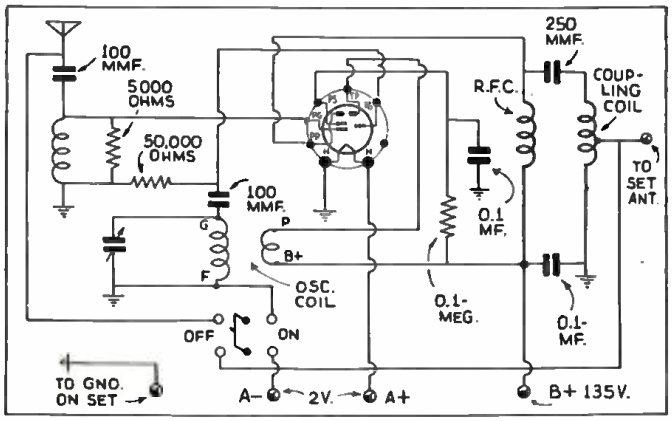
WORLD-WIDE S-W HOOKUPS—By C. W. Palmer



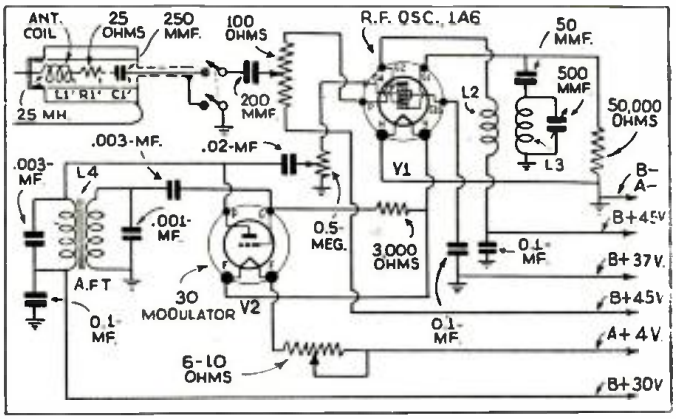
A loop receiver for short-wave reception which appeared in *Radio-Centrum* (Hague) official organ of the Netherlands Association of Radio Telegraphy. The size of the loop will depend on the frequency of operation—two or three turns on a 2 ft. square being sufficient for the 20 meter band.



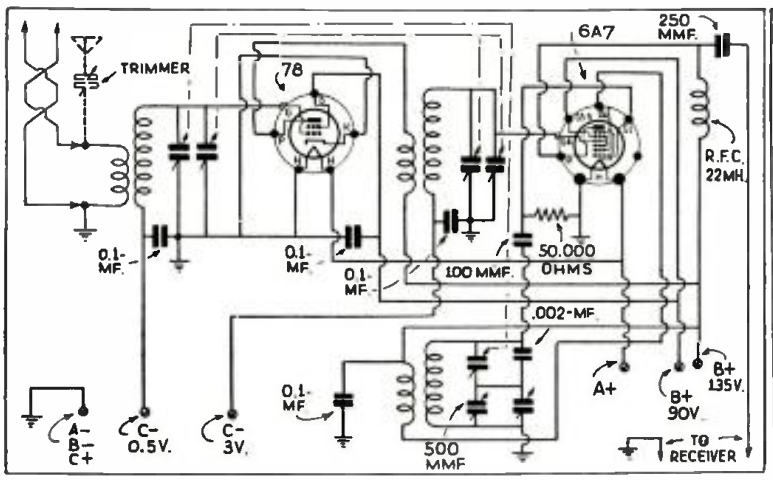
An unusual type of regeneration control, almost constant over the waveband, is the feature of this circuit which appeared in *Practical and Amateur Wireless* (London) recently. The pre-set .0002 mf. condenser and the variable resistor are carefully set, so that only a slight adjustment of the regular regeneration condenser is necessary over the entire waveband.



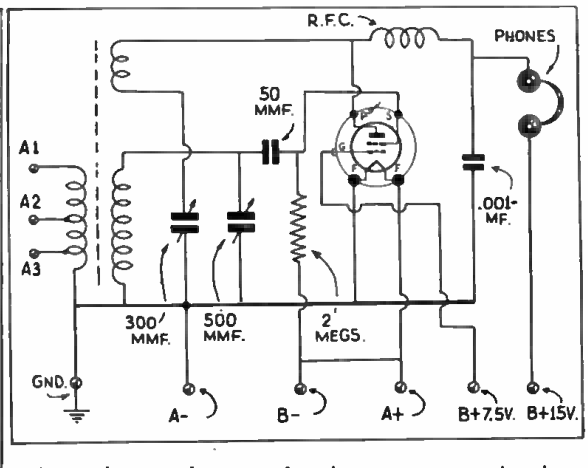
Simplicity is the keynote of this short wave converter, which appeared in *Wireless Weekly* (Sydney, Aust.). No aerial tuning is used, the oscillator condenser being the only control. A regular regenerative S.W. coil will be fine for this purpose. A switch connects the aerial to the set when desired.



Adjustment of short-wave receivers is simplified greatly by the use of a calibrated oscillator. This one from *Toute La Radio* (Paris) is calibrated against a pre-calibrated receiver or checked against known stations. It includes an R.F. oscillator, modulator and "dummy antenna." L1 is 35 T. No. 30 wire 1 in. dia.

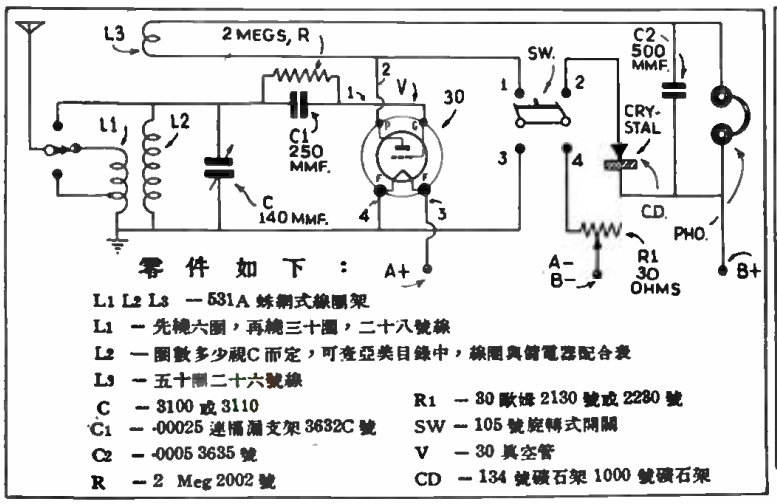


A deluxe 15 to 55 meter converter is the basis of an article in *Radio Technica* (Buenos Aires) recently. It contains a pre-selector stage and a pentagrid converter (similar to the 6A7). Band-spreading is accomplished by a small trimmer across the tuning condensers. Regular superhet coils can be used. Either doublet or "straight" aerial can be used as shown. Batteries supply power.

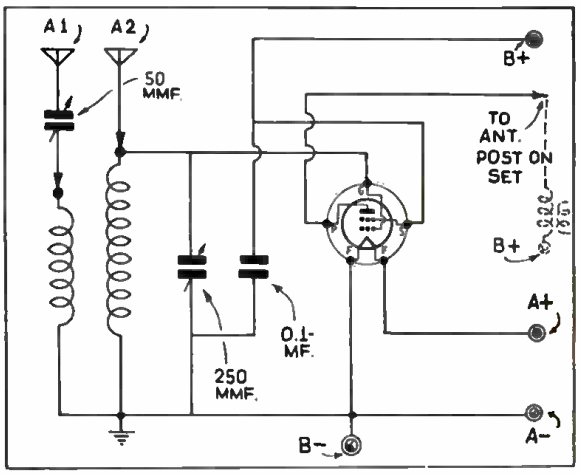


"Space-charge" detectors for short-wave reception have been given much attention lately. Here is one which appeared in *Radio Welt* (Vienna) recently. The regular grids of a screen-grid tube are reversed, at least in so far as their circuit connections are concerned. Also note the low plate and screen voltages used.

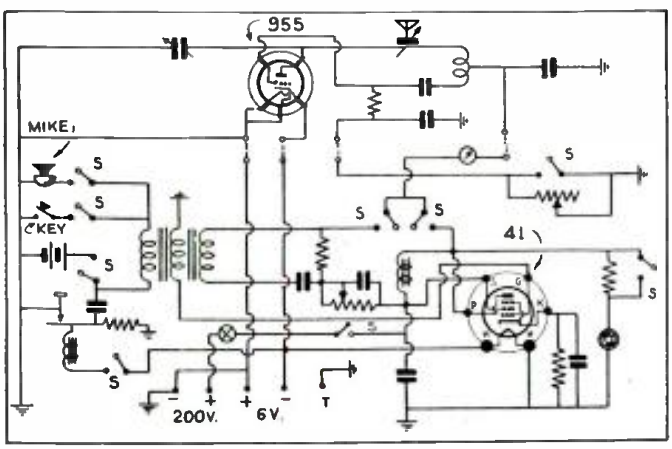
More Short-Wave Circuits—Even One from China



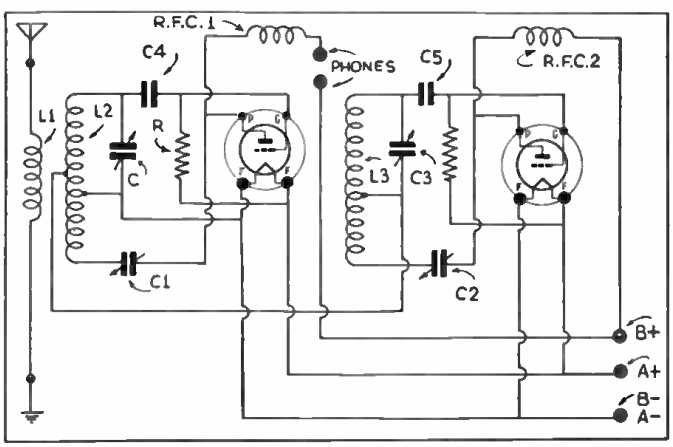
Here's one for our Oriental S-W Fans—a circuit from *The China Radio* (Shanghai) which combines a regenerative detector with a "crystal," in an all-wave receiver using a tapped coil. The crystal, no doubt, is in case the tube is burned out by some "hot" Chinese music. Seriously, though, the circuit is straight-forward and standard coils, condensers, etc., can be used.



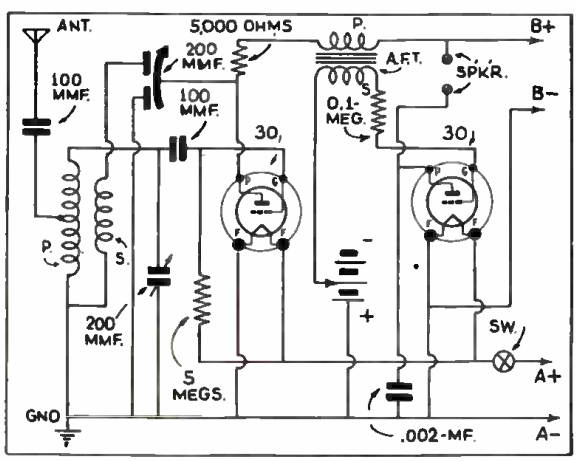
The "far-off" stations which cannot be brought in on your set will be heard if a good amplifier is added between the aerial and the set. The circuit here appeared in *Practical and Amateur Wireless* (London). Plug-in coils can be used. The aerial coil of the set must be disconnected from ground and connected to B+ of the amplifier.



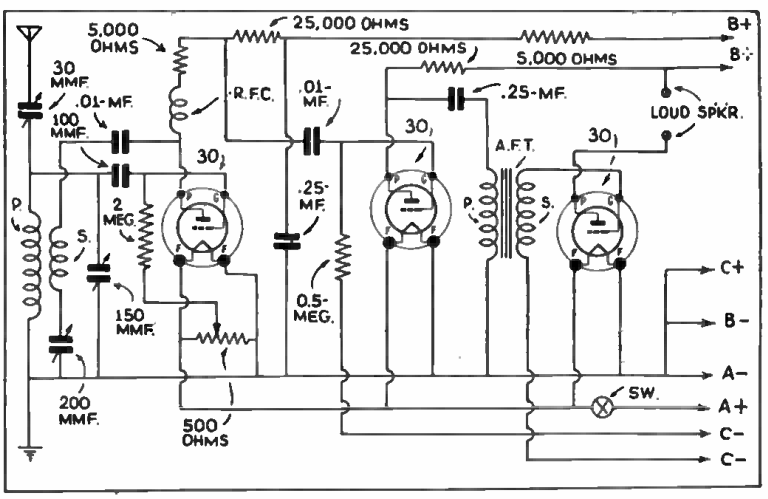
A 1 meter transceiver of French origin is shown here. It was described in *L'Industrie Francaise Radioelectrique* (Paris) recently. The device is made in two parts—a 955 acorn tube as oscillator-detector; a 41 as modulator-amplifier. The 955 tube circuit is in a separate box with the antenna on top.



A super-regenerative set of Austrian design is shown here, reproduced from *Radio Amateur* (Vienna). The aerial coil can be any well-made regenerative type to cover the desired wave-band. The coil L3 is a honeycomb coil, tuned by C3 to a frequency of about 20,000 cycles.

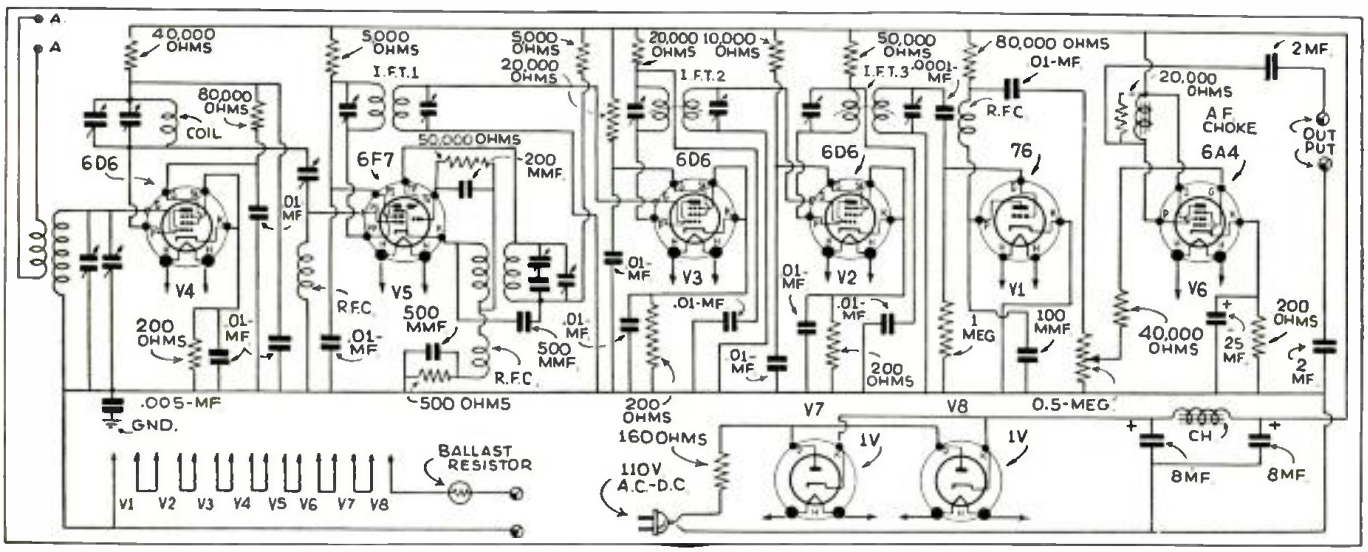


In Europe it is the custom in many cases to use a split-stator condenser for controlling regeneration. This method is applied to this small portable short-wave receiver. This set was described in a recent issue of *Practical and Amateur Wireless* (London). The values of parts are indicated. Any plug-in coils can be used for the tuning circuit. The grid coil is tapped for aerial connection.

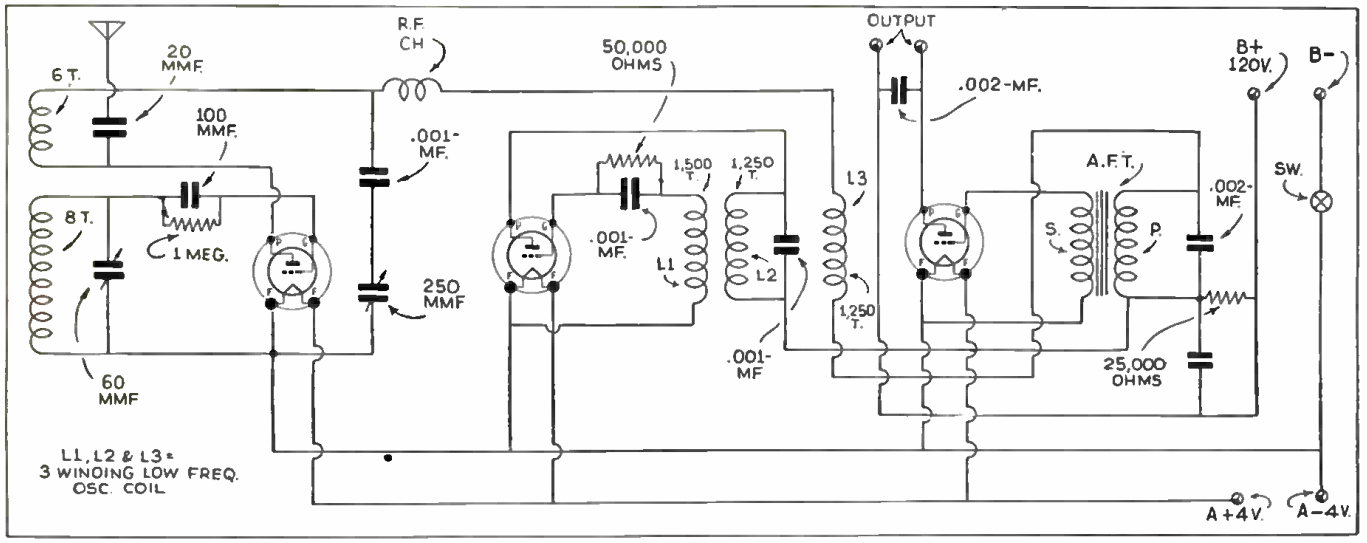


A three tube short-wave receiver of typical English type is shown above. It consists of a regenerative detector, followed by two A.F. amplifier stages. The plate circuit is carefully isolated by the use of an R.F. choke in series with a resistor and the regenerative coil is separated completely from the plate voltage supply by a 0.01 mf. condenser. This condenser also helps to make regeneration more constant, by increasing capacitive reactance of the regeneration circuit. The circuit appeared in *Amateur Wireless* (London).

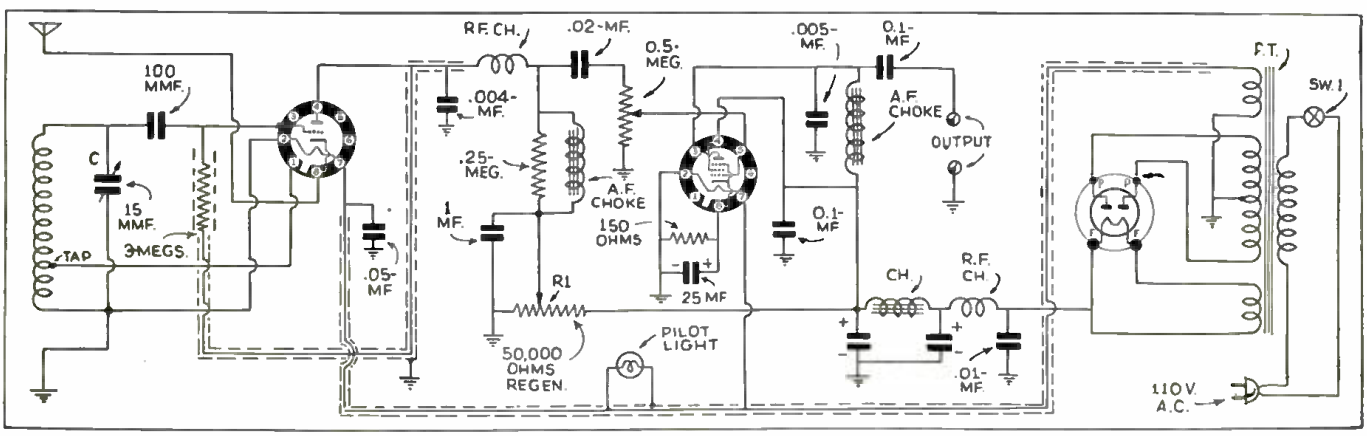
5 to 80 Meter Super-Regenerators



This set which appeared in *Television and Short-Wave World* (London) was especially designed for Television reception on wavelengths between 5 and 80 meters. Coupling in the I.F. is variable to vary the band width up to 2½ megacycles.

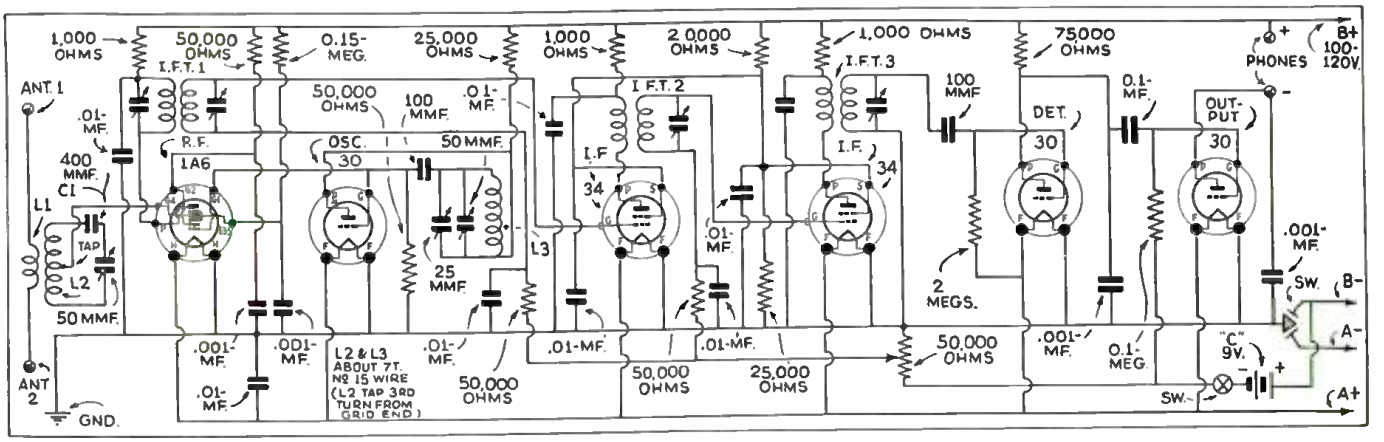


L'Antenne (Paris) is the source of this super-regenerative circuit, which was designed to receive the 8-meter voice transmissions from the Eiffel Tower. The interruption frequency oscillator coils are honey-comb coils of the sizes indicated.

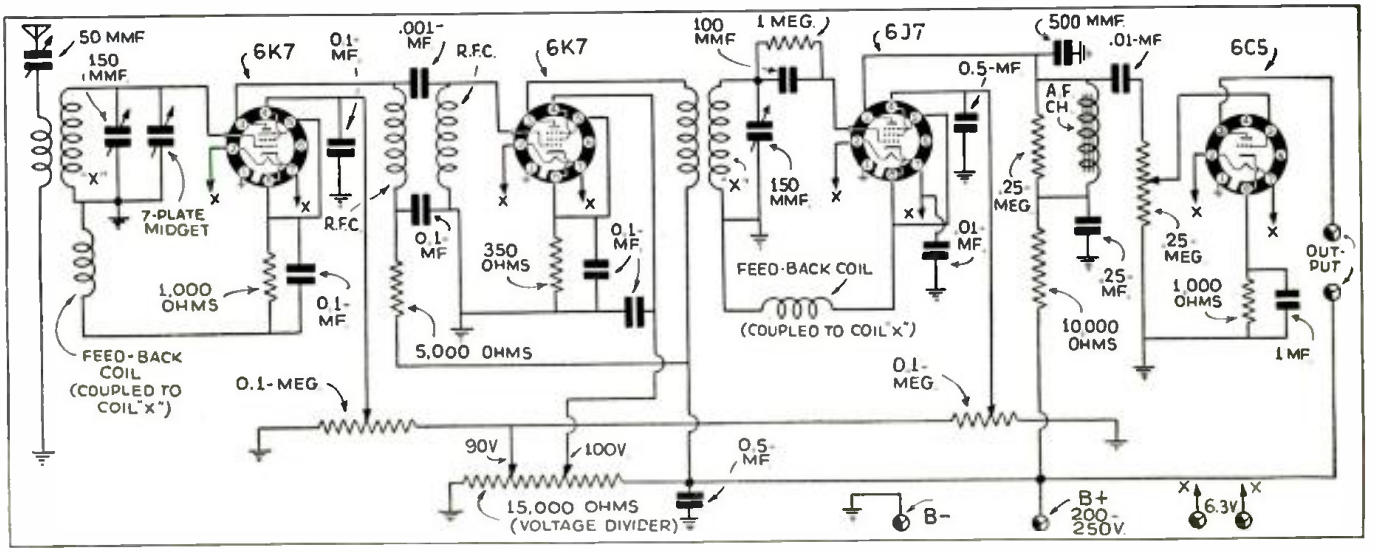


A 5-meter super-regenerative receiver using a single tube for the interruption frequency as well as detection, is shown above. This circuit appeared in *Radio Tecnica* (Buenos Aires). The set uses two tubes, the superregenerative tube and a pentode A.F. amplifier to increase the volume for loudspeaker operation. A 3 meg. resistor from grid to plate of the detector and a 100 mmf. condenser supplies the effective interruption of oscillation required for super-regeneration.

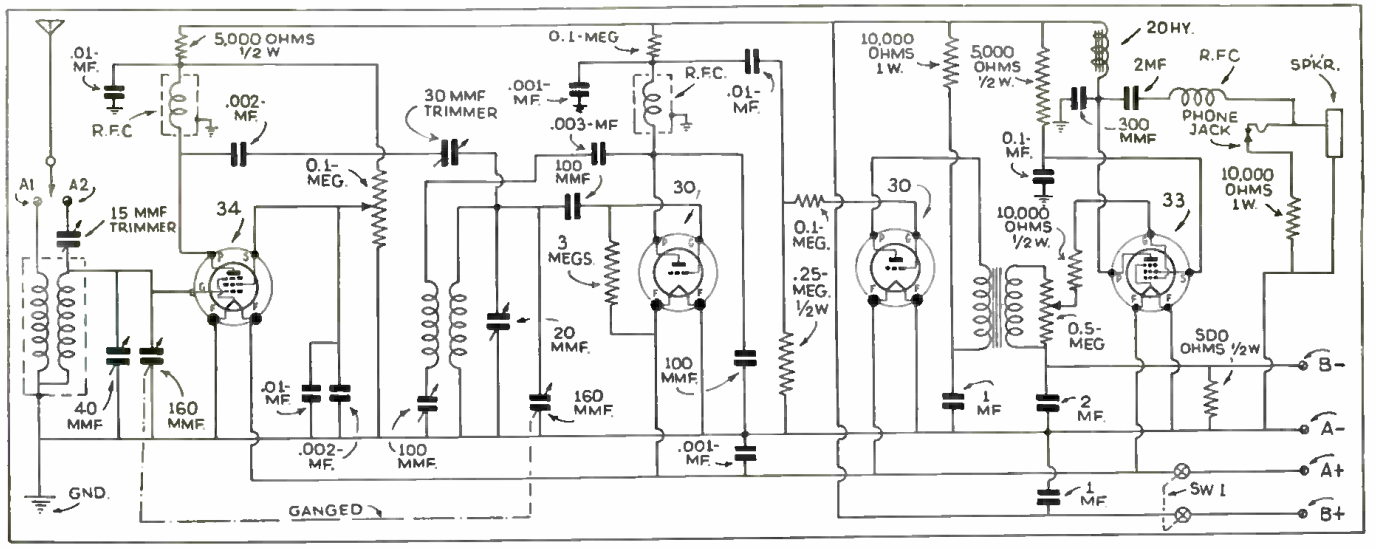
Hookups from England and Australia



A recent issue of *Wireless World* (London) contained this interesting circuit for a 5-meter superhet. The intermediate frequency of this set is about 5,000 kc. which supplies the desired second channel separation—the values of all parts are shown.



The outstanding feature of this set is the use of "cathode" regeneration in the R.F. amplifier stage. This increases the amplification tremendously. The decoupling stage is untuned. The circuit appeared in the *Australian Radio World* (Sydney).



This 12-325 meter regenerative receiver from *Television and Short-Wave World* (London) has an unusually high "audio gain," so that if a station can be picked up at all, it can be received at loudspeaker volume. The set uses one stage of R.F. followed by a regenerative detector, the output of which is fed into a resistance-coupled triode and then transformer-coupled into a high gain pentode. The values of all parts are indicated for those who might like to try it.

"LOOKING IN" AT the NEW 6-METER TELEVISION IMAGES

● WHILE the information sent out by the Don Lee station in Los Angeles, gives hints regarding experimental reception of their 300 line images, having a frame frequency of 24 per second, by means of a cathode-ray tube scanners; it would seem that many experimenters will undoubtedly try to intercept these new high-frequency television waves by means of mechanical scanners, utilizing either a vibrating mirror or *screw*, or else resorting to the well-known scanning disc with its spiral of holes or lenses.

It is interesting to note that the ordinary scanning disc, used a few years ago quite extensively for the lower frequency television reception with 40 to 60 lines, actually scans in a "saw-tooth" fashion, as shown in Fig. 1. Number 1 scanning hole or lens, for instance, moves across the image frame, and as soon as this hole has left the right-hand side of the frame, it stops scanning *instantly*, as indicated by the line "X" in Fig 1, and hole number 2 immediately takes up its scanning across the aperture, and completely cuts off at the end of its travel across the image frame; hole number 3 follows in like fashion and so on.

Fig. 2 shows a typical sweep circuit as used in a *cathode ray* oscillograph. This type of circuit is used with a gaseous discharge type tube, such as the 885, to give—in conjunction with the circuit shown—a *saw-tooth* wave series of oscillations. These oscillations, when applied to the proper electrodes of the cathode ray tub , cause the ray to sweep across the fluorescent screen at the larger end of the tube. Furthermore, this ray must be made to sweep across the screen in such a way that the return stroke of the ray will be so fast that no trace of this *return sweep* will be visible on the screen, and this action is assured by virtue of the saw-tooth oscillations produced in the form of sweep circuit shown in Fig. 2.

The action of this saw-tooth oscillator circuit is as follows: A D.C. source charges the condenser, "C," through resistance, "R." The charging voltage must be sufficient to ionize the gas in the tube. The purpose of the grid voltage, "Ec." is to prevent current passing through the tube until the ionization potential is reached.[1] When the gas in the space between the cathode and plate is ionized, plate current starts to flow in the circuit; the grid now loses control and the condenser is discharged. When the condenser voltage falls below the ionization potential, the negatively charged grid attracts the positive ions and repels the negative ions, which are attracted to the plate, thus de-ionizing the space. The charge and discharge cycle is then repeated regularly and at a frequency dependent upon the size of the condenser, "C," and the value of the resistor, "R."

[1]See Television with Cathode Rays, by Arthur H. Halloran, published by the Pacific Radio Publishing Co., San Francisco, Cal.

Type of Receiver to Use

First of all, perhaps, we should give our attention for the moment to the type of high-frequency receiver we should use in order to pick up the television images in this 6-meter region. It is interesting to note that the RCA television station in New York City is now radiating the picture images on a frequency of 49.75 mc., or 6.01 meters, while the accompanying voice channel is 52 mc., or 5.76 meters. The images are scanned at 24 frames per second, and 240 lines, so far as is known.

Regarding the receiver to use in any case, we can at once discard the regenerative and super-regenerative circuit, as these would cause a severe distortion in the image. The circuit recommended by the Don Lee experts for experimental *televiewers* is a *superheterodyne*, with band-pass intermediate frequency transformers arranged to operate on an intermediate frequency of approximately 8000 Kc. (37.48 meters). For receiving the voice announcements of W6XAO, (Don Lee), and for the preliminary television experimenters, most any type of receiver may be tried; one that will tune to 6⅔ meters for the Don Lee station images. In other words, a receiver designed for 5-meter amateur work may be fitted with larger coils, having about 50 per cent more turns, and then one turn being removed at a time while tuning for W6XAO. The Don Lee image is a 300 line, sequentially scanned picture and the receiver, of course, should tune very broadly. They recommend the use of RCA 954 or 955 acorn tubes in the ultra high-frequency circuits, in the first stages of the receiver, except for the first detector of a superhet., and here they recommend a 6L7 metal tube.

The audio stages of the receiver should be resistance-coupled and to give a faithful reproduction of the high-definition image broadcast, the frequency range should be 24 cycles to 800 Kc.

Detailed data on the *sweep oscillator* circuits, size of condensers, and also data on *magnetic sweep control* devices are given in the excellent treatise published by RCA, and available at most radio stores.[2]

One of the accompanying diagrams, Fig. 3, shows a typical circuit set-up for experimental television reception and it is advisable to have one or two tuned radio frequency stages ahead of the first detector. Next comes the detector and mixer tube, followed by about two I.F. stages, tuned to 8000 Kc.; next comes the second detector and this may be followed by two or three audio (video) frequency, resistance-coupled stages. As Fig. 3 shows, the experimenter may elect to try the *Kerr cell* and the general arrangement of this form of *light valve* is shown in Fig. 3. Two Nicol prisms are arranged, one on either side of the Kerr cell. The source of light may be an automobile or stereoptican projection lamp and an arc lamp has been used to produce large brilliant images, several feet square, but the flickering of the arc is usually an undesirable factor.

The scanning of the image might be accomplished either with a scanning disc, having 300 lenses arranged in a spiral (for the Don Lee image), or 240 holes (or lenses) for the RCA image. Another method of scanning is to use a drum containing 240 (or 300) small mirrors, each mirror being staggered progressively so that when the first and last mirrors have reflected the modulated light beam on the ground glass or other screen, the complete frame or image will have been scanned.

A vibrating mirror might also be used for scanning; more about this will be said later. Also do not forget the piezo-electric properties of the Rochelle salt and other crystals.[4]

For the experimental reception of the RCA voice and image signals on the two different frequencies of 52 and 49.75 mc. respectively, a little different arrangement is used in the set installed in many official listening posts established by RCA in the vicinity of New York. The experimenter would probably do well to use a superhet for receiving the image wave and a super-regenerative or other simple receiver tuned to the voice wave.

Fig. 4 shows schematically how the *dual-wave* superhet works. A single antenna picks up both the image and voice frequencies, and these are amplified through a broadly tuned stage or two of T.R.F. Having established a fixed ratio be- (*Continued on page* 370)

[2]Cathode Ray Tubes and Allied Types, TS-2 published by the RCA Radiotron Co., Harrison, New Jersey, 25c.

[4]When a high frequency current is applied to a Rochelle salt crystal for example, it acts as a loud-speaker and vibrates at the applied frequency. If you can arrange a reflecting mirror surface on the crystal, you will have a new form of scanner and one group of research men have reportedly spent a lot of time and money on this idea already. Who can tell—maybe you will become famous by inventing a simplified television receiver, using such a principle?

At least two high-frequency television stations are now broadcasting images in this country, and some practical hints to the experimenter desirous of "looking-in" at the images are given in the present article. The RCA transmitter is located atop the Empire State Building in New York City, and its television signals have been picked up 90 miles away. The Don Lee television transmitter is located in Los Angeles, California, and the sponsors of the Don Lee television programs, which are broadcast from station W6XAO on 45,000 Kc. or 6-2/3 meters, daily, except Sundays and holidays from 3:00 to 5:00 p.m. and from 6:30 to 8:30 p.m., invite reports from "Lookers-in" or, should we say, *Televiewers?*

TELEVISION "HOOK-UPS"

Of Interest to All Those Interested in "Looking In" on the New 6 Meter Images

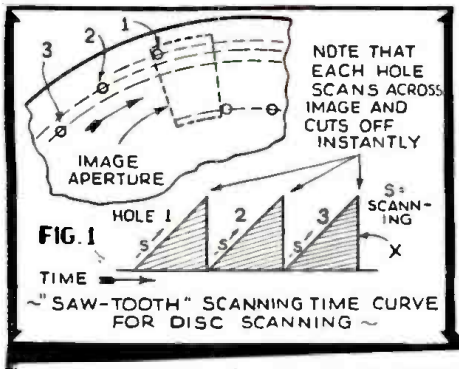


FIG. 1 ~"SAW-TOOTH" SCANNING TIME CURVE FOR DISC SCANNING~

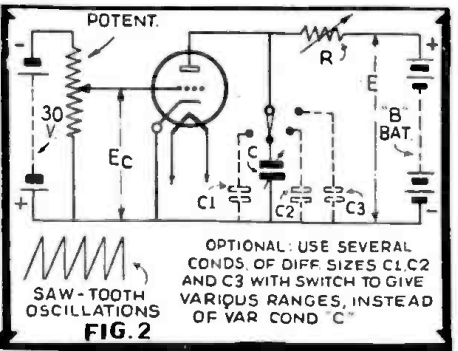


FIG. 2

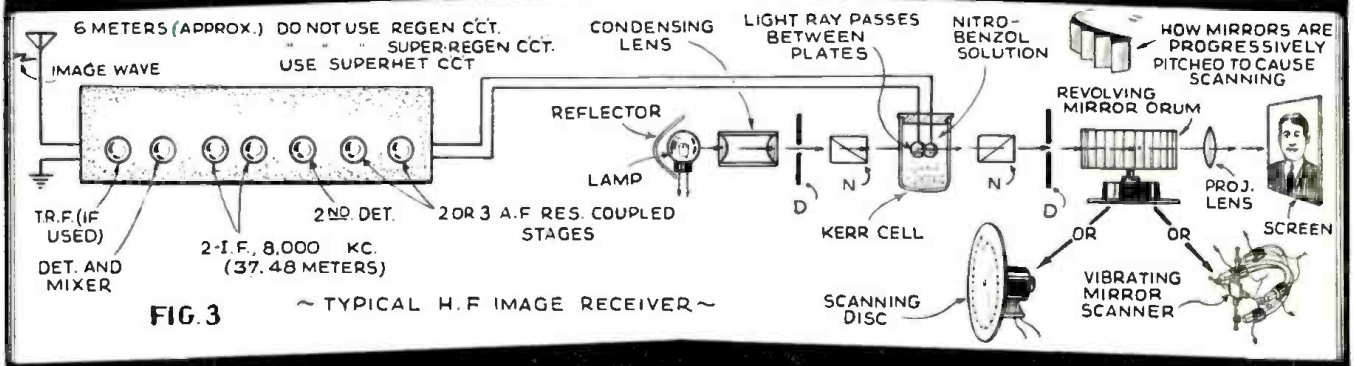


FIG. 3 ~TYPICAL H.F IMAGE RECEIVER~

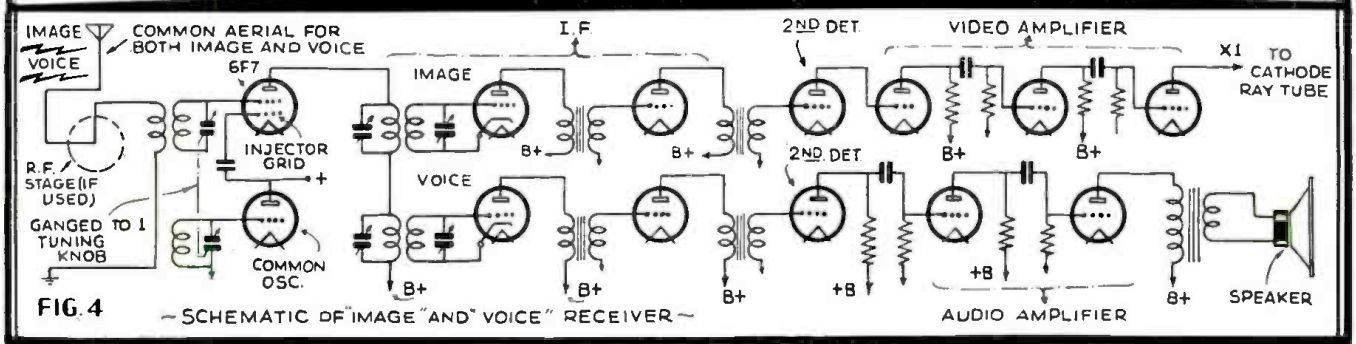


FIG. 4 ~SCHEMATIC OF "IMAGE" AND "VOICE" RECEIVER~

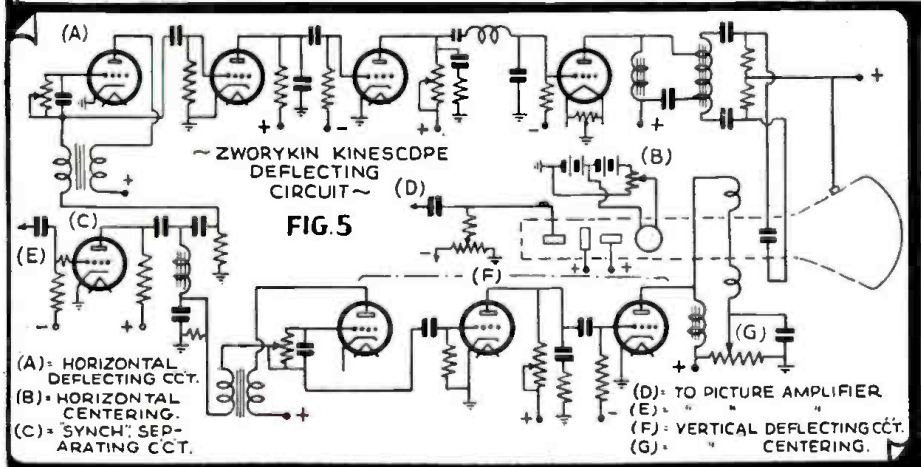


FIG. 5

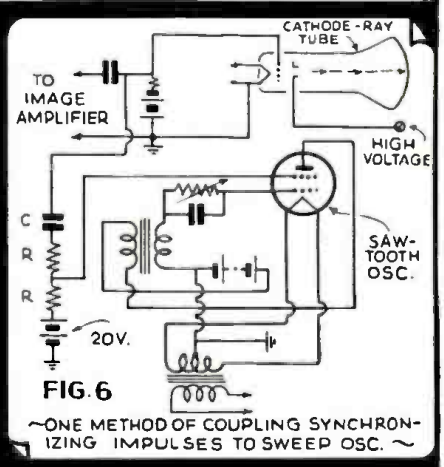


FIG. 6 ~ONE METHOD OF COUPLING SYNCHRONIZING IMPULSES TO SWEEP OSC.~

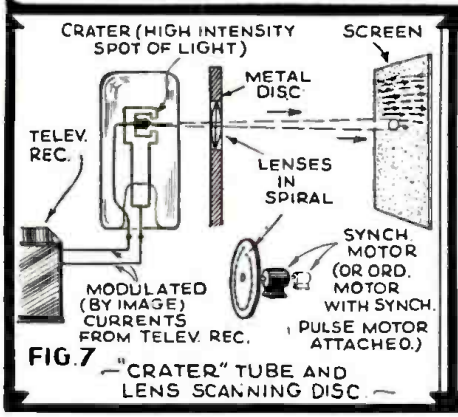


FIG. 7 ~"CRATER" TUBE AND LENS SCANNING DISC~

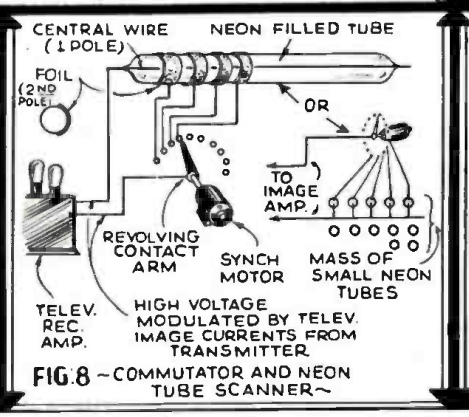


FIG. 8 ~COMMUTATOR AND NEON TUBE SCANNER~

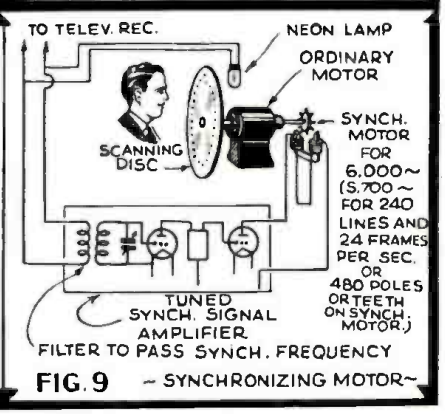


FIG. 9 ~SYNCHRONIZING MOTOR~

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

Ned Carman, Jr., of Zumbrota, Minn., Takes Prize.

The photo above shows this month's prize-winner, Ned Carman, Jr., of Zumbrota, Minn., and we believe you will agree that he has a very fine short-wave set-up.

Editor, SHORT WAVE CRAFT:

As one of the many thousands of steady boosters of "SWC," I am sending my heartiest congratulations on your "up-and-coming" magazine. It surely is very fine business for *anyone* interested in radio. I enjoy the *Short Waves and Long Raves* section most, tho for pleasure and results combined the whole magazine is the "Berries"!

A picture of my "shack" herewith. As you can easily see, it is located in the basement, so whenever it rains "cats-an-dogs" I have to get out the old mop to repel invaders. Hi! Starting at the left you can see that "SWC" is doing the honors. Next comes a two-tube battery job-30 det. and 19 audio. All QSO's in this shack are carried on by means of the typewriter with the kind assistance of Uncle Sam. Hi! Anyone wanting a Rag-chew will please call CQ at the address given below. The power-supply delivers 350 volts at 40 ma. and the outfit located between the power-supply and the speaker is a "B" eliminator, on top of which is perched an audio oscillator. The OM is sitting on two trunks which are laid end-to-end with a few blankets on top. Comes in mighty handy in case of an attack of early A.M. DX-ing. My present receiver uses a 58 untuned R.F., 57 det., and 56 audio and the antenna used is also hooked onto the B.C. set upstairs. I am planning to put up a separate antenna and also to change the R.F. stage to a regenerative T.R.F. stage.

Veris have either been received or are en route from PCJ, DJD, TPA4, EAQ, 2RO-31 meters. HAS3, and VK2ME. I have also heard the following: GS—B-C-D-F-O-P, DJA, DJB, DJN, DZH, PHI, TPA2. 2RO-25 meters, VK3ME, VK3LR, JVH, JVM, and JVN. The biggest thrill that the OM here gets though is in listening to 20 meter fone. DX on this band really means something. CE1BC in Chile, YV4AC in Caracas, also Peru, Barbados, (*Continued on page* 369)

A "Live" New York City Listener

Editor, SHORT WAVE CRAFT:

I have found your magazines to be very interesting and helpful to me, and, I am sure, to many other D.X. "Fans." Your publication contains the best classified list of short-wave radio stations throughout the world, also your notes and information regarding stations have helped me attain success and accuracy in short-wave tuning. Now I will describe my listening post.

I have a 6-tube 1936 Pilot all-wave receiver, which operates on either A.C. or D.C. Its range is from 15 to 555 meters. I also use an RCA double-doublet aerial running north and south. Each aerial is about 30 feet long and about 45 feet above my roof. My lead-in wire is about 75 feet, running down from the roof down to my window. This aerial has helped me to obtain very good results because of its sensitivity. I do not use any *ground* wire.

I have heard 29 countries throughout the world—over 220 "foreign" short-wave stations, including those in North America, South America, Central America, Europe, Asia, and Australia. I have received more than 150 verification cards and letters, and am still (*Continued on page* 369)

A glance at this picture gives some idea of the vast number of QSL cards collected by Irving Cohen of New York City—a real "dyed-in-the-wool" short-wave listener.

Louis Kingsley Rebuilt Sets From Our Diagrams

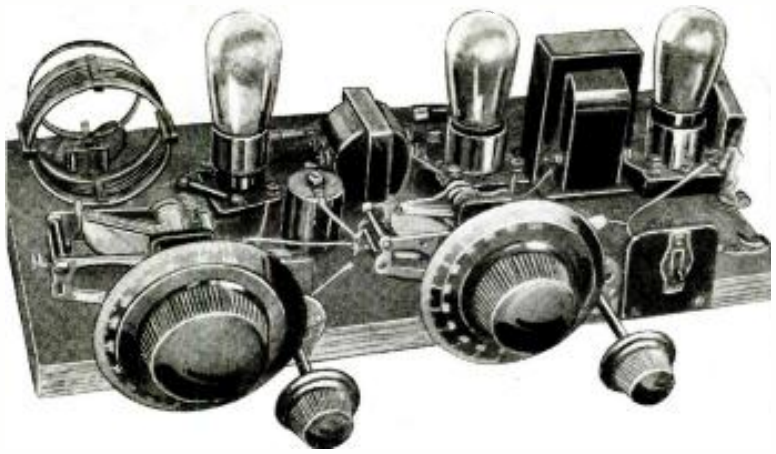
Editor, SHORT WAVE CRAFT:

Herewith is a photo of the "shack" that I'd like to enter in the "best station" photo contest. The shack is located in the basement of my home. The receiver is a Federal All-Wave Pro, rebuilt from a diagram published in *Short Wave Craft*. The tubes used are 58-56-2A5-80. Next to it is a 58 TRF stage, that "hops" the signals way up; this stage was also built from a diagram in the *Short Wave Craft*.

Above it is an old Atwater-Kent "BC" receiver. Beneath it is a Freshman Masterpiece; they're usually switched on when I'm not listening to short-wave stations. To the right is a couple more old "BC" receivers, which also take up some of my time.

On the wall are about half of my QSL cards. I grew so tired of looking at a bare wall, that I decided to "paper" it with veri cards and I've almost done it. HI! Near my left elbow is my "mill" (typewriter). Very handy thing to have around.

In closing I'd like to say that I'll gladly trade photo's and cards with anybody. (*Continued on page* 369)



The "Chicken-Coop" Special—a "Beginner's" receiver—built from old radio parts—including 201A tubes.

The "CHICKEN-COOP" Special

By Nils Radhe

Here's *the* receiver the "Beginner" has been looking for—"old" broadcast set parts can be used—including 201A tubes! Uses batteries or what-have-you? European reception? Shucks—That's a pipe!

● BACK in 1927, when G5SW first conducted the experiments which ultimately led to the development of the present Daventry system of overseas broadcasting service, the writer constructed one of the simple receivers, published at that time in Mr. Gernsback's *Radio News*. The Lord knows, the circuit was simple enough, and most of the parts were available in the radio "junk-box"—which in those days could be found in some corner of the home of any self-respecting radio enthusiast. However, the resulting reception was only fair, due, as I later learned, to ignorance of schedules, atmospheric conditions and what not. But occasionally "Big Ben" would come through good and loud, and in due time arrived the coveted "verification," from London.

Australia Romps In!

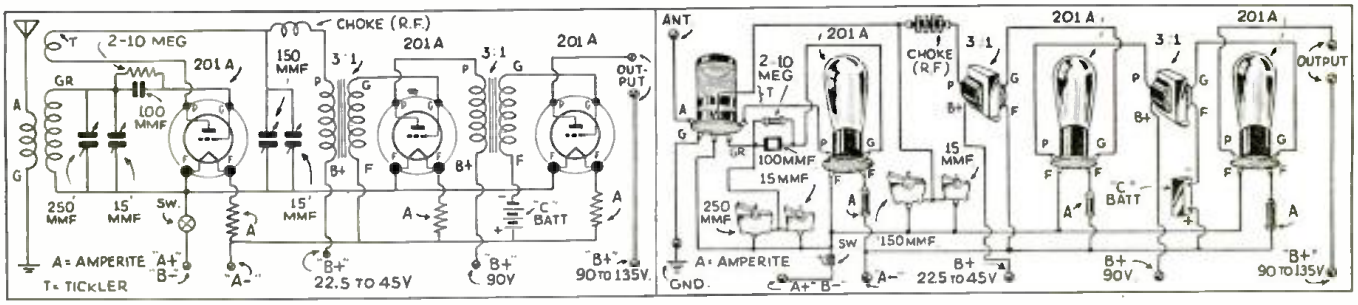
This gave inspiration to greater efforts. More amplification was added, and some "gadgets" incorporated to *facilitate tuning*, which had proved to be the greatest bugaboo. The set worked better, so much better that an enthusiastic friend offered the substantial sum of $30.00 for a *duplicate* of the receiver. Said and done, but instead of going to the "junk-box," the vital parts were obtained in a Kresge "5 and 10" store.

And so came the memorable morning of Nov. 25, 1928. We connected the set to about 25 feet of wire, stretched from a second-story window to a fence-post in the yard. For two full hours we listened to a "boxing match" and the opera *Rigoletto*, broadcast from 3LO Melbourne, Australia! In the excitement, the $30.00 was promptly spent in dispatching a radiogram to 3LO and next day a verification was received. Since then, I have owned several good *all-wave* receivers. Transmitters have increased their power and now broadcast on regular schedules. *Foreign* reception has become an "everyday occurrence" and all of the excitement a thing of the past. Yet very often I tune in on this little home-made contraption and invariably get quite a "kick" out of it. If not so loud as the factory product, reception is remarkably *clear* when conditions are right. For those who wish to experiment at little cost, I shall give details of the set.

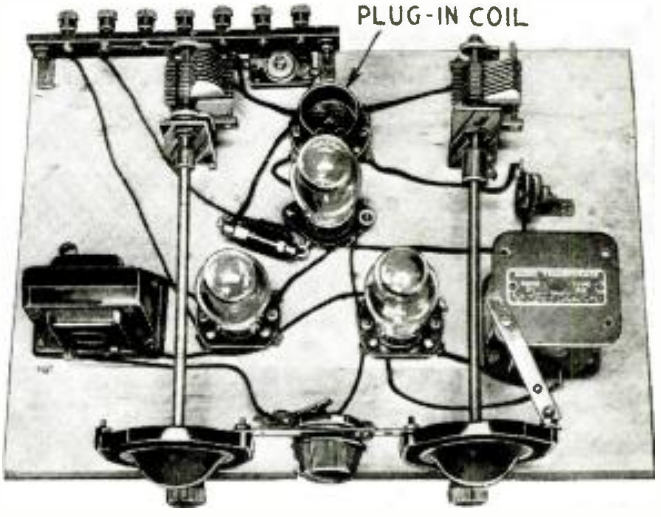
Selecting and Mounting Parts

First of all, the parts needed are few, so discard the "junk box" supply depot and buy good parts—especially condensers and chokes. If your wiring does not look so "hot," don't worry, only be sure that the connections are *right* and *tight!* Do not attempt to substitute fancy panels or metal chassis for the bread-board—it will not improve the set. The more simple, the better; just follow the diagram and avoid long grid and plate leads. Do not crowd the parts unduly for sake of appearance. Get the best condensers you can afford, and by all means do not forget the vernier condenser in the regeneration circuit, as it is absolutely essential for the proper operation of the set. When you have found the proper piece of wood for the baseboard, not less than ½ inch thick, find a piece of hard-rubber panel or hard wood, cut four strips on which to mount the condensers, and when mounted attach to the baseboard.

In place of rheostats use amperites to control filaments. It is more satisfactory and you may wish to try different type tubes. Wire the condensers and filaments first, then the rest is easy. Annunciator (bell) wire serves very well as hook-up wire. The photograph shows plainly the placement of the parts. You will note the absence of by-pass condensers; they are not needed, (*Continued on page* 362)



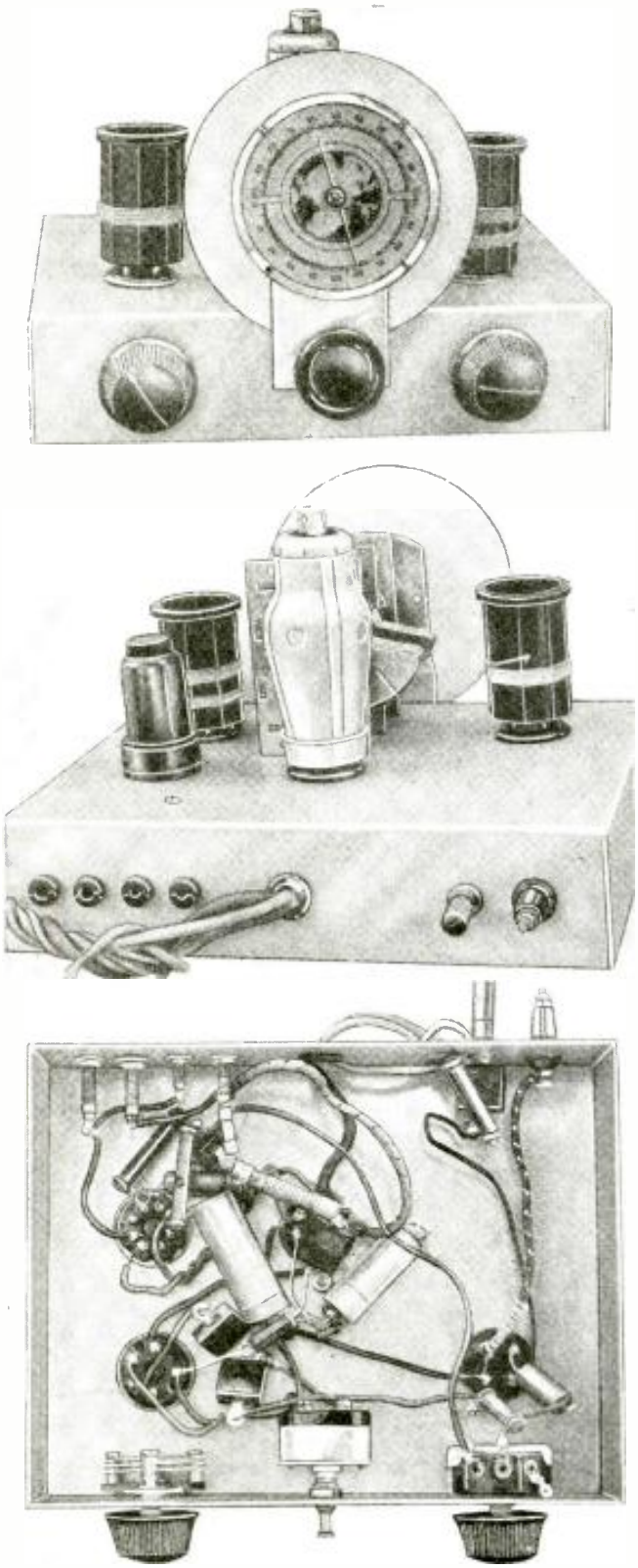
These diagrams—schematic and physical—will make the construction of the receiver very simple. Follow the one you understand best.



A more mndern versinn of the "Chicken-Coop" Special—using "parts" of a "later vintage." The "hook-up" is the same as for the original model.

2 Tubes Equal 4 in This

This Month's $20.00 Prize Winner



The photos above show front, rear, and bottom views of the "3 in 1" reflex receiver, here described in explicit detail by its designer and constructor, Mr. Hooton.

● IN the early days of broadcasting when tubes were an expensive item in receiver construction, the *reflex* circuit, in which the same tubes are used for *both* R.F. and A.F. amplification, became very popular. After tubes became cheap, however, interest in this type of circuit gradually died out, until today very few radio experimenters know what the term "reflex" really means. In view of the fact that practically all *short-wave* experimenters desire the most results from the least number of tubes, it is surprising that so few *short-wave reflex* receivers have been developed. With the abundance of *dual-purpose tubes* available today, it should be an easy matter to design a reflex circuit of either the tuned-radio-frequency or the superheterodyne type in which a *single tube*, such as the 6F7, *serves two, three or even more purposes.*

6F7 Does 3 Things!

In the short wave receiver illustrated and described in this article, the 6F7 pentode-triode tube functions as a *tuned-radio-frequency amplifier*, as a *regenerative detector* and as the *first audio-frequency amplifier*.

As Fig. 1 shows, the R.F. and detector circuits are conventional, the output of the R.F. amplifier being fed to the grid of the detector through the small condenser, C8. The regeneration is controlled by the 50,000 ohm potentiometer, R5, which varies the plate voltage applied to the triode portion of the tube. The audio-frequency output of the detector, however, is not fed to the next tube, but is returned to the grid of the pentode section. Thus the pentode portion of the

With this receiver a 6F7 tube is caused to act as a tuned radio frequency amplifier, also as a regenerative detector and first audio-frequency amplifier. To afford a better match at the output stage, a 6C5 or its equivalent is utilized. The cost of building this set is extremely low and the results are very worthwhile, indeed, as four tube results are possible with but two tubes.

6F7 not only serves as an amplifier for the R.F. signal but for the A.F. currents as well. The purpose of the R.F. choke in the plate lead of the pentode section is to isolate the R.F. and A.F. currents and to force the R.F. signal through the coupling condenser, C8, to the grid of the detector. It is extremely important that this choke be of good quality and of the exact size specified if good results are to be obtained from this circuit; most of the troubles found in reflex circuits can be traced directly to poor quality parts.

As the pentode portion of the 6F7 offers too high an impedance for the use of headphones in its plate circuit, it is necessary to utilize an additional tube, so that a better "match" can be obtained.* This tube need not be of the metal type, unless desired; the author used this type merely because both the 6C5 and an 8-prong socket were on hand. If a glass tube is preferred, the 76 or 41 types are most suitable.

Simple Chassis Used

As shown in the photographs, the set is built up on a 7x9x2 inch electralloy chassis, no front panel being used. The tuning condenser is mounted at the center with the 6F7 socket directly behind it. The plug-in coil at the left of the tuning condenser is in the R.F. circuit; the detector coil is at the right. The socket for the 6C5 tube is placed close to the rear right corner of the chassis, as shown. The three controls along the front, reading from left to right, are as follows: The 50,000 ohm regeneration control, the "off-on" switch and the R.F. trimmer condenser. The antenna and ground and the speaker or head-phone connections are at the rear of the chassis. A complete drilling layout is illustrated in Fig. 2.

Construction Not Difficult

The construction of the receiver is not at all difficult but care should be used during this process. Drill the chassis as outlined in Fig. 2 and mount the four sockets and the tuning condenser first. The metal plates should be removed from the

*The new Brush crystal earphones will work in the pentode circuit, if a high impedance A.F. choke and a coupling condenser are used.—Ed.

"3 in 1" REFLEX Set

By Harry D. Hooton, W8KPX

sockets anabling them to be placed directly in the chassis which eliminates the usual machine screws and also improves the appearance considerably. All wiring, and especially that of the R.F. and detector circuits, must be kept very short and direct with the "hot" leads well separated. When the various connections to the tube and coil sockets are soldered, be careful that no solder or rosin runs between the terminals. A drop of solder once lodged in this particular type of socket is very difficult to remove and may cause a short-circuit or impair the efficiency of the receiver.

Check Wiring Carefully!

After the set has been wired it should be checked against Fig. 1, or the picture diagram in order to make sure that all of the connections are correct before the power is applied. If the circuit appears to be correctly wired, connect the heaters to a 6.3 volt source, which may be either A.C. or D.C., and place 180 to 250 volts of D.C. current on the plates as shown. Close the D.P.S.T. switch, SW1-SW2, and turn up the regeneration control. The usual hiss of regeneration should be heard and stations should be received when the dial is rotated. Tune in a station as clearly as possible, adjust the regeneration control in the usual manner, and rotate the R.F. trimmer condenser, C5, for maximum volume. It is not necessary to readjust the trimmer each time a station is tuned in as the fixed condenser, C6, in series with the detector grid coil, is placed there for the sole purpose of obtaining better "tracking" between the two tuned circuits.

In case no oscillation is obtained in the detector circuit, it may be necessary to add more turns to the tickler coil, use a lower value resistor at R6, or readjust the coupling condenser, C8. Lack of oscillation may also be caused by a poor R.F. choke in the pentode plate lead. The tickler and resistor values are correct when the detector "breaks into oscillation" with the potentiometer turned about three-fourths on. If "B" batteries are used or the power back has a voltage-divider, R6 may be omitted, the lead from R5 connected directly to the 135 volt tap on the power-supply. The remedy for a poor choke is obvious—simply replace it with a better one.

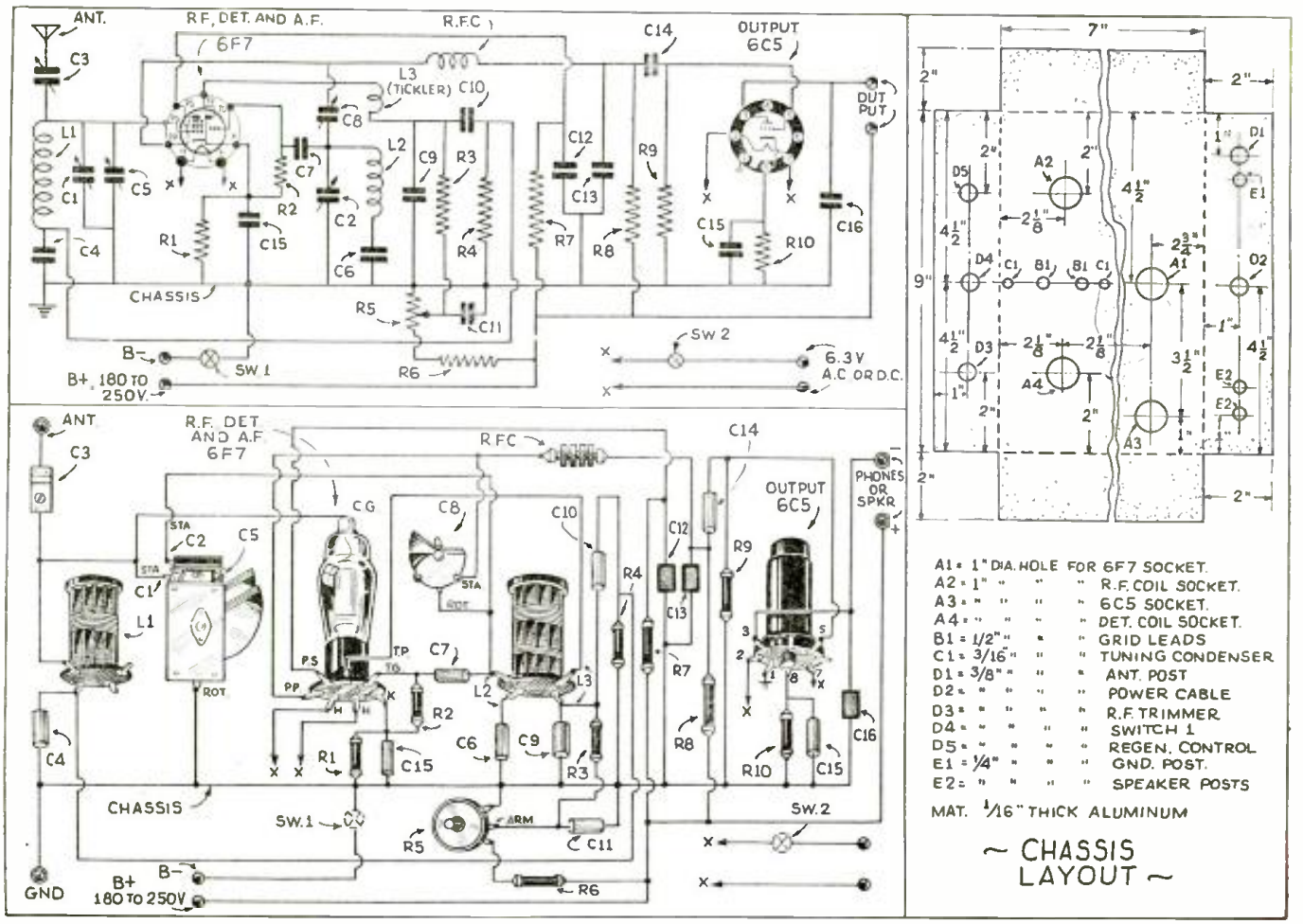
Points to Watch Out For!

If stations are received weakly or not at all with the detector oscillating, this may be due to a poor quality R.F. choke or too large a capacity at C4, C9 and C13. The total capacity of these fixed condensers, disregarding the effect of C10, is more than 0.005 mf. and while a large capacity is desirable from the R.F. by-pass viewpoint, its use is not practical because it would allow a considerable amount of A.F. current to follow this path to ground, instead of going into the grid of the 6C5 tube, where it belongs. Therefore, the substitution of parts having different values than those specified is *not* recommended.

In case the set does not bring in signals and the above suggestions do not clear up the difficulty, it is advisable to recheck the wiring against Fig. 1, and test for poorly soldered joints and open-circuited paper condensers at C10 and C14. However, if the set is correctly wired it is not likely that any difficulty will be encountered in getting it to operate properly.

Batteries or Power-Supply May Be Used

The power for operating this receiver may be obtained from either "A" and "B" batteries or an A.C. power-pack; the author is using a 6-volt storage battery and 180 volts of "B" batteries with very good results. The "B" batteries may be of the (*Continued on page* 361)



The diagrams given above in both schematic and picture style, should enable the reader to construct this 2-tube reflex receiver very easily. The stronger stations are capable of operating a sensitive loudspeaker and it makes a very good set for all-around headphone reception.

The Twin-Tube PORTABLE

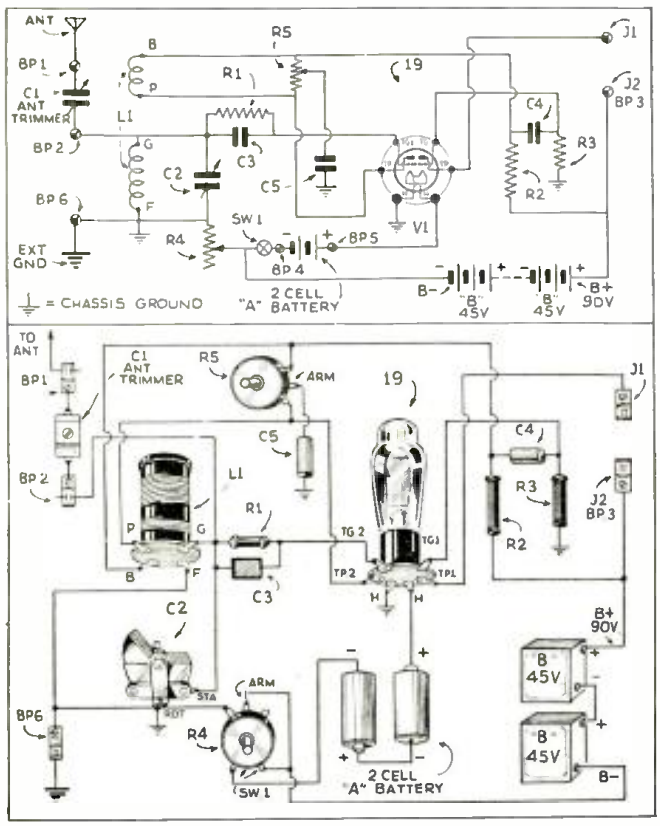
By H. G. Cisin, M.E.

This is one of the most compact 1-tube portables we have seen, and by means of plug-in coils it covers all of the regular wavebands. New style extra-small batteries are employed and the set tunes in a surprisingly smooth manner. It makes a dandy "headphone" receiver and weighs but 2 lbs., with batteries.

Isn't this 1-tube receiver a dandy! And the "A" and "B" batteries are all self-contained in the small cabinet, which can be held in one hand, as the photo shows.

● RECENTLY, the writer received an unusual request for a portable all-wave set which would be self-contained, including batteries, within a carrying case not to exceed 8½" by 5" by 4½" high. The specifications called for this receiver to have *sensitivity*, *selectivity* and more-than-usual *earphone volume*.

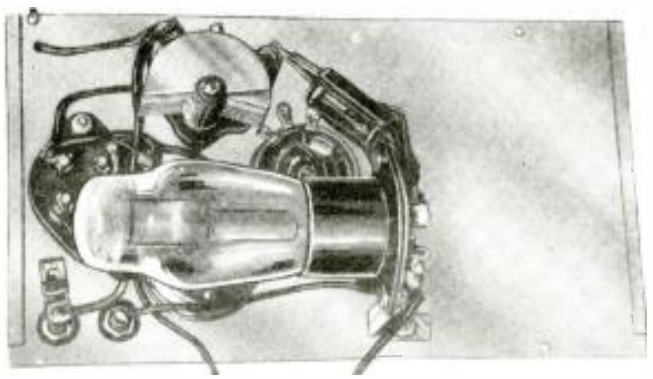
The first thought in starting to design a receiver of this type was to use two 30 type tubes, but this was soon found to be impossible due to lack of space for tubes and batteries. Next, a dual-function 19 tube was considered and this was found to be ideal for the purpose. This tube, with an over-all length of only 4½" and a maximum diameter under 2", actually contains the equivalent of two 30 type triodes within the single glass envelope. As a matter of fact, the portion of the tube which is used as an audio amplifier will furnish considerably more power than a 30 tube for the same plate voltage. Naturally, this is an important consideration in a portable set, where "B" batteries must be limited in number. The 19 tube, like the 30 tube, requires only two volts on the filament.



Picture as well as schematic diagrams are given above, to guide you in the construction of the 1-tube "headphone" receiver.

Regenerative Detector Used

Having selected the tube, the next step was to decide on a suitable circuit. For maximum sensitivity and selectivity, a regenerative detector was selected, with incoming signal directly to the grid through an antenna control condenser.



Here's the "woiks"! The cost of the few parts is very small, and the "A" and "B" batteries fit in the case behind this panel, which contains the tuning condenser tube and sockets.

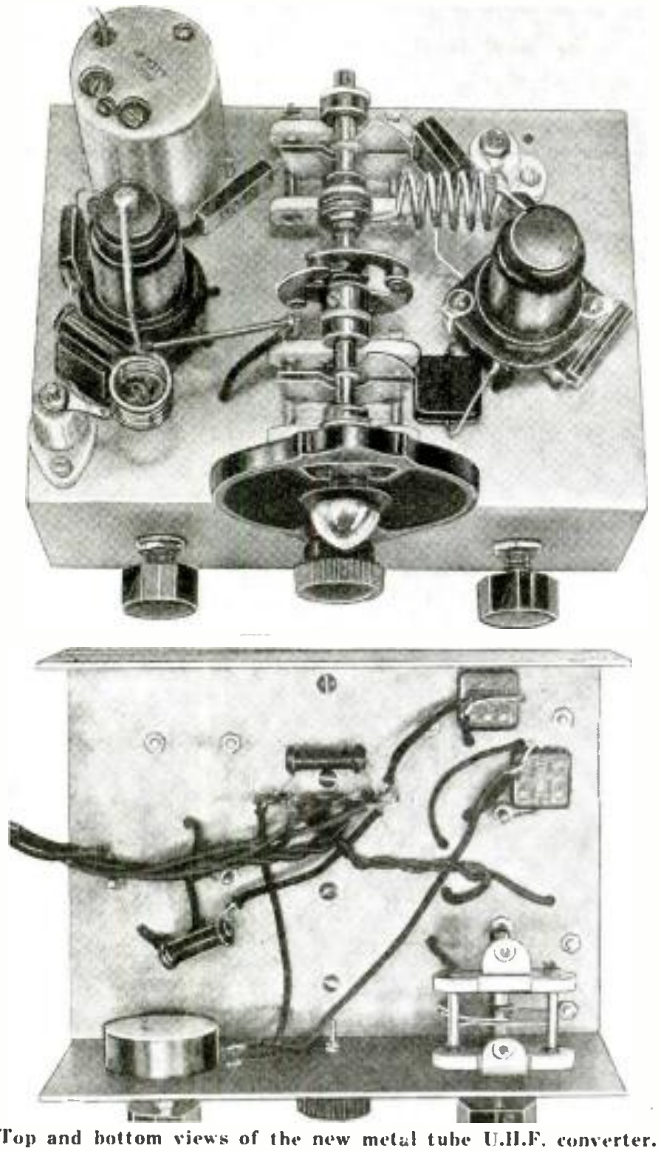
The all-wave part of the specifications was readily taken care of through the use of five plug-in coils. A midget type Hammarlund variable condenser was selected for tuning the longer winding of the plug-in coil, and the shorter winding was employed as a tickler in the plate circuit. Regeneration control was obtained by means of the conventional variable resistor shunted across the tickler winding. A 75,000 ohm Electrad potentiometer was used, having an "on-off" switch actuated by the same shaft.

The next step consisted in coupling the second triode of the 19 tube to the regenerative detector portion. Here again, space was the determining factor, making a resistance coupled stage imperative. A 40 ohm filament rheostat provided the necessary filament control and completed the circuit design.

With the electrical features taken care of, the problem now resolved itself into a mechanical one; namely, to install the various components in the allotted space, leaving room for the batteries, and presenting a compact, convenient and attractive looking job.

Aluminum Panel

An aluminum panel, about ⅛" in thickness, was chosen to carry the various parts. This was cut down to 4⅜" wide by 8" long, so that it fitted into the top of the carrying case and provided a suitable panel for the various controls. The socket hole was drilled at the upper center as shown in the illustrations and a four-prong socket was secured to the panel at this point, providing a means of plugging in the various coils. The two insulated (*Continued on page* 366)



Top and bottom views of the new metal tube U.H.F. converter.

The U.H.F. CONVERTER

Ideal for Television and "HAM" Use

By George W. Shuart, W2AMN

This is an excellent converter for either the "Ham" or "Fan." The "Ham" will find it useful for 5-meter reception, and the "Fan" may use it to convert his present receiver into an ultra high frequency combination. The "Television" experimenter may connect this to his present Television receiver and cover the new ultra high frequency television bands.

● SUCH phenomenal success has been reported by those who built the "10-meter Converter" described in the May issue, that we decided to find out how well it would work on the higher frequencies.

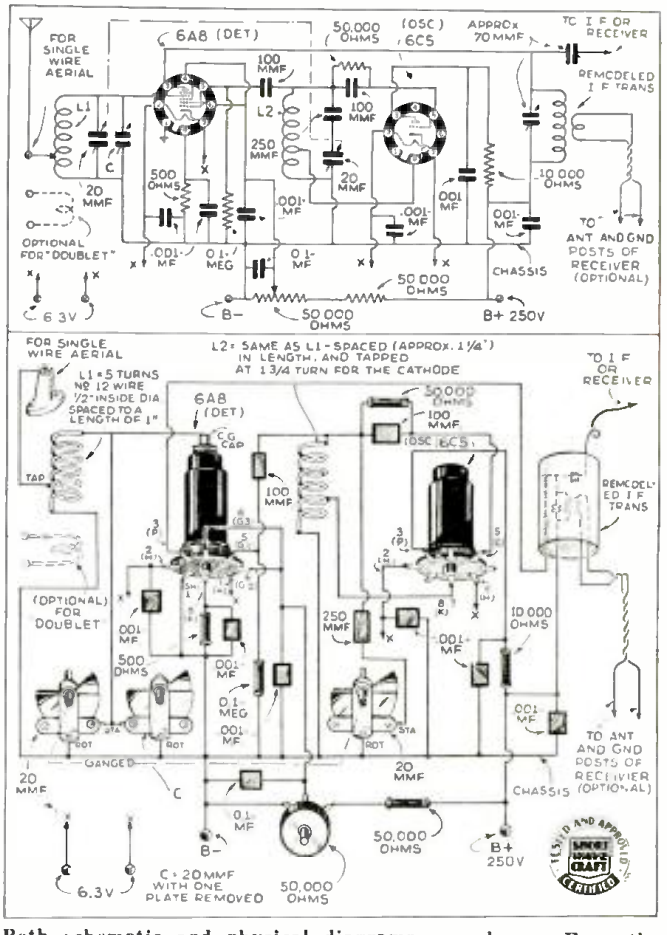
With the present interest in *television* on the higher frequencies rapidly increasing, some type of converter is necessary in order to convert the present television or short-wave receivers for the new television bands—around 5 or 6 meters. The converter described in this article makes an excellent unit for converting television receivers and is also ideally suited to "amateur" use on the 5-meter band.

This converter uses a 6A8 and a 6C5. The first as a first detector, and the latter as the high-frequency oscillator. We have shown two methods of coupling the output circuit of the converter to your present receiver. One is *capacitive* coupling and the other is *inductive*. If the present antenna coupling arrangement in your receiver consists of a condenser coupling to the grid circuit or an untuned stage, then the capacitive method shown in the diagram should be used. If your receiver employs an antenna coil consisting of several turns, then a small coil having the same number of turns as the antenna coil can be wound on the form along with the detector plate coil and connected to the antenna and ground posts of the receiver or to the two terminals which go to this coil, with a twisted pair or a short length of shielded cable.

Probably the most interesting point in this converter is the *regenerative detector*. Although no method of feed-back is indicated there is considerable regeneration in the circuit, in fact, sufficient to cause oscillation when the antenna coupling is loose and the screen voltage is adjusted to the proper value. The original 10-meter converter described in the May issue employed no regeneration control or screen-grid potentiometer. We strongly advise those operating the 10-meter converter to make this addition as the improved results will be quite worthwhile.

How Det. and Osc. Circuits are "Tracked"

The *first-detector* circuit, because of its regenerative qualities, is exceptionally selective and sensitive. It is so selective that it is almost impossible to get perfect "tracking" between it and the oscillator circuit. However, by properly adjusting the coils, i.e., by *spreading the turns of the oscillator coil either further apart or closer together*, and *employing a 250 mmf. condenser in series with the oscillator tuning condenser*, the two circuits may be made to "track" over nearly the entire range of the tuned circuit. After a station has been located and tuned in a slight re-adjustment of the detector trimming condenser C is all that will be necessary. The tuning condensers used are (*Continued on page* 364)

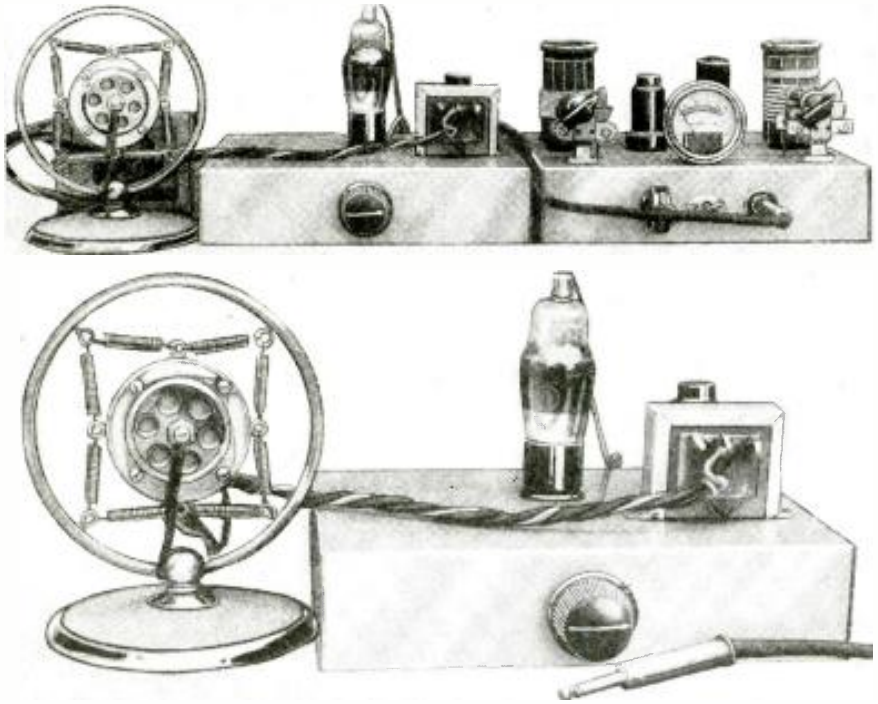


Both schematic and physical diagrams are shown. Even the most inexperienced constructor can build this excellent U.H.F. converter from these diagrams and description.

How to Build

A MODULATOR For the "M.T." Xtal Transmitter

By Harry D. Hooton
W8KPX, ex-W8BKV



Two photos above show, respectively, modulator connected with the "M.T." crystal transmitter described in the September issue of this magazine, and in lower photo—microphone connected with the modulator unit.

After considering many different types of "modulators" for use with the "M.T." Crystal Transmitter described in the September number, Mr. Hooton finally selected the one here described. This modulator can be built at a very nominal cost and utilizes a 6C5 and a 79. The circuit is of the series modulator type.

● THE problem of selecting a suitable modulator for the "M.T." Xtal (metal-tube) Transmitter, described in the September issue of *Short Wave Craft*, is by no means a simple one. In the first place if the plate type of modulation is used, the audio requirements are exactly 50% of the power input to the amplifier for 100% modulation. Or in other words, for the 20 watts input to the 6F6 we must have at least 10 watts of audio for complete modulation of the carrier. The use of such high-power *speech equipment* is decidedly impractical in this case, as it would place too great a load on the Genemotor. Suppressor and control-grid modulation must also be ruled out, because of the internal construction of the 6F6 tube and the circuit arrangement.

There is one type of modulator, however, that is ideal for use with this transmitter. This is the comparatively unknown but extremely simple *series modulation*. This system of modulation is of recent origin and deserves more attention than it has attracted up to this time. As Fig. 1 shows, only a handful of parts are required for modulating even a high-power tube and this together with the fact that no additional drain is placed on the power supply, makes this method very desirable. The main requirements for a modulator of this type are good quality parts and a modulator tube (or tubes) of sufficient plate current capacity to carry the D.C. power of the amplifier without an excessive voltage drop across its elements. The percentage of modulation is controlled by adjusting the bias applied to the grids of the modulator, the simplest method being shown in Fig. 1. No modulation transformers or chokes of any kind are required.

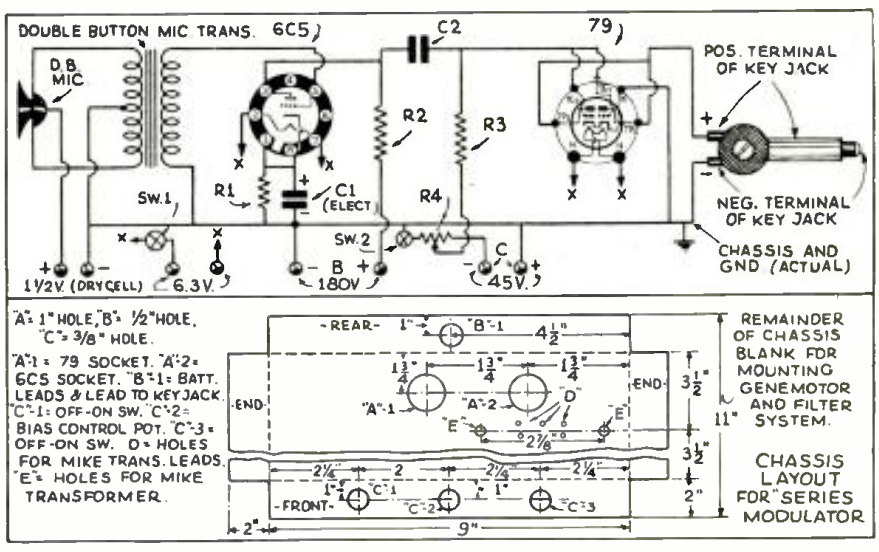
Simple Line-up of Modulator

The *series modulator* described here consists of a double-button carbon microphone, coupled to the grid of a 6C5 metal triode through the usual transformer; the 6C5 output is resistance-capacity coupled to the grids of a 79 modulator tube. The grids and plates of the 79 are connected in parallel in order to increase the plate current capacity of the tube, so that the voltage drop across its cathode-plate circuit will not be excessive.

The plate and cathode connections of the modulator tube are brought out to the terminals of a standard phone plug, as shown in Fig. 1. When this plug is inserted in the "key" jack, in the cathode circuit of the 6F6 tube, the plate circuit of the 79 is placed in series with the power-supply to the amplifier. Voice current, amplified by the 6C5 and applied to the grids of the modulator tube through the coupling condenser, C2, will cause the effective resistance of the 79 to change, according to the usual amplifier theory. As the plate circuit of this tube is in series with the cathode lead of the 6F6, it will act precisely as though it were a variable resistor and modulation will take place.

As the photographs and drawings show, the modulating equipment is built up on a 7x9x2 inch electralloy chassis, the tubes and the microphone transformer being placed close to one end. This peculiar method of construction is used in order to allow the Genemotor with its filter condensers and choke to be mounted on the opposite end at a later date. When this arrangement is used it will be necessary to use a *shielded* microphone cable and perhaps *shielding* on the grid leads to the 6C5 tube, in order to prevent commutator noise from feeding into the speech amplifier. An *actual ground* should be connected to the chassis as shown in Fig. 1.

(*Continued on page* 360)



Wiring diagram of Mr. Hooton's simple modulator.

Note the "Prof." appearance of the "R.E.C." transmitter built by Mr. Abrams from receiver parts and tubes.

The "R. E. C." 20 Watt CW Transmitter

Uses Receiver Parts and 3 Type 6K7 Metal Tubes

By ALVIN ABRAMS

This metal tube transmitter will appeal to many of our readers as practically all receiver type parts may be used in building it. It also employs receiver type metal tubes, and the cost to build it is nominal. It is crystal-controlled.

● ONE of the most popular types of transmitters in use today, is the small but efficient set composed entirely of receiving type components. Keeping the thought of *low cost* uppermost, a transmitter was designed meeting the above specifications, and for use with the all *metal* tubes. It uses three type 6K7 tubes and has an output of from 15 to 20 watts.

Naturally, the use of metal tubes in a transmitter prompts the set builder to inquire with justification, what are the advantages of these tubes over the glass types. Roughly, their superiorities can be divided into two headings, that of performance and construction. Under performance, we may credit to the metal tubes, shorter leads from the prongs to the elements, which cut down losses. And secondly, increased heat dissipation, because of the superior heat conduction of metal over glass.

Under the heading of construction, we find that the internal assembly is supported by welded and riveted members and braced by short direct leads. In addition, no trouble is experienced with loose bases, because specially designed machines weld the metal shell to the base under split second automatic time control. A current of 50,000 amperes is used for this welding operation.

Some of the features of the transmitter itself, include a tritet oscillator, making the circuit flexible for wave length change, a single tuning meter for reading grid and plate currents, a self contained power supply making the unit compact, and link coupling from the tritet to the amplifier. When the transmitter was designed originally, the amplifier consisted of a pair of 6F6's in push pull. Although the pentodes gave a larger power output, it was decided that the screen grid tubes would be better because of the fact that absolutely no neutralization is required.

A heavy steel black crystalline finish chassis 10x17x3 is used and suits the purpose because it is solid and durable, but any other convenient chassis can of course be used, providing it has these approximate dimensions. Looking at the set, we find that the power supply is located on the left hand side, with the oscillator in the center and the amplifier to the right.

Construction

When all the parts have been obtained, mount the special power transformer by bending the four crimping lugs 90 degrees, so that they are at right angles to the transformer case. Then 1/16 inch holes should be drilled through the lugs and corresponding holes drilled through the chassis.

This method of mounting is the simplest and if ordinary care is taken, it will have a neat appearance. The two filter condensers are mounted next and then the filter choke. The socket for the 5Z4 rectifier is placed near the front of the chassis by drilling a 1 5/16 inch hole with a circle cutter. The meter hole is drilled next and then the tuning condensers are ready to be mounted. This is done by drilling a hole through the chassis and placing two extruding washers together. Then the condenser shaft goes through the washers and the shank is securely tightened. This insulates the rotor from the chassis very effectively.

List of Parts

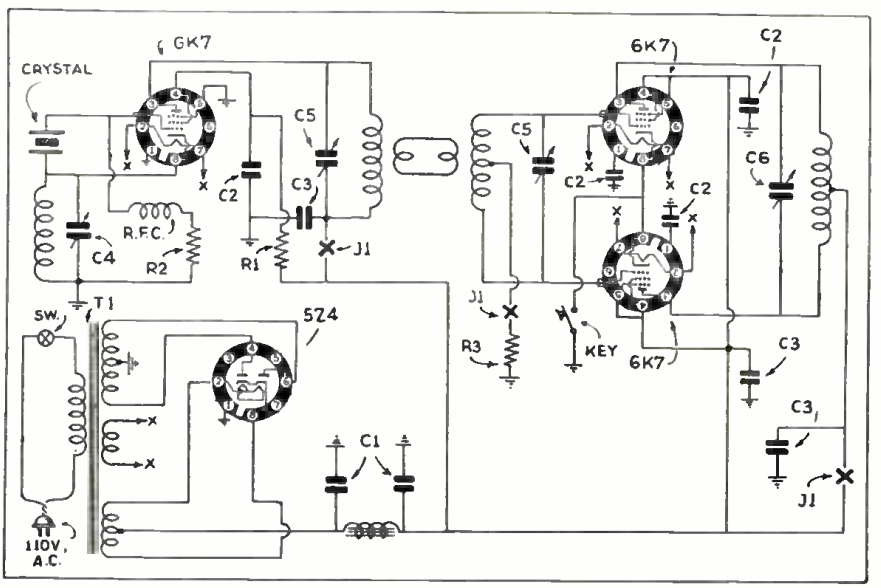
2—C1—Trutest 8 mf. Inverted Can Type Electrolytic
5—C2—.01 mf. Fixed Condensers
3—C3—.002 mf. Fixed Condensers
1—C4—Isolantite Padder 27-180 Mmf.
2—C5—Trutest 100 mmf. Midget Variable Condensers
1—C6—ICA 140 mmf. Universal Midget Variable Condenser
1—R1—Trutest 50,000 ohm 10 watt fixed resistor
1—R2—Trutest 25,000 ohm 5 watt fixed resistor
1—R3—Trutest 20,000 ohm 5 watt fixed resistor
3 Type 6K7 Metal Tubes, RCA Radiotron
1 Type 5Z4 Metal Tube, RCA Radiotron
4 Octal Base Wafer Sockets
1 Power Transformer—6.3 volt winding, 5 volt winding, 250 volt secondary at 60 mills (M.A.) or Trutest 7-8 tube transformer for greater output.
3 Midget Closed Circuit Jacks, I.C.A.
1 Trutest 30 Henry, 125 Mill. 200 ohm filter choke
1 Bud 2½ inch coil form, 4 prong base
2 Bud 2½ inch coil form, 5 prong base
1 4 prong socket
2 5 prong socket
2 Phone Plugs
3 Closed-circuit jacks, I.C.A.
1 Open-circuit jack (Phone jack) I.C.A.
¼ pound No. 20 Double Silk Covered Magnet Wire
2 Porcelain Feed-Through Insulators
1 Porcelain Coil form 2½ inches diameter Bud
1 Trutest Radio Frequency Choke

Wiring

If we look at the diagram, we will see quite a few connections grounded. However it is not quite correct to make the connections to any part on the chassis. To do so results in a loss of efficiency, because of the fact that there may be a large radio frequency voltage loss between two points on the metal, resulting in erratic operation. If all connections are brought to one common ground however, the set will look unnecessarily complicated and this may be avoided by having a ground point for the oscillator and one for the amplifier. Then these two sets of connections are joined by a heavy piece of wire.

The coils are wound with number 20 double silk covered wire and the link on the oscillator plate coil consists of a turn of wire around the low voltage

(*Continued on page 373*)



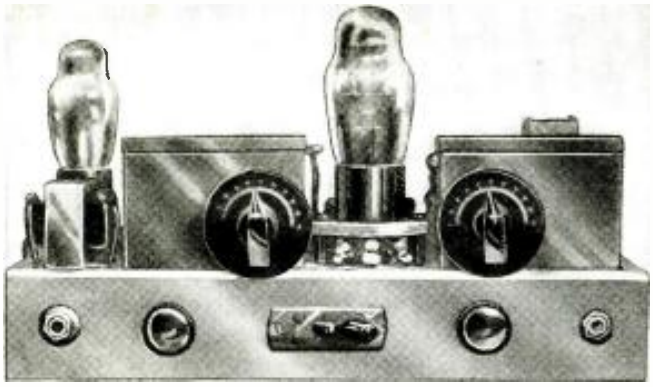
Simple wiring diagram used by Alvin Abrams in building this dandy 20-watt CW transmitter.

The IDEAL TRANSCEIVER—

Uses Split 6A6 Circuit

By Harry Pinsker

This Split 6A6, 5-meter Transceiver overcomes objections to most sets of this type, by using separate Transmitter and Receiver circuits for Detector and Oscillator. Uses 6A6, 76, and 42. Plate supply from batteries or dynamotor.

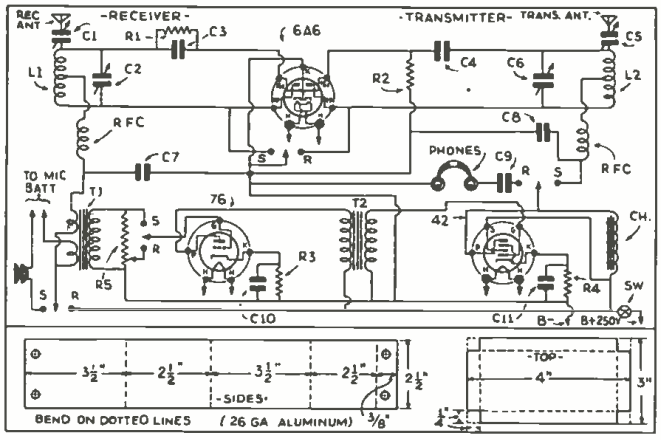


Front view of Transceiver.

● THE greatly increased popularity of the 5 meter amateur band has resulted in the use of *Transceivers*. While the transceiver is satisfactorily used on this band, it possesses a few disadvantages. The transmitter is tuned to the same frequency as the receiver and consequently crowds up all the stations on one frequency. Some transceivers do not transmit on the exact frequency of the receiver. Thus, two similar sets will chase each other right across and beyond the band during a QSO. The power output is low for a given voltage, because the antenna coupling must be very loose, in order to prevent *pulling* the detector out of super-regeneration. With the above facts in view, the author, after a good deal of experimenting, designed a transceiver which gives the advantages of a separate transmitter and receiver, and yet costing no more than a 76-42 combination.

Action When Transmitting and Receiving

A 6A6 tube, having two triodes in one envelope, was selected to do the *double duty* of being the super-regenerative



Wiring plan of the 6A6 split-circuit Transceiver.

detector and the oscillator. Each triode in its respective capacity is tuned by a separate coil and condenser, thus giving separate transmitter and receiver performance. The transmitter can be tuned to a fixed frequency for maximum efficiency. The combined audio amplifier and modulating system consists of a 76 and 42 tubes. When receiving, the signals picked up by the (super-regenerative) triode of the 6A6 are fed into the plate primary of the double-primary transformer, and are further amplified by the 76 and 42 audio amplifier. This gives plenty of audio power to the speaker. When transmitting, the 42 becomes the modulator, modulating the oscillating second triode of the 6A6. The 76 becomes the *speech-amplifier*, giving plenty of pickup. With this arrangement, it is not necessary to talk too close to the mike; a distance of eight inches is satisfactory. The circuit is a conventional *transceiver* circuit with the exception that the oscillator and detector circuits are independent of each other.

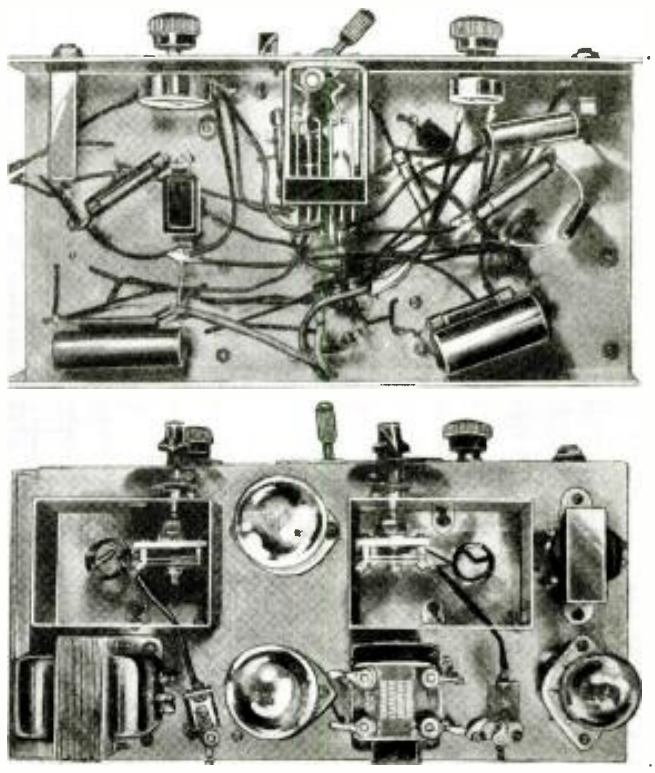
Coils and Chokes

The coils L_1 and L_2 consist of five turns of No. 18 enamelled copper wire, ⅝ inch in diameter, center-tapped and with ⅛ inch between turns. The coils are soldered directly to the lugs on the stator and rotor plates of the variable condensers. The R. F. chokes consist of 85 turns of No. 30 D.S.C. copper wire, wound on a ⅜ inch bakelite rod. Painting the chokes with a coat of collodion or finger-nail polish, will keep the winding in place and permit easy soldering to the two flexible leads at each end.

Shielding Essential

The shielding of the two tuned circuits was found to be very essential. Although the receiving tuned circuit is *grounded* when transmitting, and the transmitting circuit is grounded when receiving, power from the transmitter was absorbed when resonance was reached. Shielding the two circuits completely eliminated this effect. The shield cans are made of 26 gauge aluminum and are fastened to the chassis with small metal angles. All parts are mounted on a 12x6 inch aluminum chassis. The variable condensers are mounted on brackets and the shafts of these condensers should be insulated from the knobs by bakelite rods.

The chassis is a "U" shaped affair, bent from 12"x10" No. 14 gauge piece of aluminum. The chassis should offer no problem to the constructor. The sockets are mounted on stand-off bushings. The hole for the anti-capacity switch and the bending of the chassis may be done by a tinsmith for a very small sum. A four-pole, double-throw anti-capacity switch is used for switching over (*Continued on page* 375)



Top and bottom views of Transceiver.

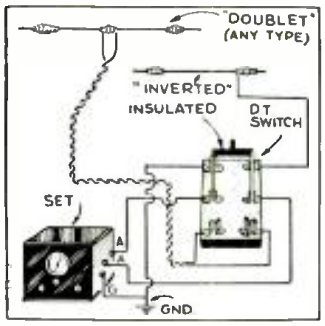
$5.00 FOR BEST SHORT-WAVE KINK

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

$5.00 Prize

ANTENNA CHANGE OVER SWITCH

Most short-wave "Fans" have found that for best results two antennas are needed—one for the broadcast and one for the short wave bands. In the broadcast band the "L" type antenna works best, while the doublet performs good for the shorter waves. The diagram clearly shows a method of connecting a double pole double throw switch for changing from one antenna to the other. In one position the "L" type antenna is connected to one side of a receiver, while the ground is connected to the ground posts

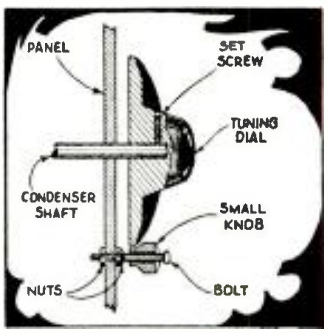


on the receiver and the other side of the doublet connection. When in the other position the doublet is connected to the two doublet posts and the ground to the ground post receiver. This system works out very well.—Glenn Crabb.

▼ ▼ ▼

VERNIER FOR S-W SET

Vernier tuning may be easily installed on a receiver equipped with a large circular tuning dial. By running a bolt through a small knob, as shown in the diagram (a cork works out very well for this purpose), and fasten it to the panel beside the large dial so that the knob will bear firmly against the edge of the dial.—Keith Wright.



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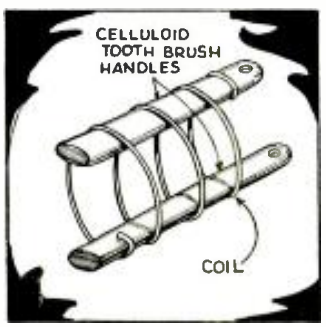
NEW USE FOR TOOTH-BRUSH

In building a low-loss plate tank coil for my transmitter, I encountered difficulty in procuring material for the celluloid strips which support the coil. Finally, I decided to use the celluloid tooth-brush handle which served the purpose excellently. I used celluloid to secure the wire to the celluloid and after construction, this made a very nice-looking piece of apparatus. If the tooth-brush is bent it may be straightened by soaking in hot water until pliable, then left to cool between weighted flat surfaces. —Sidney Slotznick.



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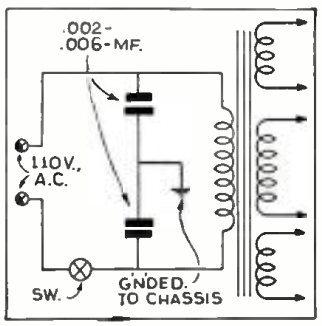
REDUCING TUNABLE HUM

I was troubled with a low-frequency hum of great intensity of the tunable hum variety in my receiver. This only occurred between 40 and 80-meters. I had tried everything I could think of to eliminate this difficulty, and finally overcame it by connecting two by-pass condensers across the power line and grounding the center connection, as shown in the diagram. This worked out remarkably well and for those who cannot eliminate the trouble by the usual methods should find this one satisfactory.—Don Lively.



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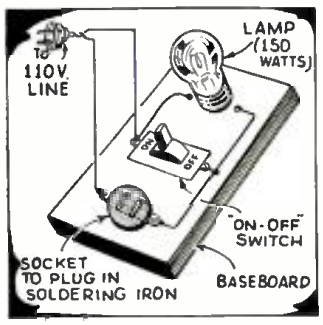
SOLDERING IRON REGULATOR

I had trouble in keeping the soldering iron at the right temperature and found the following kink the ideal solution. When starting up the bulb is shorted out of the circuit. After the iron has become hot enough the switch is thrown in the off position putting the bulb in series with the iron and, in this way, the iron will not overheat. I found the 150-watt bulb to be most satisfactory. Complete details of the circuit are given in the drawing.—Dick Eastman.



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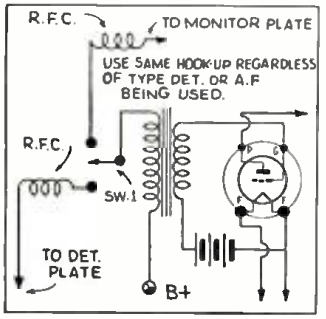
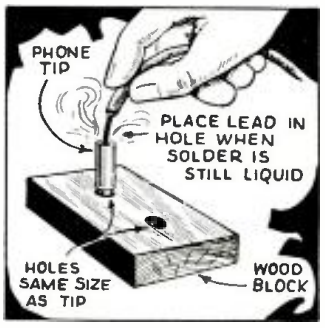
MONITOR SWITCH

By employing a single-pole double-throw switch in the plate circuit of the detector in my receiver, I am able to switch from monitor to receiver with one operation, and the signals from the monitor appear in either the speaker or the earphones of the receiver. I am presenting this for the "Hams" who desire simplicity and effectiveness. The drawing clearly shows how this is accomplished.—Lawton Westrom.





HOW TO SOLDER PHONE TIPS

When soldering phone tips to wires, I find that it is much easier if two holes the size of the tips are bored into a piece of wood, then by putting the tips into these holes they will be held firmly while soldering. Needless to say, the tips should be filled with solder and the wire should be well tinned.—James E. Dalley.

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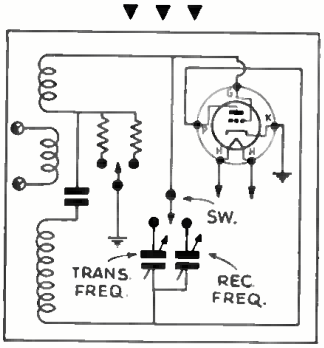

TRANSCEIVER KINK

The 5-meter transceiver has become one of the most popular pieces of radio apparatus the "Ham" has ever known. The only disadvantage is the tuning affects both the transmitting and receiving frequencies. I have overcome this by using a switch and two condensers—one for receiver and one for transmitting. The transmitting condenser is set so that the frequency when transmitting is somewhere in the band; preferably a clear spot. Then when switching to receiving, adjustment of the receiving dial causes no change in the frequency of the transmitter when we decide to transmit again.—William Thom.

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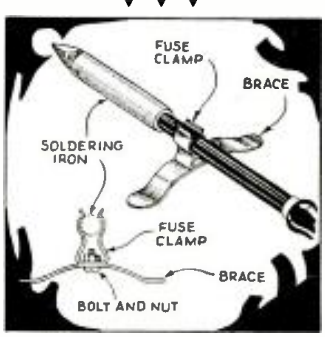
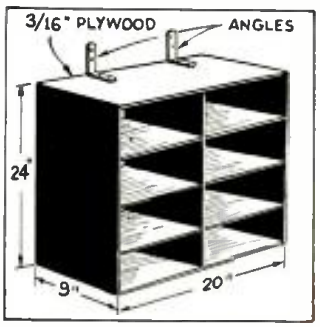


IRON HOLDER

It consists of a large fuse-clip bolted to a narrow strip of metal. This will cling to the iron and when the iron is not in use it can be rested on the bench without burning a hole in it. In this manner the holder is always attached to the iron.—L. Toman.



A PLACE FOR THOSE LOOSE PARTS

I have constructed three of these and have them hanging on the walls in convenient places. Drawers may be fitted to these but are not necessary.—Philip Greco.

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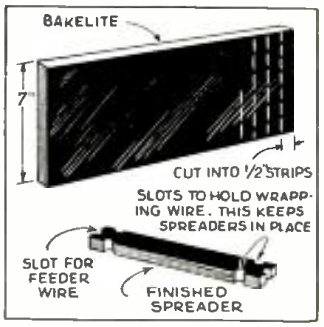
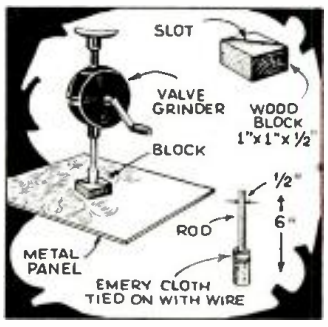


ANTENNA SPREADERS

I made a number of antenna feeder spreaders from an old bakelite panel by connecting ½ in. strips and shaping the ends in the manner shown in the drawing. The main advantage of this type of spreader, of course, is its light weight and good insulating qualities. Bakelite stands the weather much better than hard rubber.—L. Casto.

▼ ▼ ▼



ATTRACTIVE PANEL FINISH

I use a valve grinding machine. By cutting a slot into a square block of wood and gluing a small piece of cloth to the bottom of the wood, the "whirl effect" can be accomplished in a few moments.—John Wentworth.

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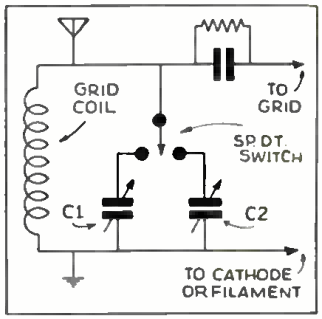


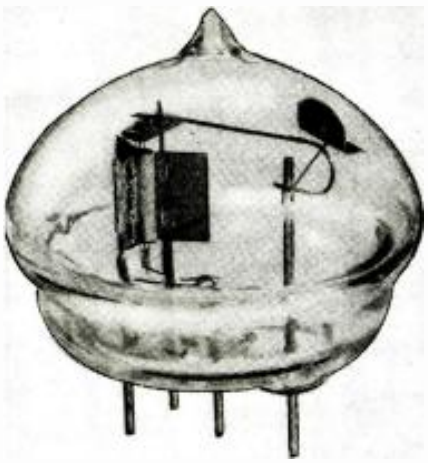
A 2A5 RECEIVER KINK

Many "Fans" are interested in listening to both sides of a radio conversation, and the following kink is one method of doing this. By using two condensers connected as shown in the diagram, together with a single pole double throw switch either side of the conversation may be conveniently tuned in.—John Prsha, Jr.

WHAT'S NEW In Short-Wave Apparatus

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

ULTRA-HIGH FREQUENCY Transmitting Tube



The 316-A triode shown above, will work at frequencies as high as 750 megacycles.

● AMATEURS interested in experimental communication on wavelengths shorter than one meter will find this new Western Electric 316-A triode the answer to their needs.

The frequency limit of oscillation is 750 megacycles. The photograph shows its construction and it reminds one immediately of a percolator top. Its maximum overall length is 2 25/32nd inches, and the maximum diameter is 2 11/16 inches.

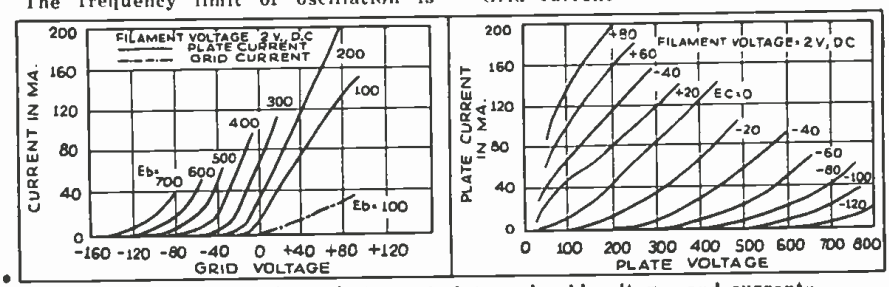
The filament voltage is 2, either A.C. or D.C. with a current requirement of 3.65 amperes, and has an average thermionic emission of .4 ampere. It has a thoriated tungsten filament. The inter-electrode capacities are as follows:

Plate to grid ..... 1.6 mmf.
Grid to filament ..... 1.2 mmf.
Plate to filament ..... .0.8 mmf.

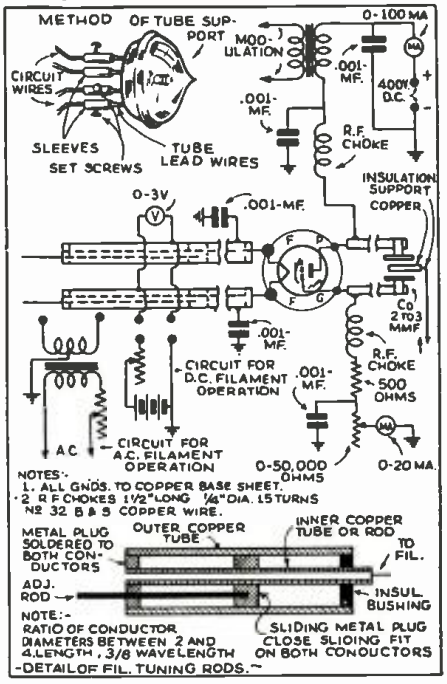
Maximum ratings—direct plate voltage, 450; direct plate current, 80 ma.; direct grid current, 12 ma.; plate dissipation, 30 watts.

The manufacturers claim that maximum plate voltage may be used at any frequency if the maximum plate dissipation (30 watts) is not exceeded. Ratings as a radio frequency oscillator or amplifier at 500 mc. are as follows:

Plate voltage 450
Plate current ..... .80 ma.
Grid current ..... .12 ma.



Graphic charts showing relations of plate and grid voltages and currents.



Hookup suggested for use with the new high frequency 316-A triode and detail of one of the filament tuning rods.

Power output ..... 7.5 watts

The grid bias or leak should be adjusted to optimum value for the particular tubes

(Continued on page 365)

New Beat Frequency Oscillator

● A VARIABLE frequency source of alternating current is a necessity for many radio service and laboratory tests. Fidelity measurements of receivers, loudspeaker testing, frequency measurements and many other applications are constantly requiring the use of a variable frequency A.C. source.

The beat frequency oscillator illustrated is ideal for any application requiring a source of A.C. of frequencies ranging from 30 to 15,000 cycles per second. Small, light in weight, and highly accurate, this unit incorporates design features found in only the highest priced laboratory oscillators.

Front view of the beat oscillator.

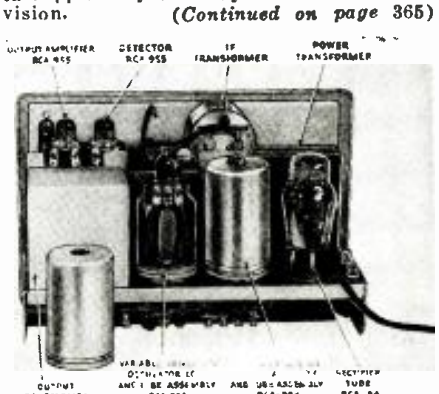
Features of the new beat frequency oscillator include the use of four Acorn type tubes, which greatly reduces space requirements and permits a more efficient component part arrangement. A neon lamp gives a quick means of checking the dial readings against the line frequency of 60 cycles—other checks may be made at 120 and 180 cycles. For 50 cycles, reference points are 100 and 150 cycles. The direct-reading dial is controlled by a 5 to 1 vernier drive, which permits easy and accurate adjustments to any desired frequency.

The entire instrument is contained in the standard service equipment case, made of solid steel and finished in black crackel lacquer. The case is fitted with a leather handle and the entire instrument weighs only 10¾ lbs.

This instrument is applicable to the following purposes: measuring receiver fidelity, measuring audio amplifier fidelity, checking transformer frequency characteristics, checking filter frequency characteristics, making frequency measurements, testing loudspeakers for rattles, testing radio cabinets for howl, stroboscopic speed measurements.

Operation of a beat frequency audio oscillator is based on the beat or difference frequency produced when two r-f oscillators are operated near the same frequency and their outputs combined. By making one of these oscillators fixed in frequency and the other variable over a small range, the difference or beat frequency may be adjusted to any desired value, by shifting the variable oscillator.

This article has been prepared from data supplied by courtesy of RCA Parts Division. *(Continued on page 365)*



Rear view of useful instrument for the serviceman and experimenter in general.

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

The New HAMMARLUND "Super-Pro"—Part IV

By Donald Lewis

The new Hammarlund Super-Pro. Right—curve showing the selectivity of the IF. amplifier. No. 570

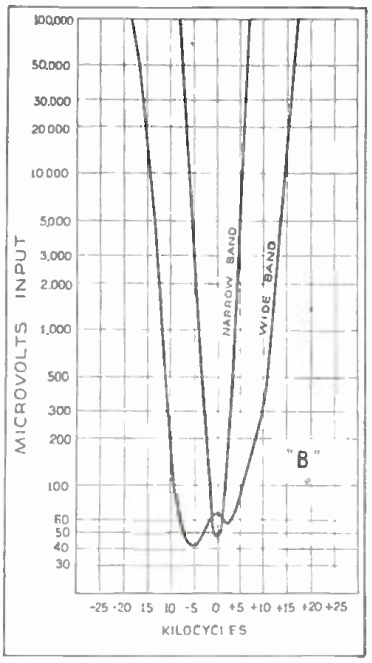
● AS promised in the last article, on the "Super-Pro," this concluding discussion will cover technical tests on the "Super-Pro."

The information presented is based on a special series of laboratory tests conducted by one of the foremost independent laboratories in the country.

First, let us discuss the dial calibration tests. The calibration of each of the five main tuning sections were checked against the crystal-controlled oscillator and against stations of known frequency stability. It was found practical to pre-set the receiver to a definite frequency and promptly intercept the desired signal. The discrepancy at the most was only a matter of a few hundred cycles.

Tests for Frequency Drift and Sensitivity

The *frequency drift* of the receiver was also checked with a high precision crystal-controlled oscillator. The test oscillator was warmed up for a period of one-half hour, so that it would be presently stabilized. The receiver was then set to 14 megacycles, the exact frequency of the oscillator, and left running for half an hour. The frequency drift of the receiver during this period from a cold start to temperature stability amounted to only 2.2 kilocycles. An additional half-hour of operation failed to indicate additional drift.



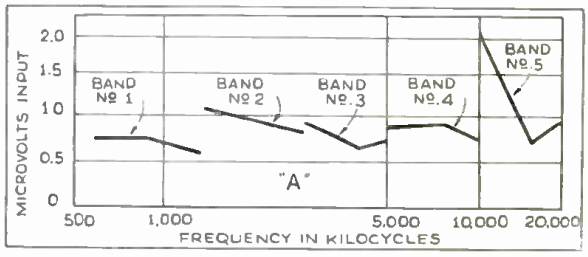
The next test was made on the receiver's *sensitivity*. The results were tabulated and appear in curve "A."

To obtain the curves shown, the signal input of the "Super-Pro" was adjusted to afford 6 milliwatts output with 30% modulation, as against 1 milliwatt output with the modulation off; or—popularly speaking—when the signal-to-noise ratio or power was 6 to 1. If the measurements had been made without regard to *noise-level*, on the basis of a 1 to 1 ratio, the sensitivity would appear still greater. With this severe restriction, nevertheless, of a 6 to 1 ratio, the sensitivity averaged about 0.85 microvolts.

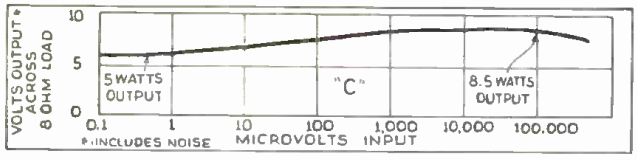
The next feature of the tests that proved interesting was the selectivity check of the I.F. amplifier. The result is graphically shown in curve "B," with both the narrow and wide band effects. The narrow band is the result of the intermediate frequency coupling control on the front panel being set at maximum selectivity, while the wide band curve was made with the control set for minimum selectivity. Intermediate settings of this continuously variable control provides band-widths between the two extremes. It is interesting to note that in the most selective position, the band has a total width of 10 kc. at 100 times the input, while in the wide-band position the curve is spread so that side-band cutting is at a minimum, providing an excellent degree of reproduction fidelity.

The accurate AVC action was the next unusual feature studied. A curve shown at "C," was made on this action with a 2200 kilocycle signal with 400 cycles, 40% modulation, and as will be seen—the result was truly amazing. The receiver output actually remained constant within 2½ DB while the signal input was varied over the extreme range from .1 to ½ million microvolts.

In the image—frequency selectivity tests



Graph above shows sensitivity of Super-Pro on various frequency bands.



Curve at left shows result of tests on the Super-Pro receiver A. V. C. action. Note how output remained constant over extreme range.

at 20 megacycles, the signal-to-image ratio was 178 to 1. At 550 kc. the ratio rose to 2,818,000 to 1. Other ratios obtained were —800 kc. 398,000 to 1; 1.8 mc. 100,000 to 1; 3.8 mc. 35,180 to 1; 7.5 mc. 7943 to 1, and 15 mc. 1413 to 1.

An interesting test was also conducted at the W.O.R. broadcasting station. The "Super-Pro" was operated in the immediate 50,000 watt field of W.O.R. and Charles (*Continued on page* 381)

New Apparatus for the "Ham"

I.F. transformer, H64

AIR-TUNED I.F. TRANSFORMER, H64

● THE National Company, well-known for their high grade radio parts, have recently announced a new I.F. transformer which is clearly shown in the photograph at the left. This is a very sturdily constructed unit and should find favor among the amateurs and experimenters who desire to build precision equipment. The two air-dielectric variable padding condensers are mounted in the top of the shield, and between these is a small metal shield, isolating the fields of the two condensers.

These condensers are adjustable from the top of the can and the grid connection comes out the side, at the proper height of the new metal tubes. The unit except for the inductances is practically the same as the exciter tank circuit, described in this column last month. The entire assembly measures 4x2¾x2 in. In designing this transformer the manufacturers have endeavored to eliminate the possibility of frequency drift by special construction.

COMPACT FILTER CONDENSER, H65

● CORNELL-DUBILIER has recently introduced a very compact and extremely efficient high voltage transmitting capacitor, which is shown in the photograph. The 1 mf. unit measures only 2⅛ in. in height. These are impregnated with Dykanol "A." They are hermetically sealed in a welded metal container and possess exceptional qualities inasmuch as the new non-inflammable liquid is used for impregnation. The manufacturers claim that the electric characteristics remain stable under all temperature conditions. These capacitors are available in the complete range of capacities at voltages up to and including 6,000 volts D.C.

Midget capacitor H65

THE RADIO AMATEUR

Conducted by Geo. W. Shuart

Radio Amateur Course

FOURTEENTH LESSON

● IN our fourteenth lesson the more sensitive type of ultra high-frequency receiver is discussed. Both the *resistance-coupled* and the *tuned I.F. superhets*, together with the various *converter* circuits are explained. In our previous lesson we considered the use of the super-regenerative receiver for ultra high frequency reception. While, as previously explained, this receiver has qualities not found in any other set, it also has certain disadvantages which may be rather important under certain conditions. Eventually, the superheterodyne will be perfected for ultra high frequency use because of its controllable selectivity and exceptional sensitivity.

In the early days of ultra high frequency experiments, the broad super-regenerator was desirable because of the type of transmitting apparatus employed, such as modulated oscillators. As time goes on, these modulated oscillators will be dispensed with, and the more stable MOPAs, with and without *crystal-control*, will be used. There are two good reasons why the transmitter will change and is changing—and they are: first—the ever-increasing number of amateur stations operating in the metropolitan areas, and the desire for better quality signals. The average modulated oscillator occupies a band width in the ultra high frequency region of from 50 to 100 kc., and in many cases a considerably wider band where the equipment is none too carefully constructed and operated.

The super-regenerator in most cases has about the same band-width as the modulated oscillator. Therefore, as the transmitters are stabilized and held down to a band of from 10 to 15 kc., immediately we need a more selective receiver if we are to cope with the ever-increasing number of stations. The answer to this, of course, is the *superheterodyne*. The most popular superheterodyne for ultra high frequency reception at this writing is the well-known *resistance-coupled* design in which the I.F. stages are resistance-coupled and the values are chosen to permit a band width of from 10 to 100 kc. In time, even this receiver will not be selective enough, although it can be made considerably more selective than the super-regenerator.

Resistance-Coupled Superhet

In Fig. 1, we have the resistance-coupled I.F. superheterodyne, employing a stage of tuned radio frequency, an autodyne first detector, two stages of I.F. amplification, a second detector, and a pentode audio amplifier. Conversion in this receiver is accomplished by slightly de-tuning the detector from the signal frequency. Thus, if we were to assume that the I.F. was 50 kc., the first detector would be detuned 50 kc. from the signal frequency. This means that 50 kc. either side of the resonant point will receive the station. We then have to allow a band width of over 100 kc. of that station because directly between the two beats we hear the "carrier" of the station, the same as you would on an oscillating detector. This carrier whistle is heard because the amplifier stages, as well as the second detector and audio stages, are operating as straight audio frequency amplifier. The R.F. stage is not entirely necessary and may be dispensed with and the antenna connected to the cathode tap on the coil through a 15 mmf. variable condenser. The R.F. stage helps somewhat for working *duplex* and also increases the *sensitivity* slightly when the regular glass type tubes are used, and a considerable increase in sensitivity is brought about through the use of the Acorn pentode 954. The best arrangement, of course, would be to use 954's in both the R.F. and detector stages.

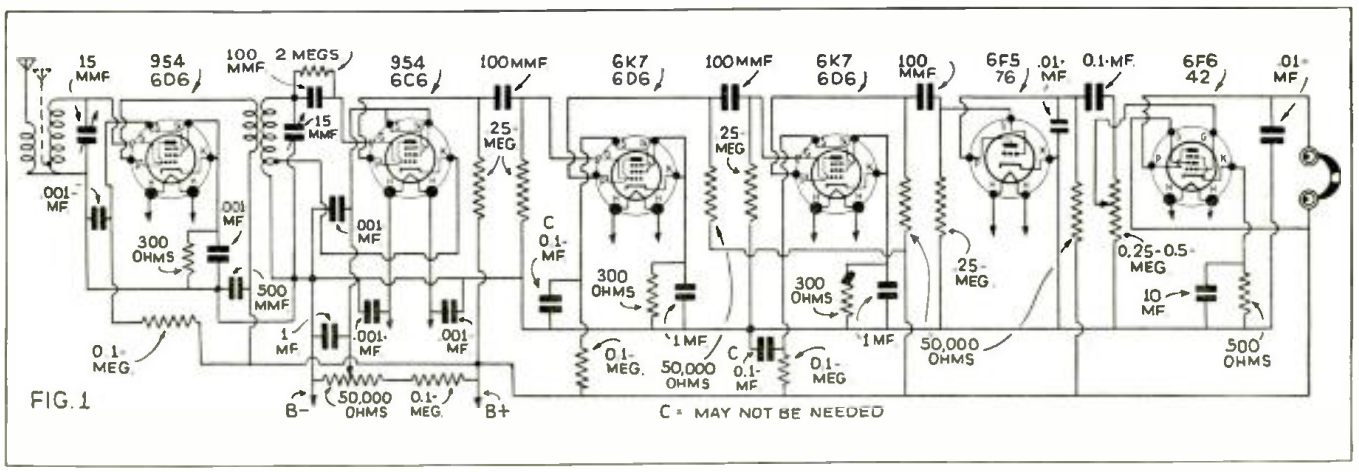


FIG. 1

A complete resistance coupled ultra high frequency superheterodyne, suitable for "Ham" or television reception.

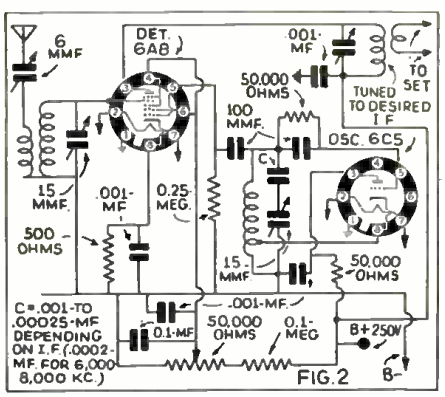


FIG. 2

A converter circuit for ultra high frequency reception, using metal tubes.

The "Converter"

With the increasing number of stabilized transmitters, one's thought nat-

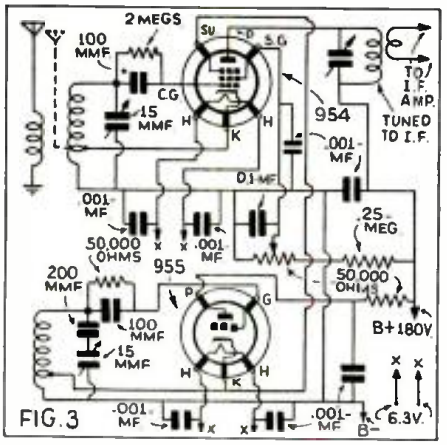


FIG. 3

Converter diagram employing the Acorn tubes, 954 and 955.

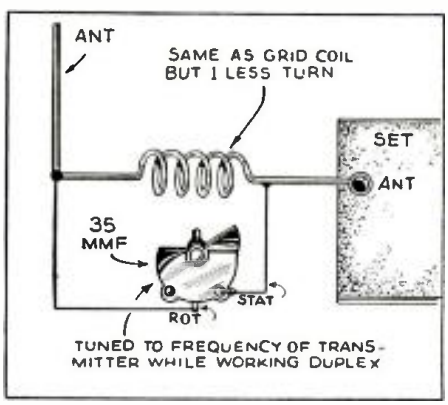
urally turns to the *converter*, which may be connected before the regular superheterodyne receiver. This makes an excellent combination when a sensitive receiver and converter are employed. Of course, the sensitivity of such a combination is far beyond the amount which can be used, because of the relatively high background noise in the average metropolitan location. A converter combination which works out very nicely is shown in Fig. 2 and consists of a 6A8 metal tube pentagrid and a 6C5 triode. The 6A8 is used as the first detector and grid number 1 is used for injecting the oscillator voltage supplied by the 6C5 oscillator. It has been found that by applying the proper screen voltage to the 6A8 and using very loose antenna coupling, considerable regeneration will come about in this circuit and for this reason we have shown a potentiometer for controlling the screen-grid voltage. This converter works best with a receiver tuned to a frequency of at least 2000 kc., and preferably higher. In choosing this intermediate frequency, we have to bear in mind harmonics of the oscillator in the superhet receiver with which the converter is being used. The receiver should be adjusted so that any harmonics would fall out of the range desired to be covered with a converter. Also, keeping the I.F. frequency high makes images a considerable distance apart and less bothersome. This particular converter in conjunction with an I.F. amplifier tuned to 8000 kc. gave marvelous results, and no image interference was experienced because of the high selectivity of the regenerative detector stage and the wide separation in frequency of the images.

In this, the 14th lesson of our Course complete information regarding ultra high frequency superheterodyne circuits is given, including converter circuits, as well as Resistance-Coupled and Tuned I.F. amplifiers.

Acorn Tube Converter for High Frequencies

In Fig. 3, we have a similar *converter*, except that here the Acorn tubes are employed. The detector is a 954 Acorn pentode and the oscillator is a 955 triode. Here regeneration is also employed to further the degree sensitivity. The advantage of the converter using the Acorn tubes, of course, is that it may be operated at a much higher frequency than the one using the metal tubes. These two converters are shown for operation directly from the antenna, while the R.F. stage shown in Fig. 4, may be employed with these converters it is not entirely necessary, but will improve sensitivity by a noticeable amount. A complete *high frequency* I.F. amplifier is shown in Fig. 5 for those who want a somewhat broader receiver, but one still not as broad as the resistance-coupled affair shown in Fig. 1.

The I.F. amplifier of Fig. 5 may be



When working "duplex," the wave-trap shown above should be tuned to your own transmitter frequency. This will practically eliminate acoustical feed-back between speaker and mike.

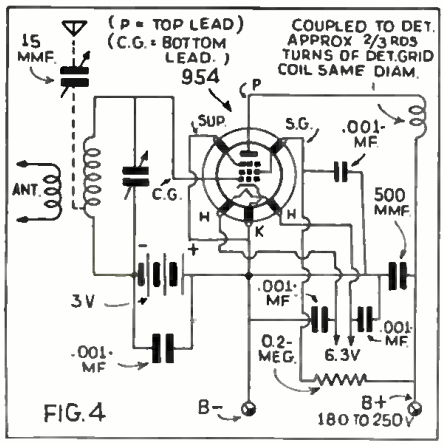


FIG. 4

Circuit diagram of a 954 T.R.F. Amplifier.

used in conjunction with either of the *converters* shown in Fig. 2 or 3. In this diagram we have employed only two I.F. stages, while some experimenters prefer three. However, if carefully designed, two stages will be entirely satisfactory. The I.F. transformers may be constructed the same as the conventional I.F. transformers, i.e., the primary and secondary wound on the same form or spool, or each may be housed in separate compartments, and the only coupling between the primary and secondary due to the length of twisted pair which is indicated above the I.F. transformers. In this case, the primary would be housed in one shield can with its associated tuning condenser, and the secondary in another, with a single turn coupled to each coil and connected by a link of twisted pair. Such an amplifier, having a range of from approximately 6000 to 8000 kc. would require I.F. transformers consisting of 14 micro-henries inductances and a 50 mmf. variable condenser connected across it. Each coil would consist of 27 turns of No. 28 enamelled wire, close wound on ¾ inch dia. form.

With the increasing activity in *television* production on the *ultra high frequencies*, a receiver of this type is sorely needed. For greater selectivity, of course, the intermediate frequency should be lowered. If used entirely for stabilized ultra high frequencies transmitters of the phone or code variety, an intermediate frequency of 2000 to 3000 kc. should be entirely satisfactory, or even a 465 kc. super with a converter ahead of it.

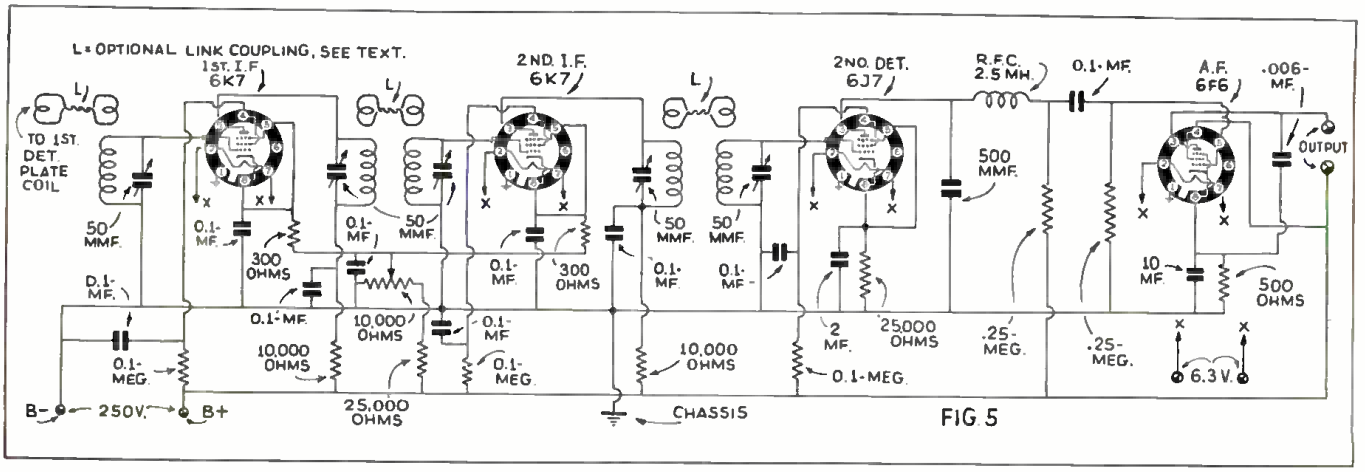


FIG. 5

I.F. detector and A.F. circuits for an ultra high frequency superheterodyne. For Television and "Ham" reception the I.F. frequency should be somewhere between 6000 and 8000 kc.

SHORT WAVE LEAGUE

Here's Your Button

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

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

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

HONORARY MEMBERS

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Hollis Baird
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Hugo Gernsback

Executive Secretary

SHORT WAVE SCOUT News

Official Listening Post Report of Fletcher W. Hartman, South Amboy, N. J.

● CONDITIONS the past month were generally *fair*, though at times they were poor, a great deal of static being heard on the 6 meg. band. Also poor strength on the 15 meg. band except in the early evening. The 11 meg. band is the best at present. Following are a few of the stations heard. All time EST.

COCQ-RCA Victor, Havana, Cuba, on about 31 meters or 9,650 kc. has been heard around 8 to 9 p.m. with a good signal. I am not certain if it is called the Voice of RCA Victor, or just RCA Victor.

PCJ-9,590 kc.—Eindhoven, Holland—heard with good strength as per your schedule in *Short Wave Craft* magazine.

HJ4ABE—Medellin, Colombia, has been heard on about 6,095 kc.—several times; it changed to this frequency from 5,930 kc.

PRF5-9,501 kc.—Rio de Janeiro, Brazil, is on daily from 4:45 to 5:45 p.m. and on Mon. from 5:30 to 5:45 p.m. the program is in English and is heard with fair strength.

XBJQ-11,200 kc.—Mexico City, Mexico, has been heard testing around 7:45 to 8:30 p.m. with fair strength.

HIT-6,630 kc.—Ciudad Trujillo, D.R. heard regular with good strength, as per your schedule.

VP3MR-7,080 kc.—Georgetown, British Guiana, heard often with fair to good strength, but often bothered by code; around 6 to 8:30 p.m.

CFCX-6,005 kc.—Montreal, Canada, heard daily with good strength.

HAT4-9,125 kc.—Budapest, Hungary, heard several Sundays 6 to 7 p.m. with poor strength.

CJRX-11,720 kc.—Winnipeg, Canada, heard several times with very good strength. It is generally heard with fair strength.

The English GS-B, C, D, F, G, I, and P were heard. GSF and D and C are *good* at night.

The Germans DJ-B, D, A, and N were heard. DJB and DJD very good at night.

The French stations TPA-2, 3, 4 heard.

A total of 74 stations were identified Veri received from PRF5.

HJ2JSB-7,854 kc.—Guayaquil, Ecuador Daily from 9:20 a.m. to 2:20 p.m., and 6:20 p.m. to 12:20 a.m., E.S.T.

Fletcher W. Hartman,
365 John Street.
South Amboy, N.J.

Parma, Ohio, Post Reports

OAX4G, 6.23 megs., 8:00 to 9:00 p.m., May 25th, very good musical program.

CFCX, 6.005 megs., 7:55 to 8:10 a.m., May 27th, very good musical program.

GBTT, 8.83 megs., 11:01 to 11:10 a.m., May 30th, boat "Queen Mary" broadcasting—Fair.

DZE, 12.13 megs., 7:00 to 7:30 a.m., May 31st, Good; Musical program.

W2XGB, 6.42 megs., 9:10 to 9:30 p.m., June 1st. Testing, and musical program.

XOJ or K, 18.27 megs., 3:00 to 3:07 a.m. June 3rd, Static, very weak, calling London.

ETA, 18.27 megs., 3:00 to 3:07 a.m., June 5th, weak and fading, calling Rome.

W8XAL, 6.06 megs., 1:30 to 2:00 a.m., special program for International 6,000 to 12,500 DX Short Wave Club—good.

TFJ, 12.23 megs., 1:40 to 2:00 p.m., June 7th, Musical program, fair.

YSJ, 13.35 megs., 10:00 to 11:00 a.m., calling WNC and WCT, new station in San Salvador, C.A., fair.

XBC, 6.55 megs., 11:00 to 11:30 a.m. June 7th, Broadcasting—fairly good.

OOS or Z, 8.74 megs., 4:00 to 4:33 a.m., June 7th. Located in Belgian Congo (Stanleyville?) Calling Leopoldville, weak, static.

VQG, 19.63 megs., 7:00 to 7:15 a.m. June 8th, calling London (fair—fading—static.)

YV11RB or D, 6.53 megs., 10:45 to 11:15 p.m., June 8th, fair—broadcasting-interference (new station).

RIO, 10.17 megs., 2:00 to 2:14 a.m., June 9th, calling Moscow. (Good, R.8)

Veris received from HRD, OAX4G, TFJ, W2XGB, OAX4D.

Wm. C. Palmer,
7240 Ridge Rd.,
Parma, Ohio.

Samuel Solito Reports

● I'M very sorry but as yet I have no picture of myself and the Trophy. The Trophy is everything you claim it to be and I am very proud of it. Due to the very limited time, my report this month is short.

COCQ, Havana, Cuba on 9660 kc. heard July 17th from 12:07 to 12:30 a.m. broadcasting; QSA5R9. This is a new station.

A station, believed to be PLO on 11,440 kc. heard Sunday, July 12th from 6:30 to 7:00 a.m., relaying program same as YDB and PLP; report QSA4R6-7.

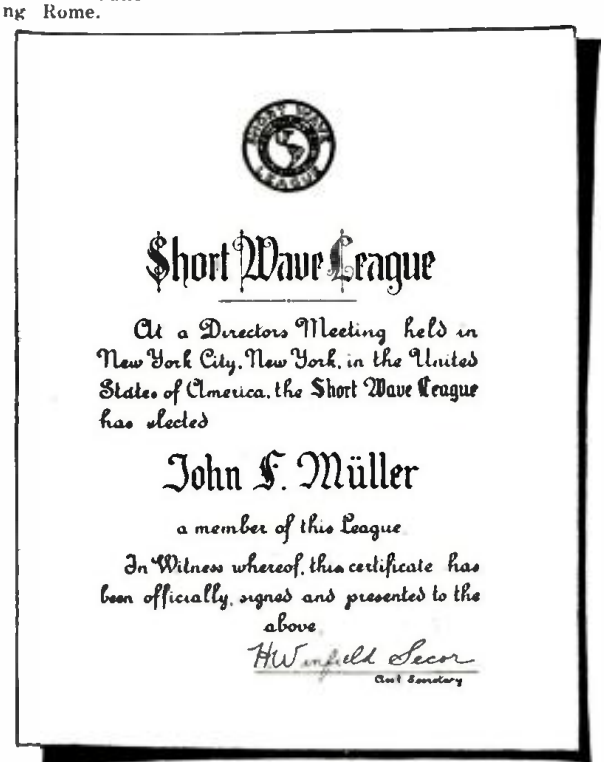
PLP, Bandoeng, on 11,000 kc., Sunday, July 12th, 6:30 to 7:00 a.m., QSA3R5-6.

JVD, Tokyo, 15,860 kc. July 17th, 12:30 a.m., phoning Dixon, Calif. QSA5R6.

DJR, Berlin, 15,340 kc., can now be heard from 12:30 a.m. E.S.T. with fair signal strength, along with DJQ, 15,280 kc.

LZA, Sofia, Bulgaria, 14,970 kc. heard Sunday, July 12th from 12:45 to 1:06 a.m., fair, QSA3-4 R5. They use 2kw power. Sunday morning is best bet to tune for LZA.

During past two months exactly 34 Australian amateur phones were heard on 20 meter band. A *(Continued on page 377)*



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

See page 376 how to obtain certificate.

CORRECTED AND REVISED Monthly

World S-W Station List

Complete List of Broadcast, and Telephone Stations

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

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

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

Around-the-Clock Listening Guide

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

From daybreak till 9 p.m. and particularly during bright daylight, listen between 13 and 19 meters (21540 to 15800 kc.)

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

Short-Wave Broadcasting, Experimental and Commercial Radiophone Stations

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

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

31600 kc. W4XCA
-BX- 9.494 meters
MEMPHIS, TENN.
Relays WMC daily

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

31600 kc. W8XWJ
-BX- 9.494 meters
PENOBSCOT TOWER
DETROIT, MICH.
Daily 6 a.m.-12:30 a.m.
Sun. 8 a.m.-12 M.

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

21530 kc. GSJ
-B- 13.93 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

17760 kc. DJE
-B- 16.89 meters
BROADCASTING HOUSE
BERLIN, GERMANY
12:05-5:15 a.m.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

15340 kc. DJR
-B,X- 19.56 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
5:55-11 a.m.

15330kc.★W2XAD
-B- 19.56 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays
WGY 10 a.m.-3:45 p.m.

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

15290 kc. LRU
-B- 19.62 meters
"EL MUNDO"
BUENOS AIRES, ARGENTINA, S. A.
Daily 7 a.m.-3:45 p.m.

15280 kc. ★DJQ
-B- 19.63 meters
BROADCASTING HOUSE
BERLIN, GERMANY
5:55-11 a.m. 4:50-10:45 p.m.

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

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

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

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

(All Schedules Eastern Standard Time)

15245 kc. ★TPA2
-B- 19.68 meters
"RADIO COLONIAL"
PARIS, FRANCE
Service de la Radiodiffusion
98, bis, Blvd. Haussmann
1-2, 4:55-10 a.m.

15230 kc.
-B- 19.70 meters
"RADIO PODEBRADY,"
CZECHOSLOVAKIA
Testing 2 p.m.-2 a.m.

15220 kc. ★PCJ
-B- 19.71 meters
N.V. PHILIPS' RADIO
EINDHOVEN, HOLLAND
Tues. 4-6 a.m.
Wed. 7-11 a.m.
Sun. 6:30-7:30 a.m.

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

15200 kc. ★DJB
-B- 19.74 meters
BROADCASTING HOUSE
BERLIN, GERMANY
12:05-5:15 a.m., 4:50-10:55 p.m.
Sun. also 11:10 a.m.-12:20 p.m.

15180 kc. GSO
-B- 19.76 meters
DAVENTRY
B.B.C., BROADCASTING
HOUSE,
LONDON, ENGLAND
12:15-3:40 p.m.

15180 kc. RW96
-B- 19.76 meters
MOSCOW, U.S.S.R.
Sun. 1-2 p.m.

15140 kc. ★GSF
-B- 19.82 meters
DAVENTRY,
B.B.C., BROADCASTING
HOUSE, LONDON, ENGLAND
9 a.m.-12 n., 3:40-5:45 p.m.

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

15110 kc. ★DJL
-B- 19.85 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
11:35 a.m.-4:30 p.m.
Irregular 4:50-10:45 p.m.

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

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

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

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

14970 kc. LZA
-B.C- 20.04 meters
RADIO GARATA,
SOFIA, BULGARIA
Broadcasts Sun. 12:30-8 a.m.,
10 a.m.-4:30 p.m., Daily 5-7
a.m., Tues. and Thurs., 1-3 p.m.

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

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

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

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

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

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

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

14600 kc. JVH
-B.C- 20.55 meters.
NAZAKI, JAPAN
Phones Europe 4-8 a.m.
Broadcasts 12 m-1 a.m.
Tues. and Fri. 2-3 p.m.
Mon. and Thurs. 4-5 p.m.

14590 kc. WMN
-C- 20.58 meters
LAWRENCEVILLE, N. J.
Phones England
morning and afternoon

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

12235 kc. TFJ
-B.C- 24.52 meters
REYKJAVIK, ICELAND
Phones England mornings,
Broadcasts Sun. 1:40-2:30 p.m.

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

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

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

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

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

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

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

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

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

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

11860 kc. YDB
-B- 25.29 meters
N.I.R.O.M.,
SOERABAJA, JAVA
Sat. 7:30 p.m.-2 a.m. (Sun.)
Daily 10:30 p.m.-2 a.m.

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

11855 kc. DJP
-B,X- 25.31 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
Irregular

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

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

11820 kc. GSN
-B- 25.38 meters
DAVENTRY
B.B.C., BROADCASTING
HOUSE,
LONDON, ENGLAND
1:15-3:15 a.m., Irregular

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

11810 kc. ★2RO
-B- 25.4 meters
E.I.A.R.
Via Montello 5
ROME, ITALY
Daily 6:43-10:30, 11:30 a.m.-
5:30 p.m., 6-6:20 p.m.; Sun.
6:43-9, 11:30 a.m.-5:30 p.m.
Also Mon., Wed., Fri., 6:20-
7:30 p.m.

11795 kc. DJO
-B.X- 25.43 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
Irregular

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

11770 kc. ★DJD
-B- 25.49 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
11:35 a.m.-4:20 p.m.; 4:50-
10:55 p.m.

11760 kc.
-B- 25.51 meters
"RADIO PODEBRADY"
CZECHOSLOVAKIA
Testing 2 p.m.-2 a.m.

11750 kc. ★GSD
-B- 25.53 meters
DAVENTRY,
B.B.C., BROADCASTING
HOUSE, LONDON, ENGLAND
12:15-5:45 p.m., 6-8, 9-11 p.m.,
1:15-3:15 a.m.

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

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

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

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

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

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

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

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

11050 kc. ZLT4
-C- 27.15 meters
WELLINGTON, N. ZEALAND
Phones Australia and England
early a.m.

11000 kc. PLP
-B-C- 27.27 meters
BANDOENG, JAVA
Broadcasts Daily exc. Sat. 5:30-
10:30 or 11 a.m., 6-7:30 p.m.
10:30 p.m.-2 a.m., Sat. 5:30-
11:30 a.m., 7:30 p.m.-2 a.m.
(Sun.)

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

10955 kc. HS8PJ
-BX- 27.38 meters
BANGKOK, SIAM
Broadcasts 8-10:15 a.m. Mondays

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

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

10740 kc. ★JVM
-B.C- 27.93 meters
NAZAKI, JAPAN
Broadcasts Tues. and Fri. 2-3
p.m., Phones U.S. 2-7 a.m.

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

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

10660 kc. ★JVN
-B.C- 28.14 meters
NAZAKI, JAPAN
Phones Europe 3-8 a.m.
Broadcasts daily 12 m-1 a.m.,
2-8 a.m.
Mon. and Thurs. 4-5 p.m.

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

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

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

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

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

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

10350 kc. LSX
-C- 28.98 meters
MONTE GRANDE,
ARGENTINA
Tests Irregularly 8 p.m.-12 mid-
night.

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

(All Schedules Eastern Standard Time)

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

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

10260 kc. PMN
-B-C- 29.24 meters
BANDOENG, JAVA
Calls Australia 5 a.m.
Broadcasts Daily exc. Sat. 6-7:30 p.m., 10:30 p.m.-2 a.m., 5:30-10:30 or 11 a.m., Sat. 5:30-11:30 a.m., 7:30 p.m.-2 a.m. (Sun.)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

9840 kc. JYS
-X- 30.49 meters
KEMIKAWA-CHO, CHIBA-KEN, JAPAN
Irregular. 11:30 p.m.-3 a.m.

9840 kc. TI4NRH
-B- 30.5 meters
AMANDO CESPEDES MARIN, APARTADO 40,
HEREDIA, COSTA RICA
Daily 8:30-10, 11:30 a.m.-12 m.

9830 kc. COCQ
-B- 30.55 meters
HAVANA, CUBA
Evenings

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

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

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

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

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

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

9660 kc. CQN
-B- 31.07 meters
MACAO, PORTUGUESE CHINA
Mon. and Fri. 7-8:30 a.m.

9650 kc. YDB
-B- 31.09 meters
N.I.R.O.M.
SOERABAJA, JAVA
Daily exc. Sat. 6-7:30 p.m., 5:30-10:30 or 11 a.m., Sat. 5:30-11:30 a.m.

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

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

9645 kc. YNLF
-B- 31.1 meters
MANAGUA, NICARAGUA
8-9 a.m., 12:30-2:30, 6:30-10 p.m.

9640 kc. LRX
-B- 31.12 meters
"EL MUNDO"
BUENOS AIRES, ARGENTINA
5-9 p.m.

9635 kc. ★2RO
-B- 31.13 meters
E.I.A.R., ROME, ITALY
Tues., Thurs., Sat. 6:30-8 p.m.

9615 kc. HJ1ABP
-B- 31.2 meters
P.O. BOX 37,
CARTAGENA, COL.
11 a.m.-1 p.m., 5-11 p.m.
Sun. 10 a.m.-1 p.m., 3-6 p.m.

9605 kc. HP5J
-B- 31.24 meters
APARTADO 867,
PANAMA CITY, PANAMA
11:45 a.m.-1 p.m., 7:30-10 p.m.

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

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

9595 kc. HH3W
-B- 31.27 meters
P.O. BOX A117,
PORT-AU-PRINCE, HAITI
1-2, 7-8:30 p.m.

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

9590 kc. ★VK2ME
-B- 31.28 meters
AMALGAMATED WIRELESS, LTD., 47 YORK ST.,
SYDNEY, AUSTRALIA
Sun. 12:30-2:30 a.m.,
4:30-8:30 a.m., 9:30-11:30 a.m.

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

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

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

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

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

9560 kc. ★DJA
-B- 31.38 meters
BROADCASTING HOUSE,
BERLIN
12:05-5:15 a.m., 4:50-10:45 p.m.

9550 kc HJ1ABE
-B- 31.41 meters
P.O. BOX 31,
CARTAGENA, COLOMBIA
Daily 7:30-9 p.m.,
Mon. also 10 p.m.-12 m.

9540 kc. ★DJN
BROADCASTING HOUSE
BERLIN, GERMANY
12:05-5:15 a.m., 4:50-10:45 p.m.

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

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

9520 kc. RW96
-B- 31.51 meters
MOSCOW, U.S.S.R.
Daily 7-7:30 p.m.,
Sun., Wed. and Fri. 6-8 p.m.

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

9510 kc. ★GSB
-B- 31.55 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
1:15-3:15 a.m., 12:15-5:45 p.m.

9500 kc. HJU
-B- 31.58 meters
NATIONAL RAILWAYS
BUENAVENTURA, COLOMBIA
Mon., Wed., Fri. 8-11 p.m.

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

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

9450 kc. TGW
-B- 31.75 meters
MINISTRE de FOMENTO
GUATEMALA CITY, GUATEMALA
Daily 11 a.m.-1 p.m., 7-8, 9-11 p.m., Sat. 9 p.m.-5 a.m. (Sun.)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

8400 kc. HC2AT
-B- 35.71 meters
CASSILLA 677
GUAYAQUIL, ECUADOR
8-11 p.m.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

7080 kc. VP3MR
-B- 42.68 meters
GEORGETOWN, BRI. GUIANA, S.A.
Sun. 7:45-10:15 a.m.
Daily 4:45-8:45 p.m.

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

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

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

(All Schedules Eastern Standard Time)

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

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

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

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

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

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

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

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

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

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

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

6635 kc. ★HC2RL
-B- 45.21 meters
P. O. BOX 759, GUAYAQUIL, ECUADOR, S. A.
Sunday, 5:45-7:45 p. m.
Tues., 9:15-11:15 p. m.

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

6625 kc. ★PRADO
-B- 45.28 meters
RIOBAMBA, ECUADOR
Thurs. 9-11:45 p.m.

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

6558 kc. HI4D
-B- 45.74 meters
CIUDAD TRUJILLO, DOMINICAN REPUBLIC
Except Sun. 11:55 a.m.-1:40 p.m.; 4:40-7:40 p.m.

6550 kc. TIRCC
-B- 45.8 meters
RADIOEMISORA CATOLICA COSTARRICENSE
SAN JOSE, COSTA RICA
Sun. 11 a.m.-2 p.m., 6-7, 8-9 p.m., Daily 12 n.-2 p.m., 6-7 p.m., Thurs. 8-11 p.m.

6545 kc. YV11RB
-B- 45.84 meters
"ECOS de ORINOCO",
BOLIVAR, VENEZUELA
6-10:30 p.m.

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

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

6477 kc. HI4V
-B- 46.32 meters
CIUDAD TRUJILLO, D.R.
LA VOZ de LA MARINA
11:40 a.m.-1:40 p.m., 5:10-9:40 p.m.

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

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

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

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

6400 kc. YV9RC
-B- 46.88 meters
CARACAS, VENEZUELA
7-11 p.m.

6380 kc. YV4RC
-B- 47.02 meters
CARACAS VENEZUELA
5:30-9:30 p.m.

6316 kc. HIZ
-B- 47.5 meters
CIUDAD TRUJILLO
DOMINICAN REPUBLIC
Daily except Sat. and Sun.
11:10 a.m.-2:25 p.m., 5:10-8:40 p.m.; Sat. 5:10-11:10 p.m.; Sun., 11:40 a.m.-1:40 p.m.

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

6282 kc. CO9WR
-B- 47.76 meters
P.O. BOX 85,
SANCTI SPIRITUS, CUBA
4-6, 9-11 p.m.

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

6235 kc. HRD
-B- 48.12 meters
LA VOZ DE ATLANTIDA
LA CEIBA, HONDURAS
8-11 p.m., Sat. 8 p.m.-1 a.m. (Sun.); Sun. 4-6 p.m.

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

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

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

6171 kc. XEXA
-B- 48.81 meters
DEPT. OF EDUCATION
MEXICO CITY, MEX.
7-11 p.m.

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

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

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

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

6147 kc. COKG
-B- 48.8 meters
BOX 137, SANTIAGO, CUBA
9-10 a.m., 11:30 a.m.-1:30 p.m., 3-4:30 p.m., 10-11 p.m., 12 m.-2 a.m.

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

6135 kc. HJ1ABB
-B- 48.9 meters
BARRANQUILLA, COL., S. A.
P. O. BOX 715.
11:30 a.m.-1 p.m.; 4:30-10 p.m.

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

6135 kc. HJ4ABP
-B- 48.9 meters
MEDELLIN, COL.
Relays HJ4ABQ 8-11 p.m.

6132 kc. HIX
-B- 48.93 meters
CIUDAD TRUJILLO, DOMINICAN REP.
Sun. 7:40-10:10; Daily 12:40-1:10 p.m., 4:40-5:40 p.m.; Tues. and Fri. 8:10-10:10 p.m.

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

6130 kc. COCD
-B- 48.94 meters
"LA VOZ DEL AIRE"
CALLE G y 25, VEDADO, HAVANA, CUBA
Relays CMCD 11 a.m.-12 n., 7-10 p.m., Sun. 12 n.-4 p.m.

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

6130 kc. ★VE9HX
-B- 48.94 meters
P.O. BOX 998
HALIFAX, N.S., CANADA
Mon.-Fri., 9 a.m.-1 p.m., 5-11 p.m.
Fri. 1-3 p.m.; Sat., Sun. 9 a.m.-1 p.m., 2-11 p.m.
Relays CHNS

6122 kc. HJ3ABX
-B- 49 meters
LA VOZ de COLOMBIA
CALLE 14, No. 738,
BOGOTA, COLOMBIA
5:45-11:30 p.m.

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

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

6115 kc.
-B- 49.05 meters
"RADIO PODEBRADY,"
CZECHOSLOVAKIA
Testing 2 p.m.-2 a.m.

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

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

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

6100 kc. ★W9XF
-B- 49.18 meters
NATL. BROAD. CO.
CHICAGO, ILL.
Sun., Tues., Thurs., Fri. 12 m.-1 a.m., 8 p.m.-11:59 p.m.
M., W., Sat., 12 m-1 a.m.
Relays WENR

6097 kc. HI3C
-B- 49.2 meters
"LA VOZ DE RIO DULCE"
LA RAMONA, DOM. REP.
11:55 a.m.-1:25 p.m., 6:10 p.m.-12 M.

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

6092 kc. HJ4ABE
-B- 49.25 meters
MEDELLIN, COLO.
Daily 11 a.m.-12 n., 6-10:30 p.m.

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

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

6085 kc. HJ5ABD
-B- 49.3 meters
"LA VOZ DE VALLE"
CALI, COLOMBIA
12 n.-1:30 p.m., 5:10-9.40 p.m.

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

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

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

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

6079 kc. DJM
-B.X- 49.34 meters
BROADCASTING HOUSE,
BERLIN, GERMANY

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

6070 kc. YV7RMO
-B- 49.42 meters
MARACAIBO, VENEZUELA
6 p.m.-12 m.

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

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

6065 kc. HJ4ABL
-B- 49.48 meters
MANIZALES, COL.
Daily 11 a.m.-12 n., 5:30-7:30 p.m. Sat. 5:30-10:30 p.m.

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

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

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

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

6045 kc. HI9B
-B- 49.63 meters
SANTIAGO
DOM. REP.
Irregular 6 p.m.-11 p.m.

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

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

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

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

6040 kc. YDA
-B- 49.67 meters
N.I.R.O.M.
TANDJONGPRIOK, JAVA
10:30 p.m.-2 a.m. Sat. 7:30 p.m., 2 a.m. (Sun.)

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

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

6025 kc. HJ1ABJ
-B- 49.79 meters
SANTA MARTA, COLO.
6:30-10:30 p.m. except Wed.

6020 kc. DJC
-B- 49.83 meters
BROADCASTING HOUSE,
BERLIN

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

6018 kc. ZHI
-B- 49.85 meters
RADIO SERVICE CO.,
20 ORCHARD RD.,
SINGAPORE, MALAYA
Mon., Wed. and Thurs 5:40-8:10 a.m. Sat. 10:40 p.m.-1:10 a.m. (Sun.) Every other Sunday 5:10-6:40 a.m.

6015 kc. HI3U
-B- 49.88 meters
SANTIAGO de los CABALLEROS, DOM. REP.
10:40 a.m.-1:40 p.m., 4:40-9:40 p.m.

6012 kc. HJ3ABH
-B- 49.91 meters
BOGOTA, COLO.
APARTADO 585
6-11 p.m.
Sun. 12 n.-2 p.m., 4-11 p.m.

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

6005 kc. HP5K
-B- 49.96 meters
BOX 33,
COLON, PANAMA
7:30-9 a.m., 12 n.-1 p.m., 8-9 p.m.

6005 kc. ★CFCX
-B- 49.96 meters
CANADIAN MARCONI CO., MONTREAL, QUE., CAN.
Relays CFCF 6 a.m.-11:15 p.m., Sun. 8 a.m.-10:15 p.m.

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

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

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

(All Schedules Eastern Standard Time)

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

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

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

5950 kc. HJN
-B- 50.42 meters
BOGOTA, COL.
6-11 p.m.

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

5915 kc. HH2S
-B- 50.72 meters
PORT-au-PRINCE, HAITI
BOX A103.
7:30-10:30 p.m.

5898 kc. YV8RB
-B- 50.86 meters
"LA VOZ de LARA"
BARQUISIMETO.
VENEZUELA
12 n.- 1p.m., 6-10 p.m.

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

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

5865 kc. HI1J
-B- 51.15 meters
BOX 204.
SAN PEDRO de MACORIS.
DOM. REP.
12 n.-2, 6:30-9 p.m.

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

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

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

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

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

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

5770 kc. HJ4ABD
-B- 51.99 meters
LA VOZ CATIA,
MEDELLIN, COLOMBIA
6-11:30 p.m.

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

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

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

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

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

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

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

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

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

4790 kc. VE9BK
-BX- 62.63 meters
RADIO SALES SERVICE,
LTD., 780 BEATTY ST., VANCOUVER, B.C., CAN.
Daily exc. Sun. 11:30-11:45 a.m., 3-3:15, 8-8:15 p.m.

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

4600 kc. HC2ET
-B- 65.22 meters
Apartado 249
GUAYAQUIL, ECUADDR
Wed., Sat., 9:15-11 p.m.

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

4273 kc. RV15
-B- 70.20 meters
KHABAROVSK, SIBERIA,
U. S. S. R.
Daily, 3-9 a.m.

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

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

4002 kc. CT2AJ
-B- 74.95 meters
PONTA DELGADA,
SAO MIGUEL, AZORES
Wed. and Sat. 5-7 p. m.

3040 kc. YDA
-B- 98.68 meters
N.I.R.O.M.
TANDJONGPRIOK, JAVA
Daily exc. Sat. 6.7:30 p.m., 5:30-10:30 or 11 a.m., Sat. 5:30-11:30 a.m.

Alphabetical List of S-W Stations

By Call-Letter and Frequency

(Frequency in Megacycles)

CALL	FREQ.	CALL	FREQ.	CALL	FREQ.	CALL	FREQ.	CALL	FREQ.	CALL	FREQ.	CALL	FREQ.
CB960	9.06 mc.	GAB	18.04	HIT	6.63	IAC	17.76 mc.	ORG	19.20 mc.	TYA	12.22 mc.	W3XAL	17.78 mc
CEC	19.68	GAD	19.48 mc	HIX	6.13 mc.	IAC	12.80	ORK	10.33	TYB	12.25	W3XAL	6.10
CEC	15.87	GAP	19.16	HIZ	6.32	IAC	8.38	OXY	6.06	TYF	14.64	W3XAU	9.59
CEC	10.67	GAQ	18.97	HI1A	6.19	IAC	6.65	PCJ	15.22	VE9BJ	6.09	W3XAU	6.06
CGA3	13.29	GAS	18.31	HI1J	5.86	IDU	13.39	PCJ	9.59	VE9BK	4.79	W3XL	17.31
CGA4	9.33	GAU	18.62	HI1S	6.42	(I)2RO	11.81	PCV	17.81	VE9CA	6.03	W4XB	6.04
CJA3	11.41	GAW	18.20	HI3C	6.10	2RO	9.64	PDK	10.41	VE9CS	6.07	W4XCA	31.60
CJRO	6.15	GBA	13.99	HI3U	6.02	JVE	15.66	PDV	12.06	VE9DR	6.01	W8XAL	6.06
CJRX	11.72	GBB	13.59	HI4D	6.56	JVF	15.62	PHI	17.78	VE9HX	6.13	W8XK	21.54
CNR	12.83	GBC	17.08	HI4V	6.48	JVH	14.60	PHI	11.73	VIZ3	11.56	W8XK	15.21
CNR	8.04	GBC	12.78	HI5N	6.14	JVM	10.74	PLE	18.83	VK2ME	9.59	W8XK	11.87
COCD	6.13	GBC	8.68	HI7P	6.80	JVN	10.66	PLP	9.42	VK3LR	9.58	W8XK	6.14
COCH	9.43	GBC	4.98	HI8A	6.60	JVP	7.51	PLV	11.00	VK3ME	9.51	W8XWJ	31.60
COCO	6.01	GBL	14.65	HI9B	6.05	JVT	6.75	PMA	19.35	VLJ	9.76	W9XAA	11.83
COCQ	9.82	GBP	10.77	HJA3	14.94	JVU	5.79	PMC	18.14	VLK	10.52	W9XAA	6.08
COKG	6.15	GBS	12.15	HJB	14.95	JYK	13.61	PMN	10.26	VLZ2	9.76	W9XBS	6.43
CO9JQ	8.67	GBU	12.29	HJN	5.95	JYR	7.88	PMY	5.15	VPD	13.08	W9XF	6.10
CO9WR	6.28	GBW	14.44	HJU	9.50	JYS	9.84	PNI	8.78	VP3MR	7.08	XBJQ	11.20
CP5	6.08	GCA	9.71	HJ1ABB	6.14	JYT	15.76	PPU	19.26	VQ7LO	6.08	XEBT	5.99
CQN	9.66	GCB	9.28	HJ1ABC	6.0	KAY	14.98	PRADO	6.63	VRR4	11.60	XECR	7.38
CRCX	6.09	GCI	8.73	HJ1ABD	7.28	KAZ	9.99	PRA8	6.04	VUB	9.57	XEFT	6.12
CSL	6.15	GCJ	13.42	HJ1ABE	9.55	KEE	7.72	PRF5	9.50	VUC	6.11	XEME	8.19
CT1AA	9.65	GCQ	8.76	HJ1ABG	6.04	KEJ	9.01	PSA	21.08	VWY	8.98	XEUW	6.02
CT1GO	12.40	GCS	9.02	HJ1ABJ	6.03	KEL	6.86	PSD	15.07	VWY2	17.51	XEVI	5.98
CT2AJ	4.00	GCU	9.95	HJ1ABK	7.07	KES	10.41	PSF	14.96	WCN	5.08	XEXA	6.17
DAF	12.33	GCW	9.79	HJ1ABP	9.62	KIO	11.68	PSH	10.22	WKA	21.06	XGM	17.65
DAF	8.77	GDB	4.32	HJ2ABA	6.18	KKH	7.52	PSK	8.19	WKF	19.22	XGOX	9.49
DFB	17.52	GDS	6.91	HJ2ABC	5.98	KKR	15.46	RIM	15.25	WKK	21.42	XGW	10.42
DGU	9.650	GDW	4.82	HJ2ABD	5.98	KKZ	13.69	RIM	7.63	WKN	19.82	YBG	10.43
DJA	9.560	GSB	9.51	HJ3ABD	6.05	KTO	16.24	RIO	10.17	WLA	18.34	YDA	6.04
DJB	15.20	GSC	9.58	HJ3ABF	6.17	KWO	15.42	RIR	10.08	WLK	16.27	YDA	3.04
DJC	6.02	GSD	11.75	HJ3ABH	6.01	KWU	15.36	RKI	15.09	WMA	13.39	YDB	9.65
DJD	11.77	GSE	11.86	HJ3ABX	6.12	KWV	10.84	RKI	7.50	WMF	14.47	YDB	11.86
DJE	17.76	GSF	15.14	HJ4ABA	11.81	KWX	7.61	RNE	12.0	WMN	14.59	YNA	14.49
DJL	15.11	GSG	17.79	HJ4ABB	6.11	LKJ1	9.53	RV15	4.27	WNA	9.17	YNLF	9.65
DJM	6.08	GSH	21.47	HJ4ABC	6.45	LRU	15.29	RV96	9.52	WNB	10.68	YVC	13.35
DJN	9.54	GSI	15.26	HJ4ABC	6.07	LRX	9.64	RV96	15.18	WNC	15.06	YVQ	6.67
DJO	11.8	GSJ	21.53	HJ4ABD	5.77	LSF	19.60	SPW	13.64	WND	4.10	YVR	18.30
DJP	11.86	GSN	11.82	HJ4ABE	6.09	LSG	19.90	SUV	10.06	WOA	6.76	YVR	9.15
DJQ	15.28	GSO	15.18	HJ4ABL	6.06	LSI	9.80	SUX	7.86	WOB	5.85	YV2RC	5.80
DJR	15.34	GSP	15.31	HJ4ABP	6.14	LSK3	10.25	SUZ	13.82	WOF	14.47	YV3RC	6.16
DZA	9.68	HAS3	15.37	HJ5ABD	6.09	LSL	15.81	TFJ	12.24	WOG	16.27	YV4RC	6.38
DZB	10.04	HAT4	9.13	HKB	9.93	LSL2	10.30	TFK	9.06	WOK	10.55	YV5RMO	5.85
DZC	10.29	HBJ	14.54	HKE	7.10	LSM2	14.50	TFL	5.0	WON	9.87	YV6RV	6.52
DZE	12.13	HBL	9.60	HKV	8.80	LSN	9.89	TGF	14.49	WOO	17.62	YV7RMO	6.07
DZG	15.36	HBP	7.80	HPF	14.49	LSN	14.53	TGS	5.71	WOO	12.84	YV8RB	5.90
DZH	14.46	HCETC	6.98	HP5B	6.03	LSN5	19.65	TGW	9.45	WOO	8.56	YV9RC	6.40
EAQ	9.86	HCJB	8.21	HP5F	6.08	LSN6	21.02	TGXA	6.13	WOO	4.75	YV10RSC	5.72
EDM	20.86	HCK	5.89	HP5J	9.61	LSX	10.35	TG2X	5.94	WOO	4.27	YV11RB	6.55
EDM	10.07	HC2AT	8.40	HP5K	6.01	LSY	20.70	TIEP	6.71	W1XAL	15.25	YV12RM	6.30
EHY	20.86	HC2ET	4.60	HRD	6.24	LSY3	18.12	TIGPH	5.83	W1XAL	11.79	ZBW	8.75
EHY	10.07	HC2JSB	7.85	HRF	14.49	LZA	14.97	TIPG	6.41	W1XAL	6.04	ZFA	5.03
FTA	11.94	HC2RL	6.64	HRL5	14.49	OAX4D	5.78	TIR	14.49	W1XK	9.57	ZFB	10.06
FTK	15.88	HC2TC	7.98	HRN	5.88	OAX4G	6.23	TIRCC	6.55	W2XAD	15.33	ZGE	6.13
FTM	19.36	HH2S	5.92	HRP1	7.03	OCI	18.68	TI4NRH	9.84	W2XAF	9.53	ZHI	6.02
FTO	18.25	HH3W	9.60	HS8PJ	10.96	OCI	10.97	TI5HH	5.50	W2XE	21.52	ZHJ	7.63
FZR3	16.23	HIG	6.28	HSJ	10.17	OCJ2	14.85	TI6OW	6.85	W2XE	17.76	ZLT2	7.39
FZS	18.35	HIH	6.78	HSP	17.74	OER2	6.07	TI8WS	7.55	W2XE	15.27	ZLT4	11.05
FZS2	11.99	HII	14.94	HVJ	15.12	OPL	20.04	TPA2	15.25	W2XE	11.83	ZSS	18.89
GAA	20.38	HIL	6.50	HVJ	5.97	OPM	10.14	TPA3	11.88	W2XE	6.12	ZTJ	6.10
								TPA4	11.72				

"WHEN TO LISTEN IN" Appears on Page 368

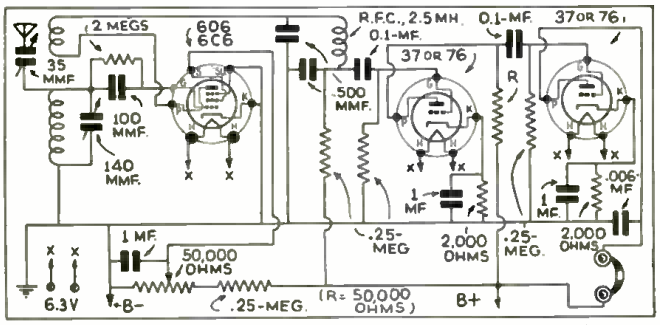
• • • Short Wave

3-TUBE RECEIVER DIAGRAM

Chas. Loutzenhiser, Toledo, Ohio.

(Q) Would you please publish a diagram in the *Short-Wave Question Box* of the short-wave receiver using a 6D6, 76, and a 37? Regeneration should be controlled with a 50,000-ohm potentiometer in the screen-grid circuit of the detector.

(A) The diagram you request is shown and the different type 6.3-volt tubes which may be used are clearly indicated in the diagram.



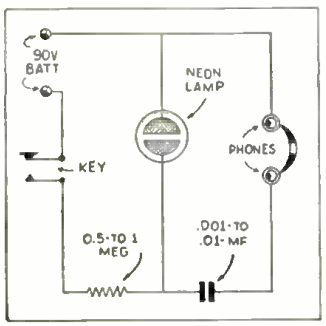
A short-wave receiver hookup utilizing a 6D6, a 76 and a 37.

NEON CODE OSCILLATOR

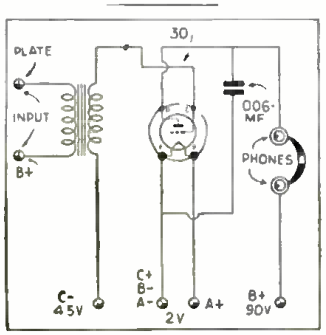
John Kveton, New York, N.Y.

(Q) I would like to know how to construct a Neon tube oscillator for learning the code. Will you please show the diagram and values of the various parts in a coming issue of the *Question Box*.

(A) The Neon tube oscillator is quite economical, inasmuch as the only requirement is a high-voltage supply. In the diagram we have shown the method of connecting it. The value of the resistor and condenser greatly effect the tone heard in the earphones. Choose the values which give the most pleasing tone.



A Neon tube may be used to make the "code practice" oscillator shown above.



Easily made audio amplifier stage for the "DX-ER."

A.F. AMPLIFIER FOR "DX-ER"

Clifton Coleman, Owens, W.Va.

(Q) Please show a diagram of an A.F. amplifier consisting of a type 30 and an audio transformer which may be added to the "DX-ER."

(A) The type 30 A.F. amplifier requested is shown in the diagram and should increase the volume of the "DX-ER" considerably. This is well worthwhile, especially on the smaller sets of the super-heterodyne variety which do not employ sufficient pre-selection to eliminate "images."

R.F. BOOSTER

Roman Weza, Sobieski, Wis.

(Q) In the August, 1934, issue you described a simple "Booster." Would you please reprint the diagram in a future issue of the *Question Box?*

(A) We have shown the diagram of a self-powered R.F. "Booster" or pre-selector which may be added to any receiver.

BEST SET FOR FIVE METERS

V. J. Pilvelatis, Cambridge, Mass.

(Q) I would like to know if it is possible to use a straight regenerative receiver for 5 meter operation. If so, will satisfactory results be obtained.

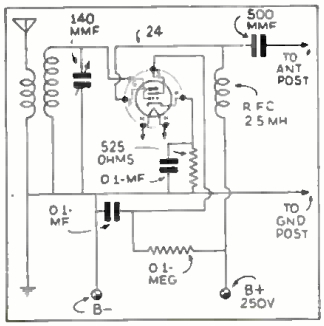
(A) In the early stages of 5 meter radio straight regenerative receivers were used but were replaced by the super-regenerator because of the greater stability. A straight regenerative detector is not recommended for five meters.

AMPLIFIER USING 24

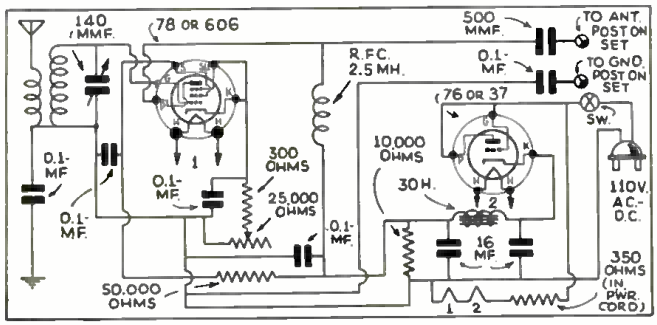
James Kaylor, Badin, N.C.

(Q) Kindly publish a diagram in the *Question Box* showing a 24 as an untuned R.F. amplifier. Also, what makes a set squeal loudly when the regeneration control is advanced too far?

(A) We have shown a diagram of a 24 in a tuned R.F. stage. Adding an untuned R.F. stage to your receiver would be of little benefit. We recommend the tuned stage as shown. The untuned stage would consist of a 2.5 m.h. choke in place of the grid coil and grid condenser. The antenna should be coupled directly to the grid of the two through a small variable condenser. Regarding the squeal, we believe this is due to the detector breaking into super-regeneration with the quenching frequency within the audible range. This would indicate that your tickler was entirely too large. We suggest that you decrease the number of turns until the proper results are obtained.



A radio frequency amplifier stage using a 24 type tube, is shown in the diagram above.



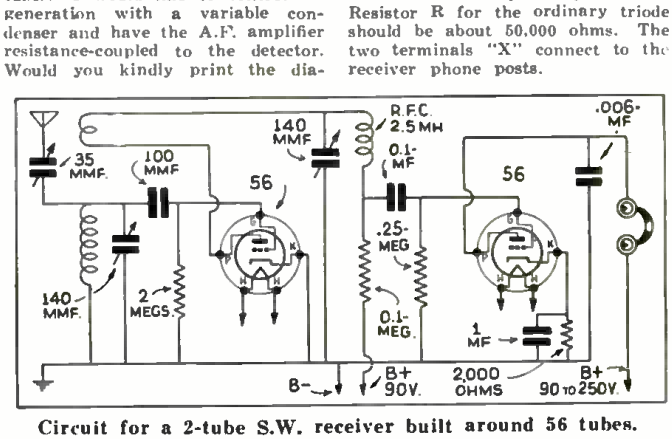
An R.F. booster stage employing a 78 and a 76, or equivalent tubes, with plate-supply filter.

2-TUBER

James Grigg, Chicago, Ill.

(Q) I would like to build a 2-tube receiver employing type 56 tubes. I would like to control regeneration with a variable condenser and have the A.F. amplifier resistance-coupled to the detector. Would you kindly print the diagram?

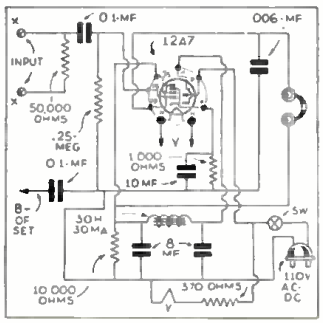
(A) The diagram requested is shown and regeneration is controlled by a 140 mmf. condenser. If you wish to incorporate "band-spread" in this receiver, merely connect a 35 mmf. condenser in parallel with the 140 mmf. grid tuning condenser and use the smaller condenser for tuning.



Circuit for a 2-tube S.W. receiver built around 56 tubes.

EDITED BY GEORGE

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



Above—diagram for an audio amplifier stage with a 12A7.

1-TUBE AMPLIFIER

Wm. McConnell, Washington, Pa.

(Q) I would like to add a pentode amplifier to a short-wave receiver. This must be self-powered and preferably a 12A7 tube. Would you please print the necessary diagram in the *Question Box?*

(A) We have shown the diagram of a 12A7 which is a combination pentode and rectifier, both in a single glass envelope. This may be connected to the output of any short-wave receiver which does not already have a power pentode output stage. The input circuit consists of two .1 mf. condensers. These are both necessary because the B negative side of the circuit connects directly to the lighting circuit, and if a ground were used on the receiver, the house fuses would very likely "blow." Resistor R for the ordinary triode should be about 50,000 ohms. The two terminals "X" connect to the receiver phone posts.

QUESTION BOX

W. SHUART, W2AMN

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

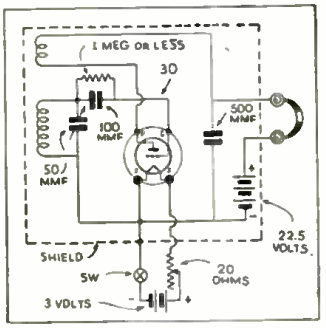
Special problems involving considerable research will be quoted upon request. We cannot offer opinions as to the relative merits of commercial instruments.

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

SIMPLE MONITOR

John Evans, Nome, Alaska.

(Q) I would like to build a simple monitor in order to check my CW signals. Would you be kind enough to print the diagram



Here is a simple Monitor circuit, using a single 30 tube.

in your *Question Box?* I would like to have this self-contained in a metal can.

(A) The conventional type 30 monitor diagram is shown. The batteries, together with the tube, and other circuit components, are housed in a metal shielded can. The size of the coil will depend upon the band in which you operate your transmitter.

2-TUBE HAM RECEIVER

Richard Lawrence, Kingston, Mass.

(Q) I would like to build a "Ham" receiver consisting of two tubes of the 6.3 volt variety. Would you please print the diagram showing "electron" coupling? I would also like "band-spread" and a potentiometer for regeneration control.

(A) We have shown the diagram and it employs a 6C6 and a 76 for 6.3-volt operation. By employing a 57 and a 56 you may use a 2.5-volt heater supply. Standard coil data shown in past issues of the *Question Box* may be employed. However, the tickler should be reduced to three or four turns for the large coils (low freq.), and to two or three for the high frequency coil.

AMPLIFIER "MOTOR-BOATS"

S. D. Terry, Jr., Grand Saline, Texas.

(Q) I have constructed several short-wave receivers and have trouble with motor-boating in the audio amplifier. Will you please tell me how to overcome this?

(A) Quite a few of our readers have written to us regarding the same subject. In the diagram we have shown a triode and pentode which is the usual tube combination of the audio system in the average short-wave receiver. Isolating resistor and by-pass condensers which may be used to overcome this difficulty are clearly shown. In all cases it is not necessary to employ the method illustrated in the diagram, but in some cases where a poor layout or crowding is present resort to the above methods may be necessary.

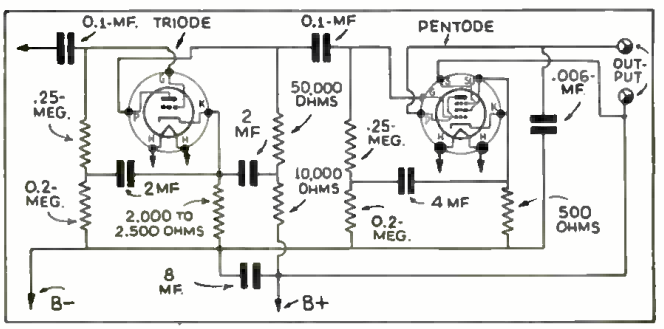
3-TUBE BATTERY OPERATED RECEIVER

Clay Boborh, Alexandria, Ind.

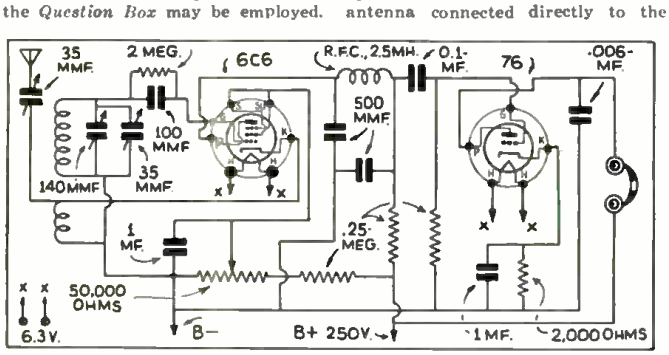
(Q) Would you please print a diagram in the next issue of the *Question Box* of a receiver employing a 32 untuned R.F. amplifier, a 32 regenerative detector employing two winding coils, and a 30 resistance-coupled audio amplifier. Also show the regeneration control as a 50,000-ohm potentiometer.

(A) We have shown the diagram with the R.F. stage tuned. However, the grid coil may be replaced by a 2.5 mh. R.F. choke and the antenna connected directly to the grid, eliminating the 140 mmf. tuning condenser. A resistor having a value somewhere between 10 and 50,000 ohms may also be used in place of the choke. We recommend, though, that the R.F. stage be tuned, because considerable interference from powerful local stations may be encountered with the "untuned" affair. Also, a switch is incorporated in series with the 50,000-ohm regeneration control, so that there will be no drain on the battery when the set is not in use.

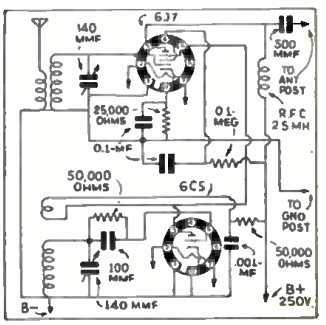
For coil data suitable for use with any of the one, two or 3-tube receivers refer to the August issue, page 226.



The circuit above shows by-pass condensers and isolating resistors as employed for improving a circuit which "motor boats."



A "Ham" receiver, using a 6C6 and a 76. It has Band-spread and electron-coupling.



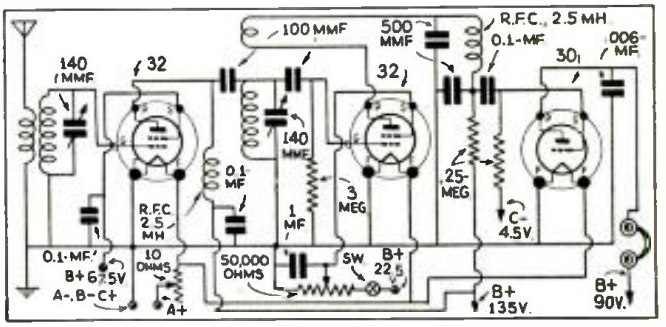
A "metal tube" short-wave converter, the output of which may be connected to practically any broadcast receiver.

CONVERTER WITH METAL TUBES

Henry Cordes, Brooklyn, N.Y.

(Q) I would like to construct a short-wave converter for my superhet. Would you please show a diagram of one using metal tubes with standard 4-prong coils and 14-mmf. tuning condensers?

(A) The converter diagram consisting of a 6J7 first detector and a 6C5 oscillator is shown. If glass tubes are used, the 6J7 should be replaced with a 57 or a 6C6, and the 6C5 with a 76 or a 56. The two output terminals are connected to the antenna and ground posts of the receiver.



A 3-tube battery receiver, using two 32's and a 30 type tube.

REGENERATION CONTROL GETS HOT

John Stadnick, Los Angeles, Calif.

(Q) In my receiver, which is a 3-tube regenerative affair, the regeneration control becomes very hot and starts to burn. I would like to know if you could tell me what the trouble is.

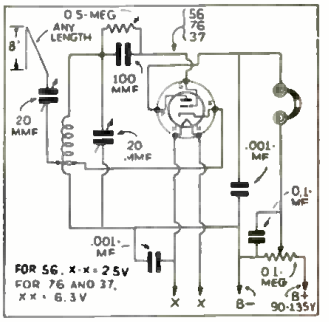
(A) Undoubtedly, you have entirely too much current flowing through the regeneration control. Potentiometers are usually employed and one terminal of the potentiometer is connected to the B negative; the central terminal to the screen-grid of the detector stage; the other terminal of the potentiometer should be connected to a 100,000-ohm resistor, which, in turn is connected to the "B" plus. If you have a 50,000 ohm potentiometer, then the current flowing through it will be low enough to do no harm.

1-TUBE 5-METER RECEIVER

Jack Carberry, Buffalo, N.Y.

(Q) I have heard much of the 56-U.S.W. receiver and would like you to print a diagram of the detector which could be used as a 1-tube, 5-meter set.

(A) We are showing the diagram of a 56 super-regenerative detector as requested.



Hookup above shows a 5-meter receiver, using a 56 or equivalent type tube. The coil data for the aerial tuning circuit has been given in many recent numbers.

SHORT WAVE . SCOUTS

THIRTY-FIRST TROPHY CUP

Presented to

SHORT WAVE SCOUT

EDWARD P. KEARSLEY

53 High Street,
Springfield, Mass.

For his contribution toward the advancement of the art of Radio

by

SHORT WAVE CRAFT

Magazine

31st TROPHY WINNER

86 Stations—69 Foreign

● THE 31st Trophy contest proved almost as exciting as the last one, inasmuch as there were a number of very close contestants. Mr. Kearsley, of Springfield, Mass., had the very excellent total of 86 stations, 69 of which were foreign. His cards were presented in the usual manner and came within the rules of the contest.

For a receiver Mr. Kearsley used a 12-tube Scott, in conjunction with a 40 foot antenna constructed of No. 14 copper wire. No other data was given regarding the receiving station. We might mention here that we would like to have contestants submit as much data as possible for the benefit of others. We do not want lengthy descriptions, merely some information regarding the experiences in obtaining cards, the direction of the antenna, and possibly a remark about which station came in best.

Another suggestion we have to offer future contestants is that their cards be in order, that is they should be arranged the same as the list, in order that the judges may go through them quickly and accurately. A number of contestants this month had them poorly arranged and it was necessary for the judges to hunt all through the cards or list for a particular station.

Also, do not fail to give the exact 30 day period for which the entry is supposed to have been made. We have received a number of complaints from people who thought their cards were not carefully considered because they received them back within a few days after the notice closed, which was naturally about 30 days before the magazine appeared on the newsstands. Please rest assured that all entries are given careful consideration and it is not necessary to correspond with this office should you receive your cards back.

(*Continued on page* 379)

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

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

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

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

Honorable Mention

Arturo Villafana, Pagani St., Arecibo, Puerto Rico.

Robert Chase, 231 Henry St., New York, N.Y.

Trophy Contest Entry Rules

● THE rules for entries in the **SHORT WAVE SCOUT Trophy Contest** have been amended and 50 per cent of your list of stations submitted must be "foreign." The trophy will be awarded to the **SHORT WAVE SCOUT** who has logged the greatest number of short-wave stations during any 30 day period; (he must have at least 50 per cent "foreign" stations). This period need not be for the immediate month preceding the closing date. The complete list of rules appeared in the September 1935 issue.

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

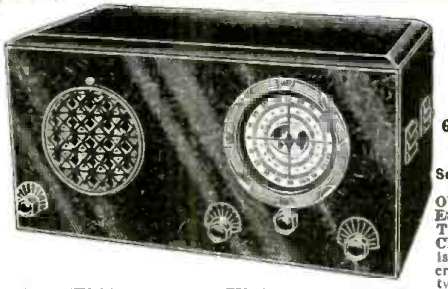
Only commercial "phone," Experimental or Broadcast stations should be entered in your list, no "amateur transmitters" or "commercial code" stations. This contest will close every month on the 25th day of the month, by which time all entries must be in the editors' hands in New York City. Entries received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

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

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

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

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



Eilen RX-14

6-tube Band-Spread Receiver

8½ to 600 meters

See article P. 151 July issue S.W.C.

OUR LARGEST, FINEST AND MOST SENSITIVE SHORT WAVE RECEIVER which WILL satisfy even the most discriminating SW fan. Uses two 6D6, two 76, one 42, and one 5Y3 hi-gain tubes as TUNED RF amplifier, TUNED electron coupled screen grid regenerative detector, POWERFUL 3 stage audio amplifier, HUM-FREE full wave rectifier and built-in power supply. Operates from your AC house current. POWERFUL hi-quality audio system delivering 3 watts of power to the built-in hi-fidelity dynamic loudspeaker—automatic headphone jack—smooth regeneration and volume controls—connections for doublet or single wire antenna—black shrivel finished metal chassis and cabinet of extreme beauty—selectivity, sensitivity, and volume that will amaze you. PRICE, complete with 6 tubes, 3 coils, cabinet, speaker, wired, less B.C. coils, ready to use..... **$21.95**

(2 Broadcast band coils, extra $1.45)

RX-14 KIT of necessary parts, including 3 low-loss coils for 8½ to 200 meters, and simple instructions. (less cabinet, tubes, and BC coils, unwired)..... **$14.95**

Beautiful, heavy steel cabinet, extra..... $2.50

6 MATCHED ARCTURUS tubes..... $2.95

SPECIAL

Complete kit, cabinet, tubes, speaker, and detailed instructions, less B.C. coils, unwired..... **$19.95**

Labor for wiring and testing, extra..... 2.00

Broadcast band coils (2), extra..... 1.45

If METAL TUBES are preferred over the glass type, add $1 to price.

RX-14B: Battery model of RX-14. Subtract $1 from above price (less batteries).

AMATEURS:

Model RX-14-AB COMMUNICATIONS RECEIVER has same specifications as RX-14 except that it is equipped with special coils for the 20-40-80-160 M bands which spread these bands over a generous portion of the tuning dial. Also equipped with plate voltage cut-off switch for use during transmitting periods. An ideal receiver for amateur communications work. Add $1 to price of RX-14.

Eilen BS-5

5-Tube Band switch Receiver

9½ to 600 meters

A powerful, sensitive, and selective SW receiver covering the entire wavelength span of 9½ to 600 meters in 5 steps. NO PLUG-IN COILS are used. Simply turn the waveband selector switch and enjoy reception on any wavelength within this range.

Uses two 6D6, one 76, one 43, and one 25Z5 tubes as RF amplifier, electron coupled screen grid regenerative detector, powerful 2 stage audio amplifier with pentode output stage, rectifier, and complete built-in power supply.

HUM-FREE—Hi-fidelity dynamic loudspeaker—illuminated, airplane type vernier dial—band spread tuning control—automatic headphone jack—extremely smooth acting controls—operates from your AC or DC house current—beautiful, heavy, black shrivel finish chassis and cabinet.

DELIVERS GREAT LOUDSPEAKER VOLUME ON THE GREAT MAJORITY OF SHORT WAVE FOREIGN STATIONS UNDER FAIR CONDITIONS.

PRICE, complete with 5 tubes, cabinet, speaker, wired, ready to use..... **$16.95**

BS-5 KIT, of necessary parts, including speaker and detailed instructions, less tubes, cabinet, unwired..... **$10.95**

Beautiful, black shrivel finish metal cabinet, extra..... $2.00

Set of 5 MATCHED Arcturus tubes, extra.. 2.50

SPECIAL: Complete kit, cabinet, tubes and instructions, unwired..... **$14.95**

Labor for wiring and testing, extra..... $2.00

(If metal tubes are preferred to glass type, add $1)

AMATEURS:

Model BS-5-AB has same specifications as BS-5 except that it has special bandspread circuit for 20-40-80-160 M bands and is equipped with plate voltage cut-off switch. Add $1.00 to above price.

Eilen 3A 3-Tube SW Receiver

9½ to 600 meters

A simple and efficient short wave model, inexpensive in price but a wizard in performance. Uses three tubes in a special ultra-sensitive regenerative circuit with one stage of audio amplification and complete built-in power supply.

- Vernier dial for easy tuning.
- Good volume on all stations.
- Small, compact, and light in weight.
- Operates from your AC or DC house current.
- Black, crackle finish metal chassis, panel, & cabinet.

Eilen 3A KIT, of necessary parts, including coils for 9½ to 200 meters, and simple instructions, less cabinet, tubes, B.C. coils, unwired..... **$4.95**

Beautiful, crackle finish cabinet, extra..... $1.25

Set of MATCHED tubes, extra..... 1.14

SPECIAL: Complete kit, cabinet, tubes, and instructions, less B.C. coils, unwired.. **$7.25**

Labor for wiring and testing, extra..... $1.50

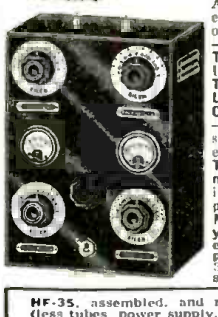
2 Broadcast band coils, extra..... 1.25

MODEL 3B 3-TUBE BATTERY OPERATED RECEIVER

9½ to 600 meters

AN IDEAL SUMMER PORTABLE

Same specifications as model 3A except that it uses 3 of the 2 volt battery operated tubes in a highly efficient circuit as regenerative detector and 2 stage audio amplifier. Same price as 3A.



Eilen HF-35 3-Tube SW Transmitter

A powerful and well engineered amateur band transmitter of great beauty and efficiency —AT A PRICE WITHIN THE AMATEUR'S REACH. Uses 59-46-46 tubes as TRITET CRYSTAL CONTROLLED OSCILLATOR—CLASS C RF POWER AMPLIFIER —built-in antenna tuning system—beautiful, black shrivel metal case and shelving—Triplett meters—Eilen transmitting dials—highest quality construction—35 watts of power output on 20-40-80-160 M bands. A transmitter that you can be proud to own. An excellent exciter unit for high power stages to be added later. 3 coils for any 1 band and instructions included.

HF-35, assembled, and ready to wire (less tubes, power supply, crystal, holder and additional coils)..... **$21.95**

Matched Arcturus Tubes (3)..... $2.15

Eilen quartz crystal (80 or 160)..... $1.95

Eilen crystal holder..... 1.00

Coils for additional bands, per set..... 1.45

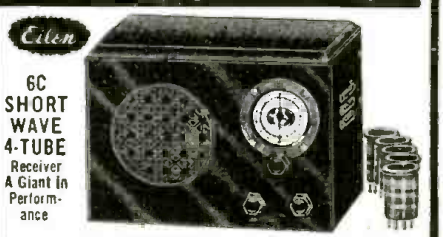
HV-475 1-Tube power supply for use with HF-35, less tube (ready to wire)..... **$12.95**

Labor for wiring extra $1.00

83 tube for HV-475, extra 65 cents

M-15 3-Tube Modulator for use with HF-35 and capable of modulating its entire output at 100%, priced at **$14.95** (less tubes)..... $14.95

Three Arcturus tubes, 56-53-53, extra.. $1.95



Eilen 6C SHORT WAVE 4-TUBE Receiver A Giant in Performance

FULL 6 TUBE PERFORMANCE.—POWERFUL 3 STAGE AUDIO AMPLIFIER which takes the guesswork out of so-called "loudspeaker reception."

Uses 6D6—6F7 (twin 2 in 1)—76—12A7 (twin 2 in 1) hi-gain tubes as RF amplifier, screen grid regenerative detector, POWERFUL 3 stage audio amplifier with pentode output stage, rectifier and built-in humfree power supply. Completely self-contained. Nothing else required. Operates entirely from 105 to 130 volt AC or DC light socket.

BAND SPREAD TUNING—smooth regeneration control—built-in high quality loud-speaker—automatic headphone jack—large, illuminated airplane type vernier dial—large 3 winding low-loss inductances —selectivity, sensitivity, and volume that will amaze you. Heavy black shrivel finish metal chassis and cabinet. Must be seen to be appreciated. Satisfied owners report dozens of foreign stations on loudspeaker—You may do the same under the proper conditions. ORDER YOURS TODAY! YOU'LL NEVER REGRET IT!

AMATEURS:

Model 6C-AB has same specifications as 6C except that it has special tuning circuit and coils for spreading out the 20-40-80-160 M bands over 80% of dial scale—plate voltage cutoff switch.

Add $1 to price of 6C.

6C KIT (unwired), of all necessary parts, 4 coils for 9½ to 200 meters and instructions (less cabinet, tubes, speaker, and B.C. coils)..... **$7.45**

Beautiful cabinet..... $1.25

4 matched Arcturus tubes 3.15

Special loudspeaker..... 1.45

Broadcast band coils (2).. 1.25

SPECIAL: Complete kit, cabinet, 4 tubes loudspeaker, and one B.C. coil, (unwired).. **$12.45**

Labor for wiring and testing, extra..... $1.50

EILEN 6B or 6B-AB battery model of 6A using 34-19-30-33 tubes. Subtract $1 from price of 6C or 6C-AB.

Eilen HF-4 4-Tube 2½ to 5 Meter combination Receiver-Transmitter

An ultra-high frequency receiver designed to give full loudspeaker volume on stations operating on wavelengths between 2½ to 15 meters. Uses two 76, one 38, and one 80 tubes as ultra sensitive super regenerative detector, powerful 2 stage audio amplifier, rectifier, and built in power supply. Great volume on amateurs, police stations, hi-frequency broadcast, television and experimental stations.

Illuminated, aeroplane dial—low loss silver plated inductances—headphone jack—chromium plated chassis and black shrivel finish metal cabinet. Extremely small and light in weight. Only 10"x7"x6½". Operates from AC house current.

Send—Receive switch, enabling the unit to be used as a low powered transmitter.

HF-4, complete with 4 tubes, cabinet, speaker, wired ready to use..... **$14.45**

KIT, of all parts including speaker, cabinet, 4 tubes and instructions, unwired **$12.95**.

SPECIAL

Eilen 75 watt soldering irons..... $0.95

Cannonball double headphones..... 1.35

Magnetic speakers..... 1.45

Eilen HF-19 One-Tube Transceiver 5 meters

A masterpiece in simplicity! An unequalled value for the experimenter who is interested in an inexpensive transceiver which will enable him to maintain reliable 2 way communication with a friend. So simple that even a beginner may readily obtain remarkable results with it. Uses one type 19 (twin 2 in 1 tube) in special circuit producing great volume and signal strength. Operates from 2 dry cells and 90 to 135 volts of B battery.

HF-19 TRANSCEIVER KIT, of necessary parts, and simple instructions, less cabinet, tube, microphone, unwired..... **$3.95**

Beautiful crackle finish cabinet, extra.. $1.25

Type 19 tube, extra..... .65

Wired and tested, extra..... 1.50

Microphone for above, extra..... 1.95

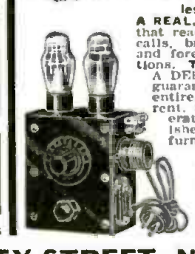
FREE

Large, illustrated 20 page catalogue of short wave receiver kits, transmitters, and accessories. Send stamp to cover postage and handling charges.

Prompt service. 20% deposit on C.O.D. orders

Eilen Two-Tube Short Wave Radio only..... $3.00

less tubes, phones, unwired



A REAL, powerful 2 tube short wave set that readily brings in amateurs, police calls, broadcast stations, experimental and foreign stations under fair conditions. THE WORLD AT YOUR DOOR!

A DEPENDABLE RECEIVER which is guaranteed to give results. Operates entirely from the AC or DC house current. Simple to build and easy to operate. Beautiful, black shrivel finished cabinet and instructions furnished. Wavelength range 10 to 600 meters.

TWO TUBE BATTERY SET, less tubes, phones, batteries, unwired..... **$2.00**

Kits wired, extra $0.75. Tubes, each..... $0.75

Cannonball double headphones..... $1.35

EILEN RADIO LABORATORIES. Dept. SC 10, 136 LIBERTY STREET, NEW YORK, N. Y.

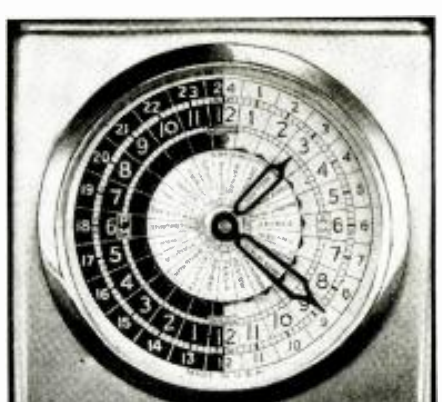
New World-Time Clock

● The accompanying illustration shows a new departure in *world-time* clocks, and this one enables the short-wave Fan or Ham to quickly read the equivalent time in a foreign country, whether it is a.m. or p.m., due to the two halves of the dial being printed in black and white. To set the clock for your local time, E.S.T. for New York, etc., a button on the back of the clock is pressed, which causes a pin to project up through the dial and block the hour hand when the hands are turned. Next, the small center dial bearing the names of the various foreign cities is turned until the city corresponding to the local time zone appears through the opening in the hour hand, New York—for example. When this has been done, the button controlling the pin is released and nothing more has to be done with the clock, except to wind it once in every thirty hours.

One of the distinct features of this clock is that the dial is laid off on the 24 hour European plan, and this will be found a great aid to the short-wave listeners tuning in on "foreign" programs. The center dial, once set as previously described, rotates with the hour hand and in this way it will be evident that the time in any "foreign" city can be read at once by simply glancing at the clock.

The clock is finished in a handsome brushed brass case, measuring approximately 4¾" wide by 5¾" high and 2" deep.

Our Information Bureau will gladly supply manufacturers' names and addresses of any items mentioned in SHORT WAVE CRAFT. Please enclose stamped return envelope.



New "World Time" Clock (No. 568)

New Velocity Microphone

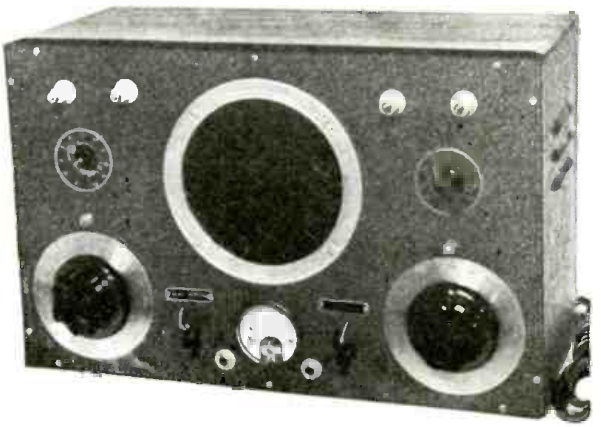
● The new velocity microphone illustrated herewith represents a popular priced line now offered to the short-wave and general electrical field. The housing is streamlined to give correct acoustic results, plus an ultra-smart appearance. There are three distinct models. The microphone is furnished complete with 8-foot length of cable, shock-absorber and locking cradle. The mike has standard output impedance and may be connected direct to grid. The mike is beautifully finished in black and chromium and has been carefully designed along new lines, to give high quality reproduction of both voice and music. Our Information Bureau will gladly supply manufacturers' names and addresses of any items mentioned in SHORT WAVE CRAFT. Please enclose stamped return envelope.

(No. 569)

RACO SCORES AGAIN!

POWER DUPLEX TRANSMITTER-RECEIVER

For The High Frequency Bands



Q S T HAMS!

Here's the job you told us you wanted for the 5 Meter Band

You Were Right. It's a Honey!

AN efficient 6 E 6 T.N.T. transmitter with 6 L 6 beam power modulator packing a terrific punch when you need it. Power enough for real D.X. work and good clean modulation even when you are "hitting it" hard.

Built-in power supply with 0-150 milliameter.
Contains *A 4-TUBE RECEIVER.*

(Note: An RK 34 may be used in place of the 6 E 6 push pull oscillator if desired.)

1-RF; Super-regen. detector; two stage audio; 6½" dynamic speaker. Every amateur who has handled this job tells us that the receiver *alone* is worth the price of the entire outfit. And if you have some "wise" friend who thinks he can do as well without that stage of R.F. don't hesitate to give him odds.

This outfit was actually designed by over a dozen prominent amateurs each of whom contributed ideas from his practical experience. There has been no skimping; from husky 150 M.A. power transformer to large 6½" dynamic speaker, the finest parts are used throughout. It is a job we are proud of and because we are certain that its performance will produce a large sales volume, we are pricing it at a figure which is unusually close to our actual cost. At this price you can't *afford* to build your own.

RACO POWER DUPLEX

Completely wired and tested, housed in hinged top cabinet, less tubes..... **$35.75**

Set of six specially tested tubes, 6E6, 6L6, 5Z3, 6D6, 6C5, 6J5G..... **$5.10**

Raco Portable Battery Duplex

(See Adv't. in Sept. *Short Wave Craft*)

Complete Kit, including meter, speaker, etc., less only cabinet, tubes and wiring..... **$12.60**

REGENERATION PLUS SUPER-REGENERATION

Hundreds of R-S-R owners, scattered over the whole world, are testifying to the splendid consistent performance of this remarkable receiver.

HAYNES R-S-R

5-TUBE RECEIVER

2½ to 555 METERS

THE IDEAL EXPERIMENTER'S SET

The Radio Editors See Them All! They Know!

The New York Sun:—"Circuits worthy of space are not numerous this season, but the R-S-R is an exception. The receiver functioned so smoothly that it was obvious its many features would appeal to the home experimenter."

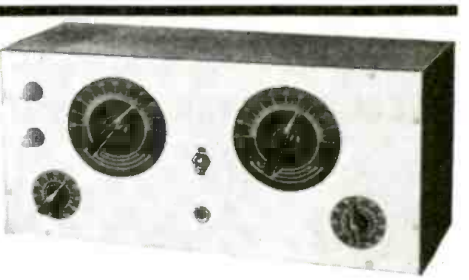
Radio News:—"A Real Go-Getter . . . It considerably exceeded expectations. Short-wave stations were tuned in, all on the loud speaker, from Spain, Italy, England, France, Germany, Columbia, Cuba."

Short Wave News & Technical Review:—"Excellent long distance reception can be accomplished with it on all of the short wave bands . . . It is a whole lot of receiver for very little money."

Complete R-S-R Receiver; ready to plug in to 110 volt line and operate, wired, tested, with 5 tubes, speaker and cabinet..... **$24.65**

Complete kit; unwired, including dynamic speaker, power supply and wired switch coil assembly (Less cabinet and tubes only)..... **$14.95**

R-S-R Jr. 3-TUBE COMMUNICATION RECEIVER 5 to 555 METERS



A NEW development of the Famous Haynes R-S-R at a remarkable low price for this class of receiver. A regenerative receiver with amazing selectivity. It actually will snap in and out the local broadcasting stations. Super-regeneration or straight regeneration as desired. Perfect smooth, silent regeneration control for phone, C.W. or broadcast reception—foreign or local. Uses 2—76 Super Triode tubes in electron coupled circuit and 80 rectifier.

FEATURES

- ★ Separate tank and band spread condensers.
- ★ Super-regeneration up to 25 meters if desired.
- ★ High voltage A.C. transformer power supply built-in.
- ★ Straight antenna or doublet connection with front panel variable antenna coupling.
- ★ Standby switch for communication work.
- ★ All coils are included, giving *full* covetage from 15 to 555 meters; also 5 and 10 meter bands.

COMPLETE KIT including all coils, drilled panel, chassis, power supply, etc., less tubes, cabinet and wiring..... **$7.60**

Crystallized Metal Cabinet..... $1.00
Kit of three matched tubes..... $1.25
Assembled, wired and tested..... $2.35

RADIO CONSTRUCTORS LABORATORIES

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136 LIBERTY ST., NEW YORK, N. Y.

RACO PRODUCTS

Export Dept.
105 HUDSON ST., NEW YORK, N. Y.

Please mention SHORT WAVE CRAFT when writing advertisers

How to Build a Modulator for the "M.T." Xtal Transmitter

(Continued from page 340)

How to Operate Modulator

The operation of the modulator is extremely simple. The transmitter is first tuned up and neutralized as outlined in the article which appeared in the September number. Next turn on the heaters of the modulator and speech-amplifier tubes and adjust the bias potentiometer until the full 45 volts negative is placed on the grids of the 79. Place the modulator plug in the key jack in the cathode lead of the 6F6 (it is advisable to provide a separate jack for the D.C. milliameter in order to allow the plate current of the amplifier to be watched while the 6F6 is being modulated) and adjust the bias applied to the 79 grids until the plate current of the 6F6 is reduced to approximately 65% of its original value when the transmitter is keyed for C.W. telegraphy. At this point the monitor or the receiver turned to a lower frequency band, should be turned on and while speaking or playing music into the microphone, adjust the bias on the modulator until smooth modulation is obtained. The power input to the 6F6 can be raised by lowering the resistance in its cathode circuit (as the 79 is in series with the 6F6 cathode, a bias voltage equal to the voltage drop across the cathode-plate circuit of the modulator tube will be placed on the grid of the 6F6 in addition to that already supplied by the bias resistor) and readjusting the negative bias applied to the grids of the 79. Any change in one usually requires a readjustment of the other. When properly adjusted the modulation will increase the amplifier plate current about 7 or 8 milliamperes when speaking with a normal voice.

"Gain" Control

No "gain" control has been incorporated in this modulator circuit; the use of one is strongly recommended. A 250,000 ohm carbon potentiometer in the usual *audio volume-control* circuit across the secondary of the microphone transformer will serve nicely and help to reduce the danger of "over-modulating" the amplifier. *Do not use the bias potentiometer as a gain control; once set correctly, this control should not be disturbed.* The plate voltage for the 6C5 "speech amplifier" tube is supplied by four ordinary 45 volt "B" batteries; it can be taken from the Genemotor supply if desired, however, as the drain of this particular tube is only about 6 milliamperes.

The 6C5-79 combination are not the only tubes that will operate in this type of modulator. In fact, some of the tubes designed for strictly class "A" work, such as the 6F6 or the 42, would probably be much better *series modulators* than those of the class "B" variety.

Any additional information will be supplied by the author who will be glad to correspond with readers who *enclose a stamped and self-addressed envelope for return.*

List of Parts For Modulator

1 Microphone transformer (single or double button type)—(Thordarson).
1 Bakelite socket for metal tube (8-prong.) Bud.
1 Bakelite socket for 79 tube (6-prong, small). Bud.
1 7x9x2 inch *electrallov* chassis. I.C.A.
1 Phone plug. I.C.A.
1 Set of tubes (6C5 and 79, RCA Radiotron.)
1 Carbon microphone, single or double-button type. Lifetime.
R1 Carbon resistor, 1,000 ohms, 2 watts. Aerovox.
R2 Carbon resistor, 50,000 ohms, 1 watt. Aerovox.
R3 Carbon resistor, 100,000 ohms, 1 watt. Aerovox.
R4 Potentiometer, wire-wound, 50,000 ohms. Electrad.
C1 Electrolytic condenser, 25 mf. 30 volts. Cornell-Dubilier.
C2 Paper cartridge condenser, 0.01 mf. 400 volts. Cornell-Dubilier.
SW1 and SW2 on-off switches. I.C.A.
1 set of "B" batteries as indicated on Fig. 1. Eveready.

2 Tubes Equal 4 in This "3 in 1" Reflex Set

(Continued from page 337)

small inexpensive size as the total drain of the tubes used in this receiver is only about 10 or 12 milliamperes. The A.C. power unit, however, is much more desirable, because the upkeep will be less and the higher plate voltage will give slightly more volume. A number of good power-packs suitable for this set have been described in past issues of *Short Wave Craft*.

While this receiver is designed primarily for head-phone reception, it will operate a loud speaker fairly well on most strong stations. If it is desired to receive code on the phones, R9 may be replaced by a 250,000 ohm potentiometer, the arm of which is connected to the grid of the 6C5. This will allow the volume to be controlled without affecting the setting of the regeneration control in any way. Without the volume control most code stations are received with too much volume for comfortable headphone reception.

The author is very much interested in hearing from those who build this receiver and to learn of the results obtained with it. If any additional information or explanation is required it will be supplied gladly if a *stamped and self-addressed envelope* is enclosed for reply. Letters may be sent direct to the author at Beech Hill, West Va.

Plug-in Coil Data

Range in Meters	Grid Turns	Spacing*	Tickler	Wire Size
16-30	5	1"	6	24 D.C.C.
29-58	12	1 1/16"	8	24 D.C.C.
54-105	26	2 1/16"	12	24 D.C.C.
100-200	45	1 5/16"	20	28 D.C.C.

All coil forms 1½" ribbed type with 5-prong bases. All tickler coils wound with No. 32 D.S.E. wire.

*Note: Spacing given is the distance between the grid and filament ends of the coil; not the distance between the turns.

List of Parts "3-in-1" Set

C1-C2—2-gang tuning condenser, 140 mmf. per section.
C3-C8—Trimmer condensers, isolantite base, 35 mmf. each.
C4-C6—Mica fixed condenser, .002 mf. each.
C5—Midget tuning condenser, 35 mmf.
C7—Mica fixed condenser, .0001 mf. Cornell-Dubilier.
C9—Mica fixed condenser, .0005 mf., Cornell-Dubilier.

C10-C14—Paper cartridge condensers, 0.01 mf. 400 volts, Cornell-Dubilier.
C11-C15—Paper cartridge condensers, 1 mf. 300 volts each, Cornell-Dubilier.
C12—Paper cartridge condenser, 0.1 mf. 400 volts each, Cornell-Dubilier.
C13—Mica fixed condenser, .003 mf., Cornell-Dubilier.
C16—Mica fixed condenser, .001 mf., Cornell-Dubilier.
R1—Resistor, 300 ohms, 1 wat, Aerovox.
R2—Resistor, 2½ megohms, ¼ watt, Aerovox.
R3—Resistor, 75,000 ohms, 1 watt, Aerovox.
R4-R9—Resistors, 250,000 ohms, ½ watt each, Aerovox.
R5—Potentiometer, 50,000 ohms, wire-wound, Electrad.
R6—Resistor, 50,000 ohms, 1 watt, Aerovox.
R7—Resistor, 75,000 ohms, ½ watt, Aerovox.
R8—Resistor, 100,000 ohm, 1 watt, Aerovox.
R10—Resistor, 1,000 ohms, 1 watt, Aerovox.
L1, L2, L3—See coil table and text.
RFC—Radio frequency choke, 2½ mh., Hammarlund.
1—7x9x2 inch electralloy chassis, I.C.A.
1—7-prong socket (for 6F7 tube), Isolantite.
1—8-prong socket (for 6C5 metal tube), Bakelite.
2—Off-on switches or one D.P.S.T. switch (SW1 and SW2), I.C.A.
2—4-prong sockets for plug-in coils (Isolantite).
1—Set of RCA tubes (6F7 and 6C5).
Necessary, knobs, tip jacks, hardware, dial, etc.

The "Chicken-Coop" Special

(Continued from page 335)

but when "B" batteries grow old, connect a 1 mf. condenser across these batteries if noise is present. Do not fasten dials directly to condenser shafts. Use dowel sticks, about 1¼ inch in length for main condensers and about 2 inches long for verniers to insure real smoothness.

How to Make the Coils

The type of coils shown in the set in the photo works exceedingly well, but the experimenter may quickly produce his own in a simple and efficient manner—and it is lots more fun. On a cardboard tube of any suitable diameter, around 2 inches is the best, wind a few turns of annunciator (bell) wire, remove from tubing and stick together with four strips of adhesive tape. Now wind a few turns of No. 22 D.C.C. wire for tickler, stick together with tape, and fasten coils together as shown in photograph, leaving ends for connections about 1½ inches in length. For the primary wind in the same manner about 8 turns of 22 D.C.C. wire. The sketch shows plainly how to connect the coils to the Fahnestock spring clips serving as coil sockets. Reverse the tickler lead connections if regeneration does not function.

For the 19-meter band, 3 turns for secondary and 4 for tickler would be sufficient, but by a little experimenting a set of coils to fit the condensers perfectly for all the bands can easily be made. In the photo a few completed coils of this type are shown on the wall. In spite of the dowel stick extensions on the tuning condensers, there may still be present a certain amount of annoying "hand capacity." This is completely overcome by housing the set in an easily constructed cage. Get some screen framing as in illustration. Cover frames with fine mesh copper screen wire and nail together like a crate. Either hinge the top or fasten with clasps. This screen should not be connected to ground. All body capacity now disappears and the screen prevents dust from accumulating in the set.

201A Tubes Can Be Used

If you have a storage battery and charger, use 201A tubes. Try several tubes in detector socket as a good, smooth-working detector is very desirable. The writer found the type 200A exceptionally fine. The set is sufficiently powerful for loudspeaker operation of the "locals" (London, Berlin, Madrid, etc.) but if greater volume is desired, a suitable pentode may be used in the second audio stage. For best results, try different values of grid-leaks from 1 to 6 megohms. Wire battery cable direct to most convenient locations in the set.

Parts List for "Chicken Coop" Special

1—variable condenser, 150 mmf. (about).
1—variable condenser, 250 mmf. (about).
2—variable condensers, 15 mmf. (about).
3—sockets.
3—Amperites (or substitute low-resistance rheostats).
1—short wave choke.
1—grid condenser, .0001 mf.
1—grid-leak, 5 megohm.
2—audio transformers, 3:1.
8—Fahnestock clips.
1—switch.
2—4" dials.
2—knobs for vernier condensers.
2—rolls annunciator (bell) wire.
1—roll 22 D.C.C. wire.
1—battery cable.

Not so many years ago *Short Wave Craft* used to publish quite regularly articles on simple short-wave receivers known as "The Junk-box 2" or by some similar name. These sets were made almost entirely of old parts found in the "junk heap" (of which every experimenter boasted) or of parts "borrowed" from other receivers. Although such sets were the rage of the day, they gradually became less conspicuous in print due to the boom in new tubes and newly-developed radio components. Of late, how-

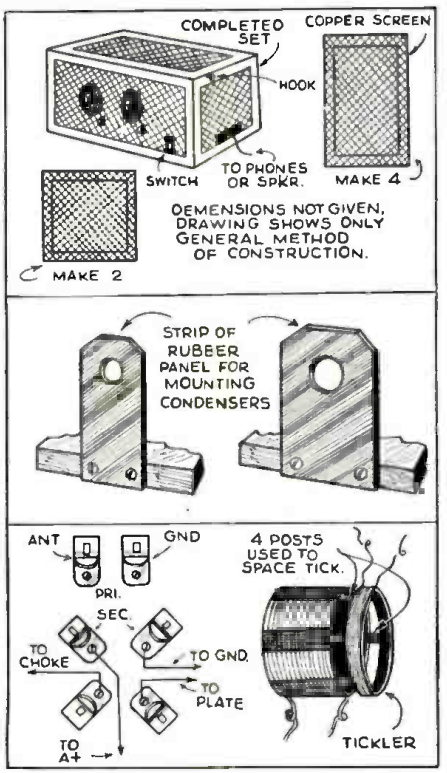
ever, there has been a steadily increasing demand for such sets and articles once more; hence the article on the "Chicken-Coop Special."

The parts used in the Chicken-Coop Special, however, are of such old vintage that it is doubtful whether they can be found in any "junk box" even after considerable digging. One would have to go to a museum to obtain them in many cases. Consequently, the editors of *Short Wave Craft*, decided to have a more modern version of this receiver built. The accompanying illustrations and diagrams picture this new set, which, incidentally, we might name the "*Modern Junk-Box 3*."

Every one of the components of this set came out of the author's junk pile. Not even the hardware and base board were purchased. The parts used are as follows:

Four 4-prong wafer sockets; one Sangamo 3 to 1 ratio audio transformer; one Pilot 3½ to 1 ratio audio transformer; two Hammarlund old-style 140 mmf. variable midget condensers; four tube-base plug-in coils (15 to 200 meters); one 10-ohm filament rheostat; two Kurz-Kash (K-K) vernier tuning dials; one 100 mmf. mica fixed condenser; one 5-megohm grid-leak; one 35 mmf. semi-variable antenna trimming condenser; one "5 and dime" breadboard size 14" x 9¾"; one 7-terminal bakelite terminal strip; one 2.5 (or thereabouts) mh. R.F. choke; and miscellaneous hardware.

The circuit is time tested and fool-proof; —regenerative detector followed by two stages of A.F. amplification. The set is a swell "DX" getter and "packs a wallop" that will operate a magnetic loudspeaker on many of the stronger stations.



Coil and Cabinet Details.

WAKE UP! FELLOWS!

$20.00 Prize Monthly for Best Set

● **THE editors are looking for "new" receiving circuits—from 1 to 5 tubes preferably. A $20.00 monthly prize will be awarded to the best short-wave receiver submitted. The closing date for each contest is 75 days preceding date of issue (Sept. 15 for the Dec. issue, etc.) In the event of a tie, an equal prize will be given to each contestant so tieing. Address all entries to: Editor, SHORT WAVE CRAFT, 99 Hudson St., New York City.**

The U.H.F. Converter

(Continued from page 339)

20 mmf. Hammarlund, three plate midgets. However, the trimming condenser C has one plate removed. The two tuning condensers are mounted on metal spacers directly on the chassis grounding both rotors. However, an insulating coupling is used between the two and each grid return circuit connects directly back to the rotor in order to eliminate as much loss as possible.

With fairly loose antenna coupling and optimum adjustment of the screen voltage, regeneration is practically constant over the entire tuning range. If one desires to tune in both of the ultra high frequency television bands, we suggest that 35 mmf. tuning condensers be employed, and one less turn on both the oscillator and detector grid coils.

If one is only interested in receiving one particular channel, then the smaller condenser provides easier adjustment.

Coils for Different Bands

The coils given are for the 5-meter amateur band. For tuning to higher frequencies then the 5-meter band, the grid coils should have one less turn each. For operation on the low frequency side of the 5-meter band, one more turn in each coil should be employed.

There are a number of methods of injecting the oscillator voltage into the 6A8 circuit, however, the method shown should be used for best results. Quite a few bypass condensers are shown in the diagram, and there are none which are unnecessary, each has its definite function. With the set-up as shown, there is practically no reaction between the two circuits when operating through an I.F. of around 2000 kc. or higher. This is the advantage because otherwise tuning in the ultra high frequency bands is quite critical and adjustment in the detector circuit would constantly throw the oscillator off tune.

In the November Issue!

George W. Shuart, W2AMN, will describe a Battery-Operated Transmitter which "Hams" have long been looking for. It's a dandy for "emergency" and "rural" requirements!

* * *

Due to the great activity in the 5-meter "Ham" bands as well as the new Television transmission in this region, there is a great interest in 5-meter receivers. W2AMN will describe his latest "resistance-coupled" superhet suitable for this work.

* * *

A host of other well-known writers will contribute articles on "Ham" and "Fan" sets, which you dare not miss!

"Grounding" of Tube Shells

The metal shell of the 6A8 must be *grounded* for proper results. However, in the diagram we have not shown the 6C5 metal shield grounded. This has been left *floating* because it permitted the use of a larger coil in the tuned circuit. There is no law against grounding the shield, although better efficiency can be expected with the larger coil and there is less likelihood of the oscillator going out of oscillation. The coils are none too large, therefore the additional inductance permitted by the shield being ungrounded is worthwhile. No shielding was employed other than the use of a metal chassis. The two tuned circuits are sufficiently far apart in frequency to eliminate all danger of undesirable reaction or feed-back between the two circuits.

Doublet or Single-Wire Aerial

We have shown connections for either a *doublet* or a *single-wire* antenna. The single wire antenna should be coupled on to the grid coil of the detector approximately ½ to ¾ of a turn from the *grounded* end. No series condenser was found necessary. The *doublet*, of course, would employ two or three turns coupled to the low-potential end of the detector grid coil. Data for all the coils are clearly given in the drawing.

This converter has proved so interesting and brought forth such favorable comment from those who have had the opportunity of hearing it, that we are now constructing a "complete" *superheterodyne* employing a 6000 kc. I.F. amplifier with this converter circuit and hope to describe it soon.

The size of the tuned circuit in the plate lead of the 6A8 depends entirely upon the I.F. or the frequency of the receiver with which this converter is being operated. The same values employed with the 10-meter converter are used if the I.F. is to be 2000 kc., and, of course, for higher frequencies, smaller values will be employed Reference to an inductance chart will readily indicate the proper size of the coil. We trust that all of our readers of an experi-

mental turn of mind have an inductance chart on hand.

Parts List for Converter

5—.001 mf. mica condensers, Cornell-Dubilier.
2—.0001 mf. mica condensers, Cornell-Dubilier.
3—20 mmf. midget variable condensers, Hammarlund.
1—250 mmf. mica condenser, Cornell-Dubilier.
1—.1 mf. by-pass condenser, Cornell-Dubilier.
1—500,000 ohm resistor, Aerovox.
1—100,000 ohm resistor, Aerovox.
1—10,000 ohm resistor, Aerovox.
1—50,000 ohm resistor, Aerovox.
1—50,000 ohm potentiometer, Electrad.
1—flexible coupling, Hammarlund.
2—octal wafer sockets, Bud.
2—small stand-off insulators, Bud.
1—chassis 5x7x2¾ in., ICA.
1—6A8 tube, RCA Radiotron.
1—6C5 tube, RCA Radiotron.

Ultra-High Frequency Transmitting Tube

(Continued from page 344)

employed. The ratings as an oscillator or amplifier with plate modulation are identical, except that the plate voltage is reduced to 400 and the output is 6.5 watts. This is also for 500 mc.

A relative table for outputs at various frequencies as published by the manufacturer are:

300 mc.	8.5	watts
400 mc.	.8	watts
500 mc.	6.5	watts
600 mc.	.4	watts
750 mc.	limit of oscillation	

The above indicates the nominal output obtainable from a 316-A tube as an unmodulated oscillator, with an input of 400 volts and 80 ma. D.C.

The manufacturers have submitted a circuit complete with recommended values. We have reprinted this diagram for the benefit of those who may be interested in trying this exceptional new tube. Connections to the terminals of the tube have to be made with care. The tube may be supported from the terminals, providing flexibility is maintained. Connectors such as brass or copper sleeves with set-screws can be used for example.

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

New Beat Frequency Oscillator

(Continued from page 344)

In the heat oscillator, the fixed frequency oscillator consists of an Acorn type tube, 954, operated in an electron coupled circuit at 350 kc. The variable frequency oscillator is also a 954, operated in an electron-coupled circuit and operated over the frequency range from 335 kc. to 350 kc., the variation accomplished by a tuning capacitor attached to the main dial.

The output of each oscillator stage is combined and fed into a self-biased 955 detector, which extracts the audio or difference frequency and rejects any r.f. frequencies present. The output from the detector is fed into the output amplifier which is a 955 fixed bias amplifier, having the output control in the grid circuit and a statically shielded output transformer in the plate circuit. This transformer is designed to operate into center-tapped loads of 250, 500, and 5000 ohms impedance. A neon lamp is used as a pilot lamp and by switching, may be connected in the output circuit to act as a frequency indicator for setting the dial scale calibration.

The Twin-Tube Portable

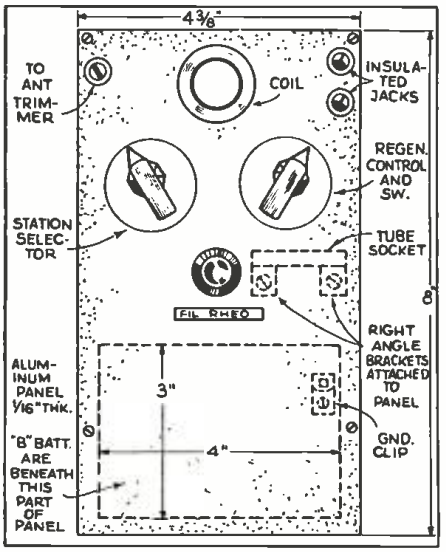
(Continued from page 338)

tip jacks were installed directly to the right of this socket.

Battery Considerations

It was found that 90 volts of "B" battery gave excellent volume, while a flashlight "A" battery containing two cells was sufficient for the filament supply. No "C" battery was necessary. Two of the latest type "B" batteries were used. These are now obtainable in very compact form, measuring only 4" by 3" by 1¼" thick. Two-cell flashlight "A" Battery was placed on the bottom of the case and since this was only 4" long by ¾" in diameter, there was space to spare.

The antenna trimmer was fastened inside the cover on the side close to the hinge, or panel. The antenna lead-in was then connected to the other side of the antenna trimmer, which also had a clip soldered to it.



Front panel Layout.

Upon testing the "Twin-Tube" portable, it was found to have sufficient volume to operate a small magnetic speaker on most of the local stations. At night, it brought in "foreign" stations on the short waves. The set was tested in a city street, using a short length of wire as an aerial, and without a ground, and it brought in not only local broadcasting, but also "police calls" and "amateur" stations.

The entire outfit, including batteries, weighed only slightly over two pounds.

List of Parts—The "Twin-Tube" Portable

C1—Hammarlund Midget antenna trimmer, 3 to 30 mmf, type MEX.
C2—Hammarlund "Star" midget condenser, 140 mmf, type SM-140.
C3—Cornell-Dubilier .0001 mf. moulded mica condenser, type 5W5T1.
C4—Cornell-Dubilier .01 mf. 400 volt "Cub" tubular condenser, type BA 4S1.
C5—Cornell-Dubilier .0005 mf. moulded mica condenser, type 5W5T5.
R1—1 meg. ½ watt carbon resistor. Aerovox.
R2—170,000 ohm, ½ watt carbon resistor. Aerovox.
R3—1 meg. ½ watt carbon resistor. Aerovox.
R4—Electrad rheostat. type 271 W, 50 ohms.
R5—Electrad potentiometer, 75,000 ohms, with switch (SW1) type 202S.
J1, J2—Insulated tip-jacks. Eby.
L1—One set of four-prong short-wave coils, 17 to 270 meters, Hammarlund, type SWK-4.
L1—One 4-prong broadcast coil, 250 to 550 meters, Hammarlund, type BCC4. PB1, BP2. BP3, BP4, BP5, BP6, Fahnestock Clips.
V1—19 type tube, RCA Radiotron.
SW1—Switch on R5.
1—2-cell Flashlight "A" battery.
2—45-volt "super-compact" type "B" batteries, Eveready, size 4" x 3" x 1¼".
1—Aluminum Panel, 1/16" x 8" x 4⅜".

2—Bar knobs; 2 plates: one for station selector, one for regeneration control.
1—Knob for Filament Rheostat.
1—Roll push-back wire.
1—6 Prong wafer socket for 19 tube. Bud.
1—4 Prong wafer socket for Plug-in Coils. Bud.
1—3 ply wood carrying-case, over-all dimensions 8¼" x 5" x 4½" high. Inside dimensions, not including cover. 8" x 4½" x 3" high.
2—Right-angle Brackets to support tube socket.

New Ultra Short Wave Police Radio for Small Cities

(Continued from page 327)

kilocycles) is automatically crystal-controlled, so as to insure stability within 0.025% of the frequency assigned.

Today it is a routine occurrence for a police officer traveling along a public highway in his *cruising car* to lift a telephone "handset" off the hook on the instrument board before him, and converse back and forth with the man on watch at headquarters. No longer is it necessary for him to await an opportunity to call in from a fixed telephone box somewhere along the route. On a moment's notice, headquarters can direct this police car to any point where it may be needed in an emergency, and having arrived there, the officer may report the situation right from the car; summon an ambulance or additional officers if required. In converse manner, if the officers in a cruising "two-way radio car discover an emergency that requires concerted police action, they can notify headquarters instantly, passing on information which will enable other police cars to converge immediately upon the point or to proceed in suitable direction to head off fleeing suspects.

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

Two-Way S-W Talk Between Blimp and Car

(Continued from page 327)

Berggren and Theodore Van Deventer, concerned the great inventor's early work with *wireless telegraphy*. Mr. Berggren recalled Edison's experiments, in 1875, with what he termed "etheric force," a phenomenon caused by electric waves in free space. In 1885, Edison sent messages to and from moving trains by induction and in the same year he took out a patent for a system of wireless telegraphy. At that time, he had succeeded in sending wireless messages for a distance of two and one-half miles through the use of kites. Unfortunately, Edison never completely followed out his experiments, or the world might have had *wireless telegraphy* several years sooner, for it was not until 1887 that Professor Heinrich Hertz announced his discovery of the "Hertzian waves."

The broadcast closed with some remarks on Edison's pioneer work on the motion pictures and the talking movies and a two-way chat from both the blimp and the police car with station LSX in Buenos Aires, a distance of 6,000 miles. Mr. Berggren was closely associated with Mr. Edison in the development of the movies and among the interesting facts he related was that Edison collected one-half cent a foot royalty on all motion picture film for his patent on the small holes along the side which fitted into cogs and prevented the film from slipping as it passed through the projector.

Girl Operators, Attention!

Listen "YL's" and "XYL's"!! Why not send the Editor a good photo of your "Rig"—and don't forget yourself. A separate photo of yourself will do, with a "clear" photo of that station! $5.00 for best "YL" photo.—Editor. See page 649 March issue for details.

When to Listen In

By M. HARVEY GERNSBACK

ALL TIME IS EASTERN STANDARD

GERMANY

● THE German stations have made some changes in their operating schedules. The latest arrangements are: For South Asia 12:05-5:15 a.m. on DJA and DJB. From 5:55-11 a.m. on DJR and sometimes DJB. For East Asia 12:05-5:15 a.m. on DJN and DJE and from 5:55-11 a.m. on DJE and DJQ. For Africa 11:35 a.m.-4:30 p.m. on DJD and DJL. DJC has been discontinued and will not be ordinarily used at all even during the winter. On Sundays DJL is on from 6-7 a.m. for Africa also. For S. America 4:50-10:45 p.m. on DJQ and DJN. For Central America 4:50-10:45 p.m. on DJA. For North America 4:50-10:45 p.m. on DJB, 15.2 mc., and DJD, 11.77 mc. Also on Sundays from 11:10 a.m.-12:20 p.m., on DJB. DJL, 15.11 mc. is frequently heard during the afternoon and evening with a directional aerial for N. America. It is used in place of, and sometimes in addition to DJB. During the month of July the power of the German stations was raised from about 8 kw. to 40 kw., making them about the most powerful regular s-w broadcasters in the world at the moment. There are now 5 separate transmitters available for regular simultaneous operation and for special occasions even more can be borrowed. These stations are now laying down terrifically strong signals in N. America and have completely eclipsed Daventry. The Olympic games were held in Berlin during the first half of August and innumerable special broadcasts for broadcasting agencies all over the world were put out over these stations and also over the telephone stations DZA, DZB, DZC, DZE, DZG and DZH. These latter stations are still very active and can be heard at almost any time.

RADIO PODEBRADY

● THE new 34 kw. Czechoslovakian broadcaster mentioned in this column several times in the last year is at last on the air. It is known simply as "Radio Podebrady" and has been heard testing from July 15th onwards and asking for reports. Announcements are given in English. The following frequencies have been used so far: 15.23 mc., 11.76 mc., and 6.115 mc. The station also has several additional frequencies in these bands and also in the 9.5 mc., and 21.5 mc. bands. It will probably go on a regular schedule shortly. Address is "Radio Podebrady," Czechoslovakia.

BELGRADE

● YUGOSLAVIA has a s-w voice now. It is "Belgrade." No call letters are used. This station has a power of 1 kw. and operates on 6.10 mc. daily from 1-9:30 a.m. and 2:15-6 p.m. Address is S-W Broadcasting Station, Belgrade, Yugoslavia.

NRH

● OUR old friend Senor Amando Cespedes Marin informs that his famous s-w station TI4NRH, at Heredia, Costa Rica, is once again on the air after several years of silence. Old-timers will remember NRH with pleasure. The station is on 9.67 mc. daily from 9-10 p.m., and from 11:30 p.m.-12 m. This schedule will probably be augmented. TIPG in San Jose, Costa Rica, has shifted from 6.41 mc. to 9.55 mc.

NORWAY

● STATION LKJ1 at Jeloy is planning an expansion on about Sept. 1. Test programs for N. America will be broadcast daily from 6-11 p.m. We are not certain whether the old frequency of 9.525 mc. will be employed and whether a more powerful station will be used. At present the power is only about 1 kw.

ITALY

● 2RO at Rome now broadcasts daily on 11.81 mc. from 6:43-10:30 a.m., 11:30

a.m.-5:30 p.m., 6-6:20 p.m., and on Sundays from 6:43-8:55 a.m., 11:30 a.m.-5:30 p.m. The American hour is broadcast now on 11.81 mc. also. This is on Monday, Wednesday and Friday from 6:20-7:30 p.m. The S. American hour is broadcast on Tuesday, Thursday and Saturday, from 6:30-8 p.m., on 9.635 mc.

JAVA

● PLP, Bandoeng, 11.0 mc., and PLO, Bandoeng, 11.49 mc. now broadcast daily from 5:30-10:30 or 11 a.m., 6-7:30 p.m., 10:30 p.m.-2 a.m. And on Saturday from 5:30-11:30 a.m., 7:30 p.m.-2 a.m. (Sunday).

Short Waves and Long Raves

(Continued from page 334)

Bermuda, and Hawaii make any less-sophisticated SW "fan" sit up and grab for a pencil.

I am a member of the *Short Wave League* and will soon be a member of the Inter. 6000-12,500 Mi. DX C. as the necessary three months' report is coming along O.K.

Ned Carman, Jr.,
Zumbrota, Minn.

(This month we are pleased to salute you, Ned, for the very excellent station photo which you have submitted. The outfit looks real snappy and business-like.—Editor.)

N. Y. Listener

"going strong." In the very near future I expect to have over 200 verification cards and letters, because every week I am constantly receiving acknowledgments of my previous reports.

Irving Cohen,
12 Willett St.,
New York City.

(Thanks for your letter, Irving, and we hope to make each successive copy of SHORT WAVE CRAFT *so much better than its predecessors that you will find the magazine still more valuable than in the past.—Editor.)*

Rebuilt Sets

Wishing you continued success,
Louis J. Kingsley,
209 Kingsley Ave.,
Waterloo, Iowa.

(Thanks very much for the photo of your listening post, Louis, and we are glad to know that you have been successful in "revamping" the Federal set with the aid of information published in SHORT WAVE CRAFT.—*Editor.)*

New Bi-Polar Headset

● The new Rex-Bi-Polar Headset, here illustrated, has recently been perfected by the Acme Specialty Co. The two receivers comprising the headset have a total impedance of 20,000 ohms. The shells are of metal with moulded black insulating caps. No protruding screws or nuts appear on the exterior surface of the receivers, the connecting cord passing through a hole in the shell and the connections to the receiver coils are made on the inside of the shell.

The highest quality steel magnets are used to produce a strong bi-polar field, and due to the simplified design of the receiver the air gap between the pole-piece and the diaphragm is accurately maintained at all times. The caps on the receiver are well shaped so as not to catch in the hair and the headband is so arranged that the receivers can be moved up and down so as to fit the head closely.

The whole headset is very light and weighs 7 ounces.

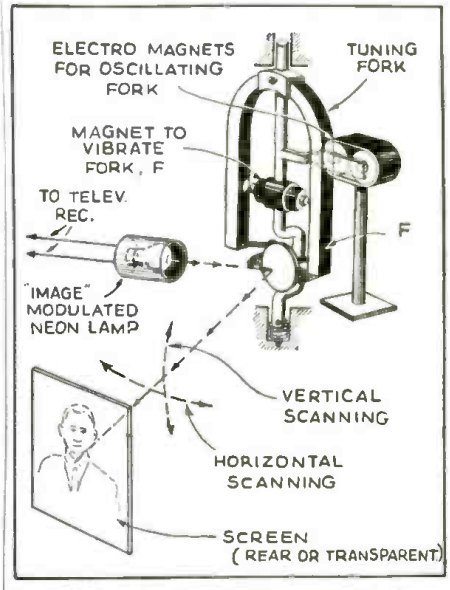
Substantial woven fabric covers the metal bands passing over the top of the head, making the headset very comfortable. This article has been prepared through data supplied by courtesy of the Acme Specialty Co.

"Looking In" at the New 6-Meter Television Images

(Continued from page 332)

tween the voice and image frequencies, the setting of the detector and oscillator condensers is also fixed, and these are ganged to a single tuning knob. The difference between the oscillator frequency and the image frequency gives one *difference* frequency, which is accepted through a set of tuned I.F. stages corresponding to that I.F. frequency. *Secondly*, the difference between the received voice frequency and the *common* oscillator frequency, produces another and different I.F. frequency and this is accepted by a series of tuned I.F. stages set at that particular frequency, as Fig. 4 shows schematically. The voice frequency passes on through a second detector and a stage or two of audio frequency and thence into a loud-speaker.

Tracing the path of the *image* frequency, we follow it through say two stages of I.F. frequency, a second detector and then through two or three stages of high-fidelity resistance-coupled audio (video) stages. When the *image* frequency emerges from the last audio (video) stage it may be connected to a Kerr cell or light valve, which comprises two small metal plates immersed in a nitrobenzol solution in a small glass cell; or following RCA and the Don Lee practice, this image output would be connected to a cathode ray tube. The circuits of the Zworykin Kinescope scanner and sweep oscillators are shown in Fig. 5. Space does not permit going into a detailed description as to just how all of these circuits work, but by studying the *cathode-ray tube manual* published by RCA and briefly referred to, as well as Mr. Halloran's new treatise on "*Television with Cathode Rays*,"



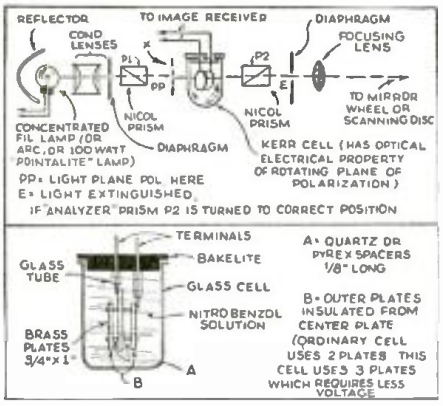
One form of vibrating scanner is shown above. It is that patented by Melchor Centeno V. (See text for Pat. No.)

and also referring to some of the past excellent papers presented before the Institute of Radio Engineers,[3] a considerable

[3]See Dec. 1933, Nov. 1934, and March 1936, Proceedings of the Institute of Radio Engineers; available at your local Public Library, or the Institute of Radio Engineers, 33 W. 39 St., New York City, $1.00 per copy.

amount of valuable information can be obtained, which will enable the experimenter to hook up a cathode-ray tube, even though it is not of the exact television type used by Dr. Zworykin, in order to have a "look" at these new high-fidelity 6-meter images.

A few words about the superhet receiver as mentioned by Mr. Halloran in connection with the Zworykin-RCA system of reception. The receiver is an ultra short-wave superhet with two coupled R.F. stages, which can be tuned over the band from 40 to 80 mc., and broad enough to pass a 4000 Kc. band. Next comes a heterodyne oscillator beating against the received



Example of Kerr cell set-up: P1 set at about 30° to the plates in Kerr cell. P2 then rotated on its axis until plane of polarization is in such a position that no light passes through the prism P2. If about 300 volts is applied, plane of polarization is rotated until light will pass through analyzer P2. Diaphragm at X may be necessary to prevent light passing by plates in cell (i.e., not confined between them.) Nitro-benzol must be clear for best results (double distilled) or super-redistilled form. Keep open flame away as it is inflammable.

carrier, to produce a 7 mc. I.F. The picture amplifier system comprises five I.F. stages tuned to 7 mc. and capable of producing an over-all gain of 10,000 to a 4,000 Kc. band at 90 per cent maximum amplitude. Next comes A.V.C. in parallel with the last I.F. stage, second detector, and a *video* or picture frequency amplifier, with two resistance-coupled stages.

As the synchronizing impulses are sent along regularly with the image components, the Kinescope receiver requires a special filter for separating the synchronizing components from the picture. The synchronizing pulses are applied to the grids of the deflector oscillators, and the picture components of the receiver image current are applied to the grid of the Kinescope cathode-ray tube.

The I.F. frequency for the voice amplifier in the Zworykin system is 6 mc. To avoid any chance of interference between the image and voice currents, special rejector circuits are coupled to the second and third I.F. transformers in the image amplifier. Another interesting thing for the experimenter to know, in case he attempts building a superhet of the type being described, is that the transformers in the I.F. stages, in order to give a 4000 Kc. band-pass characteristic, are wound with resistance wire and the coupling between the primary and secondary windings is varied so as to give a flat-top response curve. The Kinescope video amplifier gives an approximate uniform response over a band extending from 25 cycles to 2000 Kc.

The synchronizing pulses transmitted on the RCA system are much stronger than the image pulses and as Fig. 5 shows, a filter circuit "C" is used to separate the synchronizing pulses. Not only does this circuit, "C," block the video or image currents from the sweep oscillator circuits A

Book Review

The "RADIO" HANDBOOK, by Frank C. Jones. Neatly bound, 6x9x⅝ inches, and contains 360 pages. Published by Pacific Radio Publishing Co.

This is an excellent treatise on short-wave Amateur radio and covers practically every phase of the art. It is profusely illustrated with diagrams and photos covering nearly every conceivable type of receiver and transmitter, together with fundamental explanations of various types of circuits of transmitting and receiving apparatus.

Data charts are given covering tubes and various coil-condenser combinations for different circuits and for each of the amateur bands. Special attention is also paid to ultra-high frequency apparatus; many of the latest radio developments are thoroughly explained.—G.W.S.

The Cathode Ray Oscillograph in Radio Service Work—National Union Type 3-5 cathode ray oscillograph instruction book.

This instruction book is a very useful one and contains diagrams of the different figures to be observed on the target of the tube and their meaning; also descriptions of the various controls, such as that for frequency, focusing, anode voltage, amplitude, etc., and also shows a diagram of the complete oscillograph hook-up. The method of using the oscillograph for the visual alignment of radio sets, determining vacuum tube characteristics, frequency, response of audio amplifiers and radio sets are discussed.

The Editors Want

articles describing in detail Television receivers on which short-wave experimenters may pick up the television images being broadcast by the RCA Station, atop the Empire State Bldg., in New York City, on about 6 meters, and also those being broadcast from the Don Lee Station on a similar wavelength in California. All articles accepted and published will be paid for at regular space rates. Send outline of article and what photos or diagrams available to: The Editor, Short Wave Craft, 99 Hudson St., New York, N.Y.

and F, but it must also discriminate between the 24 cycle and the 5760 cycle vertical and horizontal synchronizing signals and route them to the respective horizontal and vertical deflecting sweep circuits.

The RCA image transmission is avowedly purely experimental, and no attempt is made to give out any information as to when images are broadcast for the official test stations to pick up, nor what kind of scanning is used, sequential or interlaced. So the dyed-in-the-wool "television experimenter" will have plenty to do in endeavoring to pick up these images; he should make a study of the different methods of scanning, including the *interlaced* method, so that he can arrange apparatus suitable for trying out all these different methods. Also, when the experimenter builds up any sweep oscillators, he should arrange them as shown in some of the books referred to, with *adjustable* frequency sweep circuits so that different scanning frequencies may be instantly available.

Notes on Scanning

The data supplied by the Don Lee television station, mentions that the high-frequency saw-tooth oscillator used in connection with the cathode-ray tube should develope 7200 cycles (300 lines at 24 frames per second), and the low scanning frequency oscillator a saw-tooth wave having a frequency of 24 cycles. The 7200 cycle sweep frequency current is applied to the pair of horizontal deflection plates in the cathode ray tube, and the 24 cycle sweep frequency is connected with the pair of vertical deflection plates. Reverse the connections to the low-frequency deflection plates if the image should appear upside down. Reverse the connections to the high-frequency plates if printing reads backwards on the screen. The Don Lee transmitter radiates a negative image and if the particular receiver used causes a *negative* image to appear on the screen of the cathode ray tube, the thing to do then is to use one *more* or *less* stages of audio (video) frequency amplification following the second detector, which will give the proper positive image. The Don Lee transmission includes synchronization impulses at the end of each line and also at the end of each complete image, for maintaining the receiver scanning sources in step at the 7200 and 24 cycle frequencies respectively. A fractional part of the image signal should be supplied to the grids of the gas triode tubes (885) to synchronize the sources.

The circuit Fig. 6 shows one method of separating the picture signals from the synchronizing components, by means of a condenser, "C", connected in series with the high resistance, "R." The 24-cycle and 5760-cycle pulses are separated in a similar circuit to that used in the Zworykin system, and these synchronizing pulses are then applied to the auxiliary grids of the two sweep oscillator tubes.

* * *

The arrangement of the lens disc with a Neon crater tube, for example, is shown in Fig. 7. For rotating the disc at the proper speed, 24 R.P.S. (for 24 frame scanning) a special synchronous motor might be used, or else an ordinary motor to the shaft of which is attached a special synchronizing motor of the phonic wheel type—this later device being supplied with synchronizing pulses as transmitted from the station. Even a battery motor could be used, with a storage battery to maintain a constant voltage.

Another method of *scanning* involves the employment of a series of glass tubes, or a continuous spiral of them, the Neon filled tube having small external tin-foil segments, all of these segments being progressively connected into the receiver circuit by a large commutator or rotary switch, driven by a synchronous motor as shown in Fig. 8.

Fig. 9 shows the use of a scanning disc, either of the pin-hole or lens type, together with a neon tube and an ordinary, as well as a synchronizing motor, the latter receiving the synchronization pulses through a special filter system.

Those interested in a vibrating mirror type of scanner, which has received considerable attention by several leading television experts recently, would do well to procure copies of the patents[5] issued to Melchor Centeno V, as they present a very elaborate study of mirror scanners; Fig. 10 shows one of the simplest scanners, in which a mirror is vibrated in one direction by the legs of a tuning fork, and in the second direction by a periodically interrupted electrical magnet system.

[5] U.S. Patents Nos. 1,800,601; Re. 18,761; 1,873,696. Send 10c for copy of each patent wanted to U.S. Patent Office, Washington, D.C.

The "R.E.C." 20 Watt CW Transmitter

(Continued from page 341)

end of the coil. If this does not provide sufficient coupling, it may be necessary to add a turn or two in order to obtain the maximum amount of coupling.

In the testing of this transmitter, it was found that the amplifier oscillated by itself when connected in the usual manner. At first it was thought that grounding the tube shields would eliminate this fault, but when it was tried no success was encountered. Then by-passing the shields to ground was tried and the self oscillations stopped completely. Hence, this is the reason for the .01 m.f. mica condensers connected from the shields to ground.

Tuning Up

The correct method of tuning procedure for the oscillator is to turn the mica cathode tuning condenser from its maximum capacity position to its minimum capacity. This is done by taking an insulated screwdriver and turning the adjustment screw on the condenser to the left, until there is a sudden change in the plate current. The plate tuning condenser is then adjusted for minimum current which is approximately 15 milliamperes. After these preliminary adjustments, the stage is ready to be coupled to the grid circuit of the amplifier.

The tuning meter plug should now be put in the middle jack, so that the amplifier grid current can be ascertained. The grid condenser is then rotated until there is a rise in the current, at which point the oscillator is delivering power to the amplifier. The final adjustment on the oscillator can be made now, and is quite important, since it was found that by decreasing the cathode tuning capacity, greater output was obtained. The mica condenser should therefore be turned until the maximum grid current is flowing.

With the completion of these adjustments it is only necessary to bring the amplifier plate tank into resonance and the set is functioning properly.

Antenna Selection

The correct type of antenna to use with this transmitter depends, of course, upon the location of the builder. If the roof of an apartment house is to be used, it will probably be necessary to use a half-wave Hertz antenna with either a single wire feed, inductively coupled or else directly coupled to the plate tank coil.

Another arrangement that works very efficiently, is the Hertz antenna which uses a Zeppelin type feeder. One of the feeders is connected to the flat-top, while the other one is left free. While this system requires additional parts, it is worthwhile because of its higher efficiency.

Coil Data

BAND	OSC. CATH.	OSC. PLATE	AMP. GRID	AMP. PLATE
80 m.	16	27	27	21
40 m.	16	17	17	21

Wound on porcelain form 2¼ inches in diameter. No. 14 tinned bus bar wire or enameled.

Osc. Cath., Osc. Plate, and Amp. Grid Coils are close wound with No. 20 D.S.C. wire.

Read This! You "QSL" Card Hounds!

Editor, SHORT-WAVE CRAFT:

Being driven almost to the point of desperation, you will do me a favor if you will publish my observations regarding short-wave listeners in your vast and thickly populated country.

Along with a lot more VK amateurs, I have been taking advantage of the spell of good trans-Pacific 20 meter conditions, to indulge in some excellent two-way phone chats with the gang in U.S.A. Altogether I have worked, on 20 meter phone, around 350 Americans and Canadians, and this quite casually. Invariably the question of a QSL card comes up and no genuine amateur will accept a card from the other fellow with whom he has worked, without sending along his own. It just isn't done. But there is the ever increasing question of the S.W.L. (Long may he live). Listeners in U.S.A. using dial or all-wavers (or bloopers) suddenly hear an Australian amateur's voice appearing from nowhere, so to speak, and they naturally write in their exuberance to report the fact. This is all very nice and fine, but a goodly majority don't have the good sense to include postage for a reply. Many do, and they get replies (at least from myself) even if these replies take some time to handle. Imagine what some of us are faced with down here. In my own case, I have received close on 600 SWL (excluding Ham) QSL reports from U.S.A. alone, to say nothing of other countries. This is in the space of roughly three months activity on phone on 14,300 kc. Believe you me, they take some answering. Now, as a layman of 25 years experience, I know the great fascination it must be for a newcomer in radio to suddenly receive an amateur phone clearly from a great distance.

There is no greater supporter of the S.W.L. than I am, for they are all prospective amateurs. The greater the number of amateur transmitters in this world, the greater a future argument among young (and old) men for a peaceful world. Fellows who have exchanged ideas over the air, are not likely to be bamboozled into talking to the other fellow some day behind machine guns and barbed wire! The best thing pretty-colored-shirt Dictators could do, would be to train their youth in "Ham" radio, and to give them wider frequencies and better facilities for international working.

I am getting away from my point though. Many S.W.L.'s complain that VK Hams don't QSL. If the S.W.L. sends the International coupon or stamps, the Australian will surely reply. If the S.W.L. is obviously just a card hunter, and sends a scrappy almost illegible scrawl of a few words, with little or no bearing on his reception and the apparatus he was using etc. accompanied by no covering postage; what can he expect? It costs an Australian 3d (6 cents in U.S. coin) for every letter he mails to U.S.A. Reckon up my 600 reports alone. That make £7/10—(about $36.00) worth of postage, without considering the cost of cards and envelopes. All the S.W.L.'s who have sent me report will eventually hear from me, even if many months elapse, but I know that many VK's are not in a financially equipped position to do likewise.

For the benefit of S.W.L.'s in various parts of U.S.A. who have written me for information of my power used for my 20 meter phone transmissions:—Input to the final stage, which is an Elmac 50T, never exceeds 80 watts. Modulation is Class B, with four 46's, two in parallel per side. The antenna system now in use is a Jones multi-band type, but previous to the month of May, I was using a vertical twisted-pair doublet. Not much will be heard from me on 20 meter phone for some time, as I am getting ready for an onslaught on 5 meter DX. Several of us Australians have hopes of getting across the Pacific on "Five" sooner or later.

Incidentally, I think "Short-wave Craft" is a remarkably good magazine, as it has some excellent tips for "Hams," particularly from the pen of W2AMN.

yours sincerely,

Don B. Knock, VK2NO.
Radio Editor
"The Bulletin".

Vice President, N.S.W. Division, Wireless Institute of Australia.

The Ideal Transceiver—Uses Split 6A6 Circuit

(Continued from page 342)

from the *transmitter* to the *receiver*. A separate switch for the "B" is used and was found very useful in saving the "B" batteries when operating mobile. The *volume control* is automatically cut out when transmitting and only acts as a fixed 100,000 ohm resistor across the secondary of the mike transformer.

Testing the Receiver

To test the receiver, connect the cable from the set to the respective voltages and allow the filaments to heat up. Turn on the "B" switch, with the anti-capacity switch on the receiving side, and advance the volume control. A strong "hiss" will indicate that the receiver is working. Connect a six volt lamp in series with a loop of wire, ⅝ inch in diameter, and hold it near the transmitting tank coil. With the transmitting side on, the lamp will light up if the transmitter is functioning. When speaking into the mike, the brilliancy of the lamp will fluctuate with the voice modulation. Two separate antennas were used for receiving and transmitting, but a single antenna gave equally good results. When a single antenna was used, the oscillator and detector antenna condensers were connected together. Best results were obtained when using 250 volts on the plates.

The "Split 6A6 Transceiver" was designed and built by the author, and tested and successfully used by Leon Halpern, W6MXA.

List of Parts

C1, C5—Mica trimmer condensers, Hammarlund
C2, C6—.000015 mf. Midget variable condensers with mounting brackets
C7, C8—.006 mf. fixed mica condensers, Cornell Dubilier
C3, C4—.0025 mf. mica fixed midget condensers, Cornell Dubilier
C9—.1 mf. paper condenser. 400 volts, Cornell Dubilier
C10—1 mf. dry electrolytic condenser. 400 volts. Cornell Dubilier
C11—25 mf. 50 volt dry electrolytic condenser. Cornell Dubilier
R1—.25 meg. 1 watt IRC
R2—10,000 ohms. 1 watt IRC resistor
R3—2500 ohm, 1 watt IRC resistor
R4—600 ohm, 1 watt IRC resistor
R5—100,000 ohm variable resistance. Electrad
T1—single-button mike and single plate-to-grid transformer. Thordarson. (Regular "Transceiver" Transformer.)
T2—3½ to 1 audio transformer. Thordarson
CH—20 henries 85 ma. choke, Thordarson
2—single-circuit jacks, Bud
2—stand-off insulators, Bud
1—5 prong isolantite socket. Hammarlund
1—6 prong isolantite socket Hammarlund
1—7 prong isolantite socket. Hammarlund
1—4-pole. double-throw anti-capacity switch
2 RFC (see text)
L1, L2 (see text)
Chassis and shield cans (see text)
2—couplers for condenser shafts
1—"on" & "off" switch
2—dial plates with knobs
1—6A6 tube, RCA Radiotron
1—42 tube. RCA Radiotron
1—76 tube, RCA Radiotron

• • • SHORT WAVE ESSENTIALS

FOR MEMBERS OF THE SHORT WAVE LEAGUE • • •

Application for Membership SHORT WAVE LEAGUE

SHORT WAVE LEAGUE 10-36
99-101 Hudson Street, New York, N. Y.

I, the undersigned, herewith desire to apply for membership in the SHORT WAVE LEAGUE. In joining the LEAGUE I understand that I am not assessed for membership and that there are no dues and no fees of any kind. I pledge myself to abide by all the rules and regulations of the SHORT WAVE LEAGUE, which rules you are to send to me on receipt of this application.

I consider myself belonging to the following class (put an X in correct space): Short Wave Experimenter ☐ Short Wave Fan ☐ Radio Engineer ☐ Student ☐

I own the following radio equipment:

Transmitting .....

Call Letters .....

Receiving .....

Name .....

Address .....

City and State .....

Country .....

I enclose 10c for postage and handling for my Membership Certificate.

A FEW WORDS AS TO THE PURPOSE OF THE LEAGUE

The SHORT WAVE LEAGUE was founded in 1930. Honorary Directors are as follows:

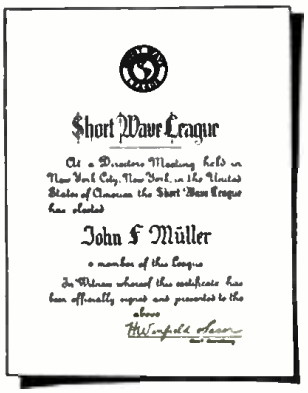
Dr. Lee de Forest, John L. Reinartz, D. E. Replogle, Hollis Baird, E. T. Somerset, Baron Manfred von Ardenne, Hugo Gernsback, Executive Secretary.

The SHORT WAVE LEAGUE is a scientific membership organization for the promotion of the short wave art. There are no dues, no fees, no initiations, in connection with the LEAGUE. No one makes any money from it; no one derives any salary. The only income which the LEAGUE has is from its short wave essentials. A pamphlet setting forth the LEAGUE'S numerous aspirations and purposes will be sent to anyone on receipt of a 3c stamp to cover postage.

FREE MEMBERSHIP CERTIFICATE

As soon as you are enrolled as a member, a beautiful certificate with the LEAGUE'S seal will be sent to you, providing 10c in stamps or coin is sent for mailing charges.

Members are entitled to preferential discounts when buying radio merchandise from numerous firms who have agreed to allow lower prices to all SHORT WAVE LEAGUE members.



If you wish your name engraved on the Free membership certificate, as illustrated above, please send 25c to cover cost.

SHORT WAVE ESSENTIALS LISTED HERE SOLD ONLY TO SHORT WAVE LEAGUE MEMBERS

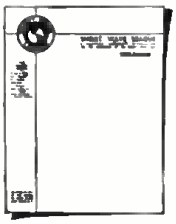
They cannot be bought by anyone unless he has already enrolled as one of the members of the SHORT WAVE LEAGUE or signs the blank on this page (which automatically enrolls him as a member, always provided that he is a short wave experimenter, a short wave fan, radio engineer, radio student, etc.).

Inasmuch as the LEAGUE is international, it makes no difference whether you are a citizen of the United States or any other country. The LEAGUE is open to all.

SHORT WAVE LEAGUE LETTERHEADS

A beautiful letterhead has been designed for members' correspondence. It is the official letterhead for all members. The letterhead is invaluable when it becomes necessary to deal with the radio industry, mail order houses, radio manufacturers, and the like; as many houses have offered to give members who write on the LEAGUE'S letterhead a preferential discount. The letterhead is also absolutely essential when writing for verification to radio stations either here or abroad. It automatically gives you a professional standing.

A—SHORT WAVE LEAGUE letterheads, per 100..... **50c**



A—50c per 100

OFFICIAL SHORT WAVE LISTENER MAGAZINE

The finest magazine of its kind ever published—totally different in get-up and contents from any other. Contains the largest listing of short wave stations in the world, up-to-the-minute, including "Police," "Television" and short-wave stations, as well as a special list of the star short-wave stations with their frequencies and call letters. Also contains photos and descriptions of short-wave broadcasting stations in various parts of the world with photos of short wave studio artists—How to locate "weak" distance stations, and other hints for the "short-wave listener"—Question and Answer Department for the "listener"—Silver Cup Trophy for best photo of readers' listening "Posts," etc etc

B—Official Short Wave Listener Magazine.....Prepaid **15c**

B—15c per copy

RADIO MAP OF THE WORLD AND STATION FINDER

The finest device of its kind published. The world's map on heavy board is divided into 23 sections, while the rotary disc shows you immediately the exact time in any foreign country. Invaluable in logging foreign stations. Also gives call letters assigned to all nations. Size 11"x22".

C—Radio Map of the World and Station Finder.....Prepaid **25c**

GLOBE OF THE WORLD

This highly important essential is an ornament for every den or study. It is a globe, 6 in. in diameter, printed in fifteen colors, glazed in such a way that it can be washed. This globe helps you to intelligently log your foreign stations. The base is of solid walnut, and the semi-meridian of a nickel-like metal. Entire device substantially made, and will give an attractive appearance to every station, emphasizing the long-distance work of the operator.

D—Globe of the World.....Prepaid **89c**

SHORT WAVE LEAGUE LAPEL BUTTON

This beautiful button is made in hard enamel in four colors, red, white, blue and gold. It measures three quarters of an inch in diameter. By wearing this button, other members will recognize you and it will give you a professional air. Made in bronze, gold filled, *not plated*. Must be seen to be appreciated.

E—SHORT WAVE LEAGUE lapel button.....Prepaid **35c**

EE—SHORT WAVE LEAGUE lapel button, like the one described above but in solid gold.....Prepaid **$2.00**

C—25c each

SHORT WAVE LEAGUE SEALS

These seals or stickers are executed in three colors and measure 1¼ in. in diameter, and are gummed on one side. They are used by members to affix to stationery, letterheads, envelopes, postal cards and the like. The seal signifies that you are a member of the SHORT WAVE LEAGUE. Sold in 25 lots or multiples only.

G—SHORT WAVE LEAGUE seals.....per 25, Prepaid **15c**

SHORT WAVE MAP OF THE WORLD

This beautiful map, measuring 18x26 in. and printed in 18 colors is indispensable when hung in sight or placed "under the glass" on the table or wall of the short wave enthusiast. It contains a wealth of information such as distances to all parts of the world, political nature of the country in which a broadcast station is located, etc., and from the manner in which the map is blocked off gives the time in different parts of the world at a glance.

F—SHORT WAVE Map of the World.....Prepaid **25c**

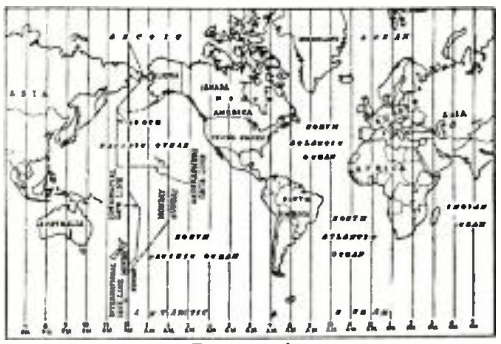
PLEASE NOTE THAT ABOVE ESSENTIALS ARE SOLD ONLY TO MEMBERS OF THE LEAGUE—NOT TO NON-MEMBERS WITH EXCEPTION OF ITEM B.

Send all orders for short wave essentials to SHORT WAVE LEAGUE, 99-101 Hudson Street, New York City.

If you do not wish to mutilate the magazine, you may copy either or both coupons on a sheet of paper.

SHORT WAVE LEAGUE 99-101 Hudson St., New York, N. Y.

G—15c for 25



F—25c each

D—89c each

E—35c each

SHORT WAVE LEAGUE, 99-101 Hudson Street, New York, N. Y.
Gentlemen:
I am already an enrolled member in the SHORT WAVE LEAGUE ☐
I am a new member and attach my application to this coupon ☐
Please send me the following short wave essentials as listed in this advertisement:

.....

.....

.....

.....

for which I enclose $..... herewith.
(The LEAGUE accepts money order, cash or new U. S. Stamps in any denomination. Register cash and stamps.)

Name .....
Address .....
City and State .....
Country .....

10-36

Short Wave Scout News

(*Continued from page* 348)

Swedish amateur SM5SX in Stockholm can be heard in late evenings.

New veries received are IAC, 8380 kc., HPSK, KA1AK.

Lots of "DX" to all readers of *Short Wave Craft*, and I shall appreciate hearing from some of my new friends.

Samuel Solito,
303 Beaver St.,
Leetsdale, Pa.

News from Freeport, Pa.

● THE 49-meter band has now become covered with summer static. Therefore, most of my listening is done on the 30-31, 25, 19 and 16 meter bands.

PHI, 17.77 meg., is not putting over the signal they were putting across on the same wave length last year. Germany is occasionally using DJL, 15.11 meg. in place of DJB for the evening (North American) programs. They come in with a bang!

There is a new phone station in Central America located at Salvador, (El. Salvador) on 13.41 meg. They work WNC in the mornings and afternoons.

"From the Mail":

Last month it seems that 2RO tested on 11.81 meg. for the afternoon programs, but did not settle there. They seem to have made up their minds now, so the schedule is as follows:

11.81 meg.—6:45-10:30 a.m.—11:30 a.m. to 5:30 p.m., also 6 p.m. daily, except Sundays, till 7:45 p.m.

IAC on 12.80 meg. sometimes is used with 2RO to send special programs to the U. S.

Here is a list of the stations in Switzerland: HBH, 18.48 meg.; HBJ, 14.54 meg.; HBO, 11.38 meg.; HBL, 9.59 meg.; HBP, 7.79 meg., and any one of these frequencies may be used when there is a program from Switzerland. So start "dialing" when you hear of a program from Switzerland.

JVH, 20.55 meters, 14.60 meg. is being heard well all over the United States. They broadcast every night at midnight until 1:00 a.m. Mondays and Thursdays from 4:00 to 5:00 p.m., Tuesdays and Thursdays 2:00 to 3:00 p.m.

W8XK and W1XK, Westinghouse stations do not verify any more, the reason being that their programs are printed in many foreign and local newspapers.

Angelo Centanino,
Freeport,
Pa.

Brecksville, Ohio, Report

Date	Time	Call	K.C.	Location	Remarks
June	p.m.				
28	8:05	DJB	15,200	Germany...	Very loud, steady and clear
28	8:10	DJD	11,770	Germany...	Very loud
28	8:20	TPA4	11,715	France.....	Loud and clear
29	6:50	DJB	15,200	Germany...	Very, very loud
30	8:15	DJB	15,200	Germany...	Very loud and clear
30	10:40	GSC	9,580	England...	Very loud. Clear
July					
1	7:45	PCJ	9,590	Holland....	Very loud. Clear
3	10:40	HJU	9,510	Colombia, S.A.....	Loud. Some fading
3	10:45	DJD	11,770	Germany...	Loud, but faded
3	10:50	GSF	15,140	England...	Steady, but weak
3	10:55	DJB	15,200	Germany...	Steady, but weak
4	11:05	W3XAL	17,780	U. S.....	Very, very loud
6	7:20	2RO	9,635	Italy.....	Loud, but choppy
6	7:30	GSC	9,580	England...	Loud, but choppy
6	7:40	COCH	9,428	Cuba.....	Fair, but steady

Reception during the day has been very poor during this period. And during the hot spell, it was poor at all hours.

A great many commercial phone stations were heard during the evening, but could not be identified. Listened to one new station testing for over an hour, but could not understand the call.

In general reception has been best on the 19 meter band.

Have received some unusual QSL cards from some of the boys in Australia, New Zealand and England.

Very truly yours,
EDWARD M. HEISER,
Route 2, Box 124,
Brecksville, Ohio.

Here are the Six BEST SHORT-WAVE RADIO BOOKS!

Without doubt you will have to go a long way to buy better books on short waves than you find on this page. Each book is written by a well-known authority on short waves . . . each book has been carefully illustrated with photographs and diagrams to make the study of this field of radio much simpler. The volumes on this page are the finest books on short-waves which are published anywhere today. Order one or more copies today . . . find out for yourself how fine they are. Prices are postpaid.

How to Get Best Short-Wave Reception

By M. HARVEY GERNSBACK

This book tells you everything you ever wanted to know about short-wave reception.

The author, a professional radio listener and radio fan for many years, gives you his long experience in radio reception and all that goes with it.

Why is one radio listener enabled to pull in stations from all over the globe, even small 100 watters, 10,000 miles away, and why is it that the next fellow, with a much better and more expensive equipment, can only pull in the powerful stations that any child can get without much ado?

The reason is intimate knowledge of short waves and how they behave. Here are the chapters of this new book:

1. What are Short Waves and what can the listener hear on a short-wave receiver or converter?
2. How to tune and when to listen in on the short waves.
3. How to identify short-wave stations.
4. Seasonal changes in short-wave reception.
5. Types of receivers for short-wave reception.
6. Aerial systems for short-wave receivers.
7. Verifications from short-wave stations.

The book makes excellent reading matter. There are many tricks in short-wave reception that even some of the "old-timers" do not know. Be sure to get it.

40 Illustrations, 72 Pages. Stiff, flexible covers **50c**

HOW TO BUILD AND OPERATE SHORT-WAVE RECEIVERS

THIS is the best and most up-to-date book on the subject. It is edited and prepared by the editors of SHORT WAVE CRAFT, and contains a wealth of material on the building and operation, not only of typical short-wave receivers, but short-wave converters as well. Dozens of short-waves sets are found in this book, which contains hundreds of illustrations; actual photographs of sets built, hookups and diagrams galore.

This book is sold only at a ridiculously low price because it is our aim to put this valuable work into the hands of every short-wave enthusiast.

We know that if you are at all interested in short waves you will not wish to do without this book. It is a most important and timely radio publication.

150 Illustrations, 72 Pages. Stiff, flexible covers **50c**

THE SHORT-WAVE BEGINNER'S BOOK

HERE is a book that solves your short wave problems—leading you in easy stages from the simplest fundamentals to the present stage of the art as it is known today. It is the only low-priced reference book on short waves for the beginner.

The book is profusely illustrated—it is not "technical." It has no mathematics and no technical jargon.

It also gives you a tremendous amount of important information, such as time conversion tables, all about aerials, noise elimination, all about radio tubes, data on coil winding and other subjects.

Partial List of Contents

Getting Started in Short Waves—the fundamentals of electricity. Symbols, the Short Hand of Radio—how to read schematic diagrams. Short Wave Coils—various types and kinds in making them.

Short Wave Aerials—the points that determine a good aerial from an inefficient one.

The Transposed Lead-in for reducing Static.

The Beginner's Short-Wave Receiver—a simple one tube set that anyone can build.

How to Tune the Short-Wave Set—telling the important points to get good results.

Audio Amplifiers for S-W Receivers.

Learning the Code—for greater enjoyment with the S-W set.

Wave length to Kilocycle Chart.

Wire Chart—to assist in the construction of coils.

25c **75 Illustrations, 40 Pages. Stiff, flexible covers**

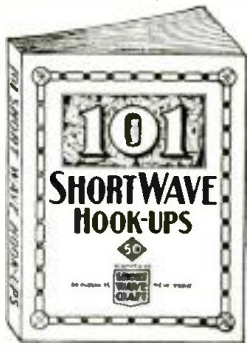
101 SHORT-WAVE HOOKUPS

Compiled by the Editors of SHORT WAVE CRAFT

EACH and every hook-up and diagram illustrated is also accompanied by a thorough explanation of what this particular hook-up accomplishes, what parts are required, coil-winding information, values of resistors, etc., in fact, everything you want to know in order to build the set or to look up the data required.

To be sure, all of the important sets which have appeared in print during the past five years are in this valuable book. Sets such as the Doerle, Dinsmore, the "19" Twinplex, Oscillodyne, Denton "Stand-by," Megadyne Triplex 2, "Globe-Trotter," 2-Tube Superhet, Minidyne, "Loop" Receiver, "Doerle" 2-tube Battery, "Doerle" 2-tube Battery, "Doerle" 2-tube A.C., "Doerle" 3-tube A.C. Doerle "Signal Gripper," Duo R.F. 4-tube Receiver, The Sargent 9-33 Tapped Coil Receiver, Globe-Girdler 7, The 2-Tube "Champ"—2 Tubes Equal 3, Ham-Band "2-Tube Pee-Wee" Wyeth All-Way 6, Denton Economy 3, 2-Tube "Regenerative-Oscillodyne" will be found here, with full descriptions. In many cases, we have also included a picture hook-up for those who do not wish to follow the regular symbolic hook-up, but wish to have a regular wiring diagram.

This is a very handy volume, especially for those "fans" who wish to study the best sets in the short-wave art, from one tube up to ten tubes.



100 Illustrations, 72 Pages, Stiff, flexible covers **50c**

HOW TO BECOME AN AMATEUR RADIO OPERATOR

WE chose Lieut. Myron F. Eddy to write this book because his experience in the amateur field has made him pre-eminent in this line. For many years he was instructor of radio telegraphy at the R.C.A. Institute. He is a member of the I.R.E. (Institute of Radio Engineers), also the Veteran Wireless Operators' Association.

If you intend to become a licensed code operator, if you wish to take up phone work eventually—this is the book you must get.

Partial List of Contents

Ways of learning the code. A system of sending and receiving with necessary drill words is supplied so that you may work with approved methods. Concise authoritative definitions of radio terms, units and laws. Brief descriptions of commonly used pieces of radio equipment. This chapter gives the working terminology of the radio operator. Graphic symbols are used to indicate the various parts of radio circuits. General radio theory particularly as it applies to the beginner. The electron theory is briefly given, then waves—their creation, propagation and reception. Fundamental laws of electric circuits, particularly those used in radio are explained next and typical basic circuits are analysed. Descriptions of modern receivers that are being used with success by amateurs. You are told how to build and operate these sets. Amateur transmitters. Diagrams with specifications are furnished so construction is made easy. Power equipment that may be used with transmitters and receivers, rectifiers, filters, batteries, etc. Regulations that apply to amateur operators. Appendix which contains the International "Q" signals, conversion tables for reference purposes, etc.

50c **150 Illustrations, 72 Pages, Stiff, flexible covers**

TEN MOST POPULAR SHORT-WAVE RECEIVERS

—HOW TO MAKE AND WORK THEM

THE editors of SHORT WAVE CRAFT have selected ten outstanding short-wave receivers and these are described in the new volume. Each receiver is fully illustrated with a complete layout, pictorial representation, photographs of the set complete, hook-up and all worth-while specifications. Everything from the simplest one-tube set to a 5-tube T. R. F. receiver is presented. Complete lists of parts are given to make each set complete. You are shown how to operate the receiver to its maximum efficiency.

CONTENTS

The Doerle 2-Tube Receiver That Reaches the 12,500 Mile Mark, by Walter C. Doerle.

2-R.F. Pentode S-W Receiver having two stages of Tuned Radio Frequency, by Clifford E. Denton and H. W. Secor.

My de Luxe S-W Receiver, by Edward G. Ingram.

The Binneweg 2-Tube 13,000 Mile DX Receiver, by A. Binneweg, Jr.

Build a Short-Wave Receiver in your "Brief-Case," by Hugo Gernsback and Clifford E. Denton.

The Denton 2-Tube All-Wave Receiver, by Clifford E. Denton.

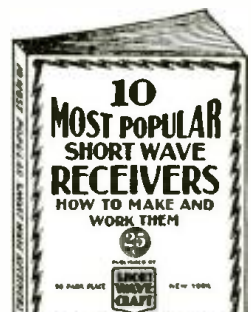
The Denton "Stand-By," by Clifford E. Denton.

The "Stand-By" Electrified.

A COAT-POCKET Short-Wave Receiver, by Hugo Gernsback and Clifford E. Denton.

The S-W PENTODE-4, by H. G. Clein, M. E.

Louis Martin's Idea of A GOOD S-W RECEIVER, by Louis Martin.



75 Illustrations, 40 Pages, Stiff, flexible covers **25c**

All the books shown on this page are published exclusively by

SHORT WAVE CRAFT

99-101 Hudson Street, New York, N. Y.

CLIP—MAIL

SHORT WAVE CRAFT, 99-101 Hudson Street, New York, N. Y. SW-10-36

Gentlemen: I enclose herewith my remittance for the amount of $.....for which you are to send me, postpaid, the books checked below.

( ) How to Get Best Short-Wave Reception.....50c each
( ) 101 Short-Wave Hook-ups.....50c each
( ) How to Build and Operate Short-Wave Receiver.....50c each
( ) How to Become an Amateur Radio Operator.....50c each
( ) Ten Most Popular Short-Wave Receivers. How to Make and Work Them.....25c each
( ) The Short Wave Beginner's Book.....25c each

Name.....

Address.....

City.....State.....

(Send remittance in form of check or money order. If letter contains cash or unused U. S. Postage Stamps, register it.)

OVERSEAS READERS!

These books can be obtained from the following houses:

GREAT BRITAIN
Gorringe's
9a, Green Street, Leicester Square
London, England

FRANCE
Editions Radio
42 Rue Jacob
Paris

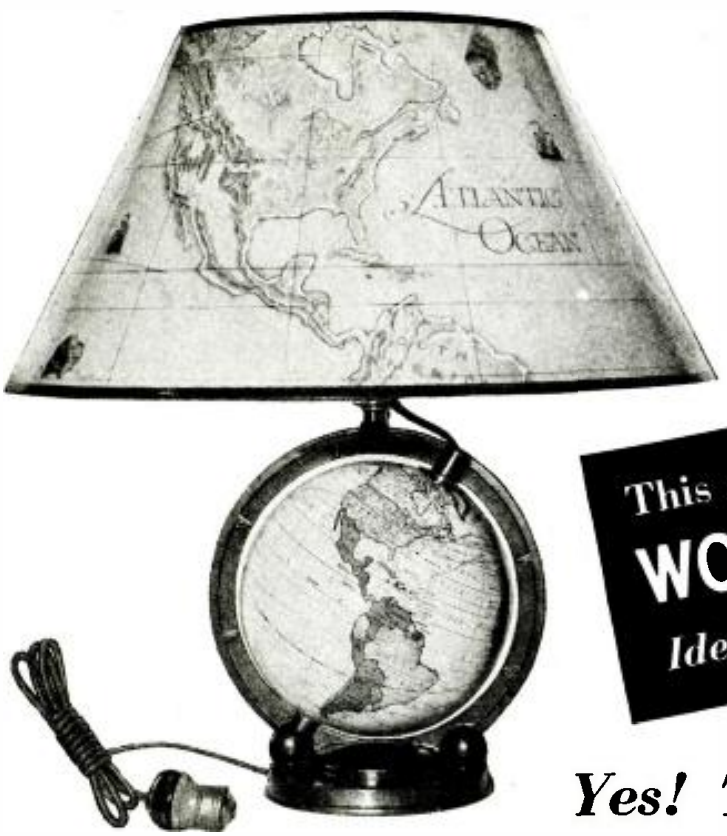
AUSTRALIA
McGill's
183-195, 218 Elizabeth St.
Melbourne, C. 1

Short Wave Scouts

(Continued from page 356)

W3XAL—17780—Bound Brook, N.Y.
HAS3—15370—Budapest, Hungary, "Royal Hungarian Post."
W2XAD—15330—Schenectady, N.Y.
TPA2—15243—Paris, France, "Radio Coloniale."
PCJ—15220—Eindhoven, Holland.
W8XK—15210—Pittsburgh, Pa.
DJB—15200—Zeesen, Germany.
HVJ—15121—Vatican City.
DJL—15110—Zeesen, Germany.
DJH—14460—Zeesen, Germany.
TPA3—11890—Paris, France, "Radio Coloniale."
W8XK—11870—Pittsburgh, Pa.
W2XE—11830—New York, N.Y.
2RO4—11810—Rome, Italy.
W1XAL—11790—Boston, Mass.
PHI—11730—Eindhoven, Holland.
CJRX—11720—Winnipeg, Manitoba, Canada.
TPA4—11719—Paris, France, "Radio Coloniale."
HJ4ABA—11710—Medellin, Columbia, "Ecos de la Montaña."
HBO—11385—Geneva, Switzerland, "Radio Nations."
PLP—11000—Bandoeng, Java.
PMN—10260—Bandoeng, Java.
DJJ (now DZB)—10042—Zeesen, Germany.
EAQ—9860—Madrid, Spain.
DJI (now DZA)—9675—Zeesen Germany.
2R03—9635—Rome, Italy.
HBL—9595—Geneva, Switzerland. "Radio Nations."
W3XAU—9590—Philadelphia, Pa.
HP5J—9590—Panama City, "La voz de Panama."
VK3LR—9580—Lyndhurst, Victoria, Australia.
W1XK—9570—Boston, Mass.
CT1AA—9560—Lisbon, Portugal "Radio Colonial."
DJA—9560—Zeesen, Germany.
DJN—9540—Zeesen, Germany.
W2XAF—9530—Schenectady, N.Y.
HJU—9510—Buenaventura, Colombia, "La voz del Pacifico."
PRF5—9501—Rio de Janeiro, Brazil.
VK3ME—9510—Melbourne, Australia.
HAT4—9125—Budapest, Hungary, "Royal Hungarian Post."
HCJB—8775—Quito, Ecuador, "La voz de Los Andes."
CO9JQ—8665—Camaguey, Cuba.
HBP—7795—Geneva, Switzerland, "Radio Nations."
XECR—7380—Mexico City, Mexico.
HJ1ABD—7282—Cartagena, Colombia, "Ondas de la Heroica."
TIEP—6700—San Jose, Costa Rica, "La voz del Tropico."
HC2RL—6635—Guayaquil, Ecuador, "Quinta Piedad."
PRADO—6618—Riobamba, Ecuador, "El Prado."
TIRCC—6550—San Jose, Costa Rica, "Radio-emisora Catolica Costarricence."
YV6RV—6520—Valencia, Venezuela, "La voz de Carabobo."
HI4D—6482—Trujillo City, Dom. Rep., "La voz de Quisqueya."
HJ4ABC—6451—Ibaque, Colombia, "Ecos Del Combeima."
HJ1ABB—6447—Barranquilla, Colombia, "La voz de Barranquilla."
TIPG—6410—San Jose, Costa Rica, "La voz de La Victor."
YV4RC—6375—Caracas, Venezuela, "Ecos Del Avila."
HIZ—6315—Trujillo City, Dom. Rep.
YV12RM—6300—Maracay, Venezuela, "Emisora 24 De Julio."
HI1A—6185—Santiago De Los Caballeros, D.R. "La voz Del Yaque."
HI5N—6150—Santiago, Dominican Republic.
CJRO—6150—Winnipeg, Manitoba, Canada.
YV3RC—6150—Caracas, Venezuela.
W8XK—6140—Pittsburgh, Pa.
COCD—6130—Havana, Cuba, "La voz Del Aire, S.A."
W2XE—6120—New York, N.Y.
HJ1ABE—6115—Cartagena, Colombia, "La voz de Los Laboratorios Fuentes."
VE9HX—6110—Halifax, Nova Scotia, Canada.
HI3C—6105—La Romana, Rep. Dom., "La voz de La Feria."
W3XAL—6100—Bound Brook, N.J.
W9XF—6100—Chicago, Ill.
2RO1—6085—Rome, Italy.
W3XAU—6060—Philadelphia, Pa.
W8XAL—6060—Cincinnati, Ohio.
HJ1ABG—6042—Barranquilla, Colombia, "Emisora Atlantico."
W1XAL—6040—Boston, Mass.
W4XB—604—Miami, Florida.
HP5B—6030—Panama City, "Miramar."
DJC—6020—Zeesen, Germany.
XEBT—6000—Mexico City, Mexico.
RV59—6000—Moscow, Russia.
HIX—5980—Trujillo City, Dom. Rep.
TG2X—5940—Guatemala City, "La voz de La Policia Nac."
HCK—5885—Quito, Ecuador.
HI1J—5865—San Pedro de Macoris, Dominican Republic.
YV5RMO—5850—Maracaibo, Venezuela. "Ecos Del Caribe."
YV2RC—5800—Caracas, Venezuela, "Broadcasting Caracas."

(Continued on page 381)



Free!

This *useful* and *ornamental*

WORLD-GLOBE LAMP

Ideal for short wave fans

Yes! The globe revolves!

NEVER in the six years that SHORT WAVE CRAFT has been published, have we found *anything* that is as *useful* and *ornamental* as the WORLD-GLOBE LAMP we now offer free to our readers.

This beautiful WORLD-GLOBE LAMP measures 17½" high. The attractively colored shade, with nautical and map designs, is 8" in height and 16" in diameter. It is made of fine quality parchment, highly glazed, to assure long life. A slightly damp cloth quickly removes dust from the shade. The 6¼" globe, printed in many colors, has a *full meridian*, and *rotates*. Hundreds of names—countries, cities, rivers, oceans and others are *clearly printed on the globe.*

Another feature on this WORLD-GLOBE LAMP is the *movable hour scale* found at the north pole. This permits determining the correct time in any part of the world.

The metal parts are finished in antique bronze. A piece of heavy green felt is glued under the base, therefore it may be placed *anywhere,* without fear of marring table, desk, etc.

The weight of the WORLD-GLOBE LAMP is nearly three pounds. When packed for shipping, six pounds.

Here is the way to get this beautiful prize. Fill in the coupon in the left hand corner—cut it out and mail it to us together with your remittance of $2.50. You will receive a full year's subscription (12 months) to SHORT WAVE CRAFT—*the greatest short-wave magazine in the world today.* In addition, we will send you absolutely FREE one of these handsome WORLD-GLOBE LAMPS. *Old subscribers* may renew their subscription now for another year following expiration of their present one and still receive this WORLD-GLOBE LAMP.

Only a limited number of WORLD-GLOBE LAMPS are available. Take advantage of this offer *without delay* in order to insure receiving *your free gift.* RUSH THE COUPON TODAY.

Long Needed Article

Gentlemen:

Regarding your wonderful GLOBE-LAMP, please accept my sincere compliments for a long needed article and trust you'll be swamped with orders.

(Signed) W. H. Herman,
7704 Sagamore Ave.
Cleveland, Ohio.

All Admired It

Gentlemen:

I am perfectly satisfied with your GLOBE-LAMP. It is just what you have said about it in every way. All my family and friends have admired it. It arrived in perfect condition. Many thanks and the best of good luck to you and your SHORT WAVE CRAFT.

(Signed) William Owens,
30 North Fifth Street,
Bangor, Penna.

WHAT THEY SAY ABOUT THE WORLD-GLOBE LAMP!

Very Well Pleased

Gentlemen:

I am very well pleased with my Globe-Lamp. It presents a handsome and novel appearance and is most appropriate when located near an all-wave radio set. When lighted at night, it sheds a warm, soft glow, and the parchment shade shows up most attractively. Unquestionably, the combination of the lamp and SHORT WAVE CRAFT for $2.50 is a real bargain.

William E. Sloan, Jr.,
67 Exchange Street,
Rochester, New York.

Unique, Beautiful and Useful

Gentlemen:

The Globe-Lamp arrived today, also the magazine. Congratulations on a premium so unique, beautiful and, above all, useful, especially to DXers on the short-wave bands. I already have a large globe, but I expect to use the small one much more frequently and with equal satisfaction. It goes fine with the new Hammerlund "Super Pro."

T. H. Warnock,
99 Elm Street,
Meriden, Connecticut.

Wouldn't Take $15.00 For It

Gentlemen:

I received the Globe-Lamp and I am very much pleased with it. I think it is handsome and think a good deal of it. I wouldn't take $15.00 for it. The lamp sets on top of the radio and is handy to glance at when I hear the foreign stations.

Warren G. Ryder,
Barnstable Radio Shop,
Barnstable, Mass.

P.S.: Many thanks for the lamp! WGR

How to Order Your WORLD-GLOBE LAMP

Simply fill in the coupon at the left and mail together with check or money order. Register letter if cash or coin is sent. To cover shipping charges on WORLD-GLOBE LAMP, add to your remittance the amount indicated. If you are located: East of the Mississippi add 35 cents; Between the Mississippi and the West Coast add 70c; Foreign Countries add $1.30. Any excess remittance will be refunded.

SHORT WAVE CRAFT

99 HUDSON STREET **NEW YORK, N. Y.**

MAIL COUPON TODAY!

SHORT WAVE CRAFT SWC-1036
99 Hudson Street, New York, N. Y.

Gentlemen: Enclosed you will find my remittance of $2.50 (plus.....cents shipping charges) for which enter my subscription for SHORT WAVE CRAFT for one year (12 issues). This amount entitles me to a WORLD-GLOBE LAMP free. See chart next to coupon for shipping charges on WORLD-GLOBE LAMP.

( ) Enclosed find my remittance of $2.50, please send me the WORLD-GLOBE LAMP by express, collect.

Name .....

Address .....

City ..... State .....

Send remittance in form of check or money order—register letter if it contains cash, stamps, or currency.

Short Wave Scouts

(Continued from page 379)

YV10RSC—5720—San Cristobal, Venezuela, "La voz Del Tachira."

TGS—5713—Guatemala City, "Radiotransmisora de la Casa Presidencial."

(As this "log" was made some time ago, the frequencies will be found different than those now assigned.—Ed.)

The New Hammarlund "Super-Pro"—Part IV

(Continued from page 345)

Singer, the plant supervisor of W.O.R., who supervised the test, reported the following: "We are using three doublet antennas, 50 feet high and exposed to an R.F. field from W.O.R. transmitter of 10 or more volts of R.F. We are able to tune in all broadcasting stations between 500 and 1600 kc. with no inter-channel interference. On shorter waves we experience pre-selection enough to pick up all foreign and local stations with 5 to 10 kc. separation from our harmonics. We followed the *Queen Mary* from its dock in England to New York. It is the only receiver of the many tested that performs so well in our immediate transmitter field."

5 Meter Club of N.J. Meets "On the Air"

By Frank Lester, W2AMJ

● DURING the past two or three years 56 megacycle activity has been increasing in leaps and bounds, until at the present time in quite a few large metropolitan areas the 5 meter band is one of the most popular. In New York City and New Jersey the writer feels perfectly safe in saying that the 5 meter band is the most popular, with much activity and two or three new stations being heard every night. This activity has resulted in considerable advancement of 5 meter communication brought about by the continual and consistent improvement of 5 meter transmitters and receivers.

In the short space of one year the range of 5 meter communication has been doubled. Only a year ago a 50 mile QSO was considered big DX and one was considered fortunate if he made over five contacts during an entire evening. At the present time 50 and 75 mile QSO's are nightly occurrences with exceptionally good signal at both ends.

During the past summer and continuing up to the present time at almost regular weekly intervals, it has been possible for stations in Metropolitan New Yerk and Northern New Jersey to work stations in Philadelphia and the surrounding towns, as well as other stations in Connecticut, Massachusetts and Northern New York. It is now possible, if one desired to contact as many stations as possible in one night, to easily contact 25 or 30 amateurs in two or three hours time, and be able to keep this up for a few nights without working the same station twice.

Early in the Spring of this year, when the majority of pioneer 5 meter stations began complaining among themselves regarding the many unlicensed stations and new stations with exceptionally poor signals, an idea was born in the mind of W2CVF, Mr. Ralph Hasslinger, of Wycoff, New Jersey. Shortly thereafter the interest and curiosity of many of the amateurs operating on the 5 meter band was aroused by a series of QST's sent out by W2CVF announcing a meeting to be held for the purpose of organizing a Five Meter Radio Association, with meetings to be held *over the air!* On Sunday afternoon, April 7th, 1935, thirty 5 meter operators from all over Northern New Jersey gathered at the home of W2JT, Earle Lucas, of Midland Park, New Jersey. The various problems that were at hand were discussed, which briefly were as follows:

The number of stations on the band was rapidly increasing. Conditions were bad, as might be expected on a band only recently developed.

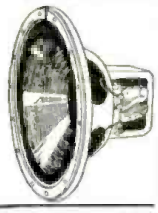
SCOOP—THE BUY OF A LIFETIME

Nationally Advertised Brand 6½ inch DYNAMIC SPEAKERS

ALL BRAND NEW

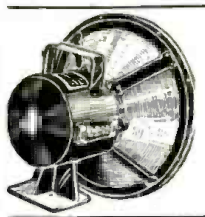
1500 ohms. Output transformer to match 38, 12A7, 71A, 43, 45, 2A5, 47, 59, 53 tubes, etc. Shipping weight 6 lbs. AD 600, AD-600 Speaker complete.....

89c



As Illustrated

SAME SPEAKER—
10¼ inch, available in the following sizes: 1000, 1500, 2000 ohm field coils. Brand new, less output transformers.
10" SPEAKER less transformer..... **$2.29**
OUTPUT TRANSFORMERS, extra pp 45-2A3 extra..... **25c**
OUTPUT TRANSFORMERS, single pentode, extra..... **39c**
AD-1601 Shipping weight, 10 lbs.



GENUINE KOLSTER 12-inch DYNAMIC SPEAKER

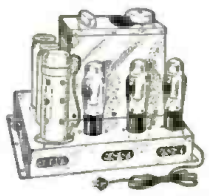
A husky 12-inch heavy-duty dynamic speaker, excellently suited for large P.A. systems. Has free-edge cone with voice coil flexibly mounted on chamois leather. Field coil resistance 6,000 ohms. Quantity limited. Measures 12 in. in diameter by 7 in. deep. Net wt., 20½ lbs. Ship wt., 23½ lbs.

Your Price **$2.50**

No. AD-502 Kolster 12 in. Dynamic Speaker.

NO ORDER FOR LESS THAN $1.00 WILL BE ACCEPTED. ALL REMITTANCES MUST INCLUDE A SUFFICIENT AMOUNT TO COVER POSTAGE AND INSURANCE. NO C.O.D. ORDERS FILLED UNLESS ACCOMPANIED BY A 25% DEPOSIT.

4-Tube 7½ Watt Amplifier Kit



A beautifully designed amplifier, conservatively rated at 7½ watts. Comprises two-stages—one utilizing a 57 input tube and the other a parallel stage using 2-2A5's. Uses an 80 rectifier. Input to grid of 57. Output from plates of 2A5. Designed for 100 to 130 volts, 50-60 cycles, A.C. Entire system fuse protected. Sold complete with all parts: chassis, wire, hardware, etc., ready to assemble and wire. Detailed diagram included. Ship wt. 15 lbs.

No. AD 112 7½ Watt Amplifier Kit, less tubes, unwired..... **$4.95**
Amplifier, Completely Wired..... $1.00 extra

Complete Public Address Combination

This combination comprises:
Completely Wired and Tested 7½ Watt Amplifier, described above..... **$5.95**
1—Faraday Double Button Professional Carbon Mike..... $2.95
Paragon Professional Double Button Mike..... $3.95
1—Telescopic Chromium Plated Microphone Floor Stand..... $3.95
1—10" Dynamic Speaker..... $2.29
1—Microphone Input Box..... $2.95
1—Set of Matched Tubes..... $1.95
Special Price for Complete System..... **$16.95**
Add $1.00 extra for Paragon Mike—Add 5c per ft. for 3-wire shielded mike cable—Add 6c per ft. for 4-wire shielded speaker cable.

Build your own Midget Radio, 4-tube TRF Circuit. Complete parts with drilled universal chassis that will fit any cabinet, ready to wire with wiring diagram, 8" Dynamic Speaker and Chassis 5"x9½", 4 tested tubes— **$5.95**
Cat. AD-204.....
Kit Completely Wired..... EXTRA $1.00
Same Kit 3 Tubes—Magnetic Speaker..... $4.95

WHAT IS IT?

Radio Experimenter's Surprise Package

A large box chock full of assorted radio parts, worth over $10.00—parts that any radio experimenter and set builder can use. All brand new—no junk. Weight 20 lbs.

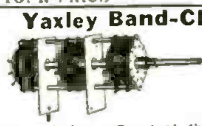
Surprise Kit—
AD-1260..... **$1.29**
Giant Surprise Kit, weight 40 lbs. $2.58

General Electric Phonograph Motor

This is the same sturdy motor used in the highest quality phonographs and combinations. List Price $18.92 complete with turntable. Designed for 110-120 volts, A.C., and available for either 25 or 60 cycles (please specify which when ordering.) For 78 RPM records. Ship. wt., 10 lbs.

No. AD-106
YOUR PRICE **$3.95**
Limited Quantity

Yaxley Band-Changing Switch



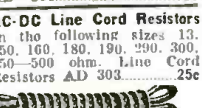
Designed especially for all-wave sets. Heavy silver plated contacts. Consists of six 2-gang decks—12 gangs in all. Three positions. Excellent for short-wave as well as for analyzers. List price $4.12. Never before offered at the low price shown below. Ship. wt., 1 lb. **29c**
No. AD-111.....
AD 112A, Three double sections for use on 5 band all wave radios—5 stops—(can be adjusted to 12 stops)..... **49c**

CCA Wet Electrolytic Filter Condenser

500 Volts	
4 MFD	20c
6 MFD	23c
8 MFD	25c
10 MFD	35c
12 MFD	38c
14 MFD	40c
16 MFD	45c

Complete parts in stock for all diagrams appearing in Short Wave Craft, Radio Craft, QST, Popular Mechanics, etc.

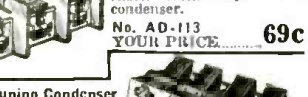
2½ MH. SHORT WAVE R. F. CHOKE



These low Loss Chokes Pie Wound on isolantite forms are used in every S. W. Set. Special Pie Wound Chokes AD—304..... 15c

AC-DC Line Cord Resistors

In the following sizes 13, 150, 160, 180, 190, 290, 300, 350—500 ohm. Line Cord Resistors AD 303..... 25c



Three-Gang Midget Tuning Condenser

Capacity .000365 mf. Measure 3¼"x1¼". ¾" shaft. With compensating condenser.

No. AD-113
YOUR PRICE **69c**

Four-Gang Tuning Condenser

Capacity .000365 per section. Solid brass plates. Ship. wt., 5 lbs.

No. AD-115 YOUR PRICE **20c**

FREE 64-page catalog and treatise. Send stamp for our FREE treatise and catalog which contains much valuable data and radio information. There is no obligation involved. Absolutely free. Book sent by return mail.

SPECIAL OFFER

DILCO R.C.A. Licensed 100% Triple Tested TUBES

YOUR CHOICE ANY GROUP ONLY **$1.00**

Quan.	Type	Quan.	Type
3 —	50	5 —	24A
2 —	12A7	4 —	35-51
3 —	2A3	4 —	36
12 —	27	4 —	47
6 —	26	4 —	82
6 —	01A	4 —	6D6
6 —	12A	4 —	523
4 —	30	4 —	33
4 —	31	4 —	46
6 —	71A	4 —	1A6
4 —	56	3 —	484
2 —	10	3 —	485

Quan.	Type
3 —	6F7
3 —	2A7
3 —	32
3 —	59

866 RECTIFIERS..... **89c**
6E5-6G5 Magic Eye..... 2 for $1.00
Also the new metal glass Octal base tubes, as shown below:

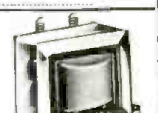
1 D 7	5 Y 3	6 F 7	
1 D 5	6 H 6	5 Z 4	**2 FOR**
1 E 5	6 K 7	6 A 8	
1 C 7	6 A 6	5 Z 5	**$1.00**
1 F 5	1 F 4	6 Z 5	
25 A 6	1 H 4	6 F 5	
6 C 5	1 H 6	6 F 6	
6 L 7	1 J 6	25 Z 6	

Output Transformer for Dynamic Speakers

This well made unit will match any dynamic speaker, having a voice-coil impedance of from 5 to 15 ohms to any radio set using push-pull 43's, 171's, 41's, 2A3's or single 2A5, 42, 47, 59, 38, 33 and 89 tubes. Makes an excellent replacement transformer. Supplied with convenient mounting strap, with mounting holes 2¼" apart. Ship. wt., 2 lbs.

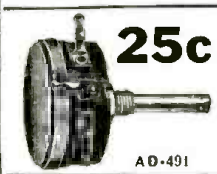
No. AD-105.
YOUR PRICE **25c**

AC-DC Filter Chokes



Small, compact units designed for use in AC-DC midget sets. Will pass 60 mils. Available in sizes from 200 to 500 ohms.

No. AD-110
YOUR PRICE **25c**



25c

CRL Volume Control Potentiometer

5,000, 25,000, 50,000, 100,000 ohm

The most handy size used by the radio experimenters at a give-away price.

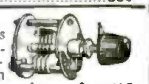
AD-491

Short-Wave Plug-In Coils

Designed for use with the Doerle or other standard regenerative circuits using .00014 mf. condensers. Range 15 to 200 meters. 2-winding coils. Ship wt., 1 lb.

No. R-100 Set of 4 Coils..... 49c
No. R-101 Set of 4 Coils for Electron Coupled Circuit as described in QST-5 prong..... 69c

Midget Variable Condensers



Excellent for use as antenna trimmers in short-wave sets and as vernier tuning condensers. Capacity approximately 20 mmf. Sold complete with knob and pointer. Single hole mounting. 9 solid brass plates. Ship. wt., ½ lb.

No. AD-117 YOUR PRICE **25c**

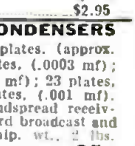
BUILD YOUR OWN RADIO SET

5-Tube Super Het Kit

Comprising of 1 oscillator, 2-456 KC. Double Tuned I-F Transformers—1 Antenna coil, 1-2 gang oscillator tracking condenser, complete with wiring diagram, ready to use.... **$1.75**

Drilled Chassis to Match 29c

Kit of other essential parts to complete set including condensers, resistors, choke filter, volume control, nuts, bolts, etc.,
AD-900—Super Het Kit Complete less tubes..... **$2.39**



Set of Five Matched Tubes..... $2.95

BANDSPREAD VARIABLE CONDENSERS

Available with 11 plates, (approx. .00025 mf); 13 plates, (.0003 mf); 17 plates, (.000365 mf); 23 plates, (.0005 mf); 46 plates, (.001 mf). For short-wave bandspread receivers as well as for standard broadcast and long-wave receivers. Ship. wt., 2 lbs.

No. AO-116 Variable Condensers—each..... **25c**

G.E. POWER TRANSFORMER

Manufactured by General Electric. A well designed transformer. Has 6.3 volt filament winding. Designed for 110-125 volts, 50-60 c., A.C. Specifications: 6.3 V., 2½ amp.; 5 V., 2 amps. for 81, or 80 tube; 750 V., C.T., 75 mils, for plate current. Ship. wt., 5 lbs.; also available in 215 v.

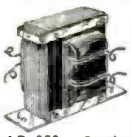
No. AD-101, 6 to 7 tube transformer, 75 mils..... **99c**
No. AD-102, 7 to 8 tube transformer, 100 mils..... **$1.49**
No. AD-103, 8 to 10 tube transformer, 125 mils..... **$1.96**

R.M.A. Color Coded Carbon Resistors

These are all Brand New Stock. 100 Assorted sizes 50 ohm—5 meg ohm. ¼, ½, 1 watt sizes guaranteed 10% accuracy resistors.
Complete assortment 100 resistors..... **$1.50**
Individual sizes..... 3c
AD 185—shipping weight 4 lbs.

Unshielded Power Transformers

6-8 Tube 6.3 volts



These transformers, the products of one of America's largest radio factories, are brand new, 6-tube, 6.3 filament, 280 filament, 5 volt, 750 volt, CT high. Color code diagram with each one; ideal for replacement or for new sets:

AD-201 6-tube unshielded transformers..... **$0.65**
AD-202 8-tube unshielded transformers..... .85
AD-203 10-tube unshielded transformers..... 1.15

Hum Free Power Supply Pack

This Pack will supply 2.5 volt Filament voltage. Pure Rectified D.C. 350 volts at 80 MILS 6 AMPS for Filament.
Same Pack supplies 6-7 tubes at 6.3 volts..... $2.95
Same Pack supplies 8-9 tubes at 6.3 volts..... $3.39
Same Pack supplies 10-12 tubes at 6.3 volts..... $4.25

Complete Kit $2.49

with wiring diagram and drilled chassis less tube, unwired. Wiring 50c extra AD—201. 80-Rectifier tube extra 34c. Shipping weight, 12 lbs.

RADIO BOOKS, published by the RCA Institute, Radio Telegraphy and Telephony, Vacuum Tubes, Modern Radio Operation, Preparatory Mathematics relating to Radio, Acquiring the Code, Practical Electricity:—Average value of these books— over $2.00 each. PER VOLUME..... **25c**

UNITED RADIO COMPANY

Successors to Radio Trading Company

58 MARKET STREET Dept. S-10 NEWARK, N. J.

• Index to Advertisers •

(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)

The quality of modulation was very poor in many cases, due to the equipment used and lack of experience on the part of the operators, some of whom were even unlicensed. Many who were licensed seemed to forget that the band is controlled by the same laws and regulations governing the lower frequencies. Constant shifting of frequencies from one end of the band to the other, breaking up many QSO's, was one of the biggest headaches, as well as the elimination of foolishness with the *ham* next door, which could have been carried on in person and eliminate this unnecessary QRM.

The local nature of the band made the idea of organizing to correct these evils and improve conditions a very feasible one. After all of this was discussed, W2CVF, being way ahead of us, presented the gathering with a constitution, which, after several changes, was finally adopted and the organization named the "Five Meter Radio Association of Northern New Jersey." The constitution in brief is as follows:

1) Object: To advance the art of communication on the 56 megacycle and higher frequency bands by:

1. Dealing with illegal operation.
2. Cooperating with broadcast listeners.
3. Cooperating in the matter of frequency.
4. Cooperating in reporting and testing.
5. Establishing a more intimate and friendly feeling on the bands.
6. Conducting contests.
7. Establishing a system of "Calls Heard."
8. Passing along the results of experiments.

2) Meetings to be conducted *over the air* every other Tuesday at 8:30 P.M., E.S.T.

The other articles in the constitution are typical of those of any other organization.

The problem arose as to how the meetings could be conducted "over the air." It would be impossible to cover each one that might have something to say, and this was solved by dividing the territory into six sections, each to have a manager and assistant manager in a representative form of government.

After several meetings had been conducted the idea appealed to some of the operators across the river in New York, who had listened in and requested membership. It was, therefore, put before the various section managers who voted in favor of the additional section thus required which automatically formed the seventh section, taking in Greater New York.

At the present time the organization consists of over 100 members and is constantly growing. Excellent speakers have and will continue to be presented at the meetings held over the air.

The author would like, at this time, to thank all of the 5 meter stations within range of the Association for their past cooperation, which has resulted in a considerable improvement on the 5 meter band, resulting in making this band one of the most popular at the present time.

In view of the many new requests for membership, and also due to the latest addition of New York (as the seventh section) a movement is in progress at the present time to change the name of the organization in view of the seventh section being in New York and our present name only applying to New Jersey.

We are now trying to increase the activity on the 2½ meter band and have set aside Thursday nights for 2½ meter activity. 2½ meter stations will call tests for CQ beginning at 8:30 P.M. and for the benefit of those who do not have 2½ meter transmitters but have receivers, stand-by periods will be made on the 5 meter band, allowing QSO's between 2½ meter transmitters and 5 meter transmitters.

KABLE BROS. CO., PRINTERS

THERE IS SOMETHING NEW IN RADIO!

Announcing:

NATIONAL NC-100

12 TUBE SUPERHETERODYNE

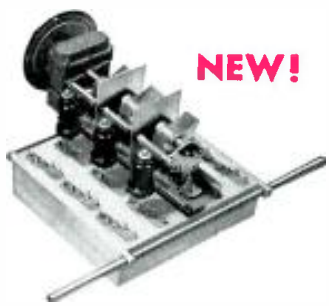
The NC-100 is more than a newly designed receiver, it is a new invention! Although coil ranges are shifted easily and quickly by the twist of a knob on the front panel, no coil switch is used. Instead, an ingenious mechanism moves efficient plug-in coils into position close to the tuning condenser and tubes, and plugs them in. Each of the fifteen HF coils is shielded in heavy cast aluminum, each is of high-Q design, each has low loss insulation, and each has its own individual air dielectric padding condenser. Idle coils are completely isolated. Leads are short. Calibration is permanent. For the first time, the uncompromised efficiency of plug-in coils has been combined with the convenience of the coil switch.

HIGH PERFORMANCE

The precise and efficient Movable Coil Tuning Unit is just one of many details that make the NC-100 so outstanding. Every tube in the NC-100—and there are twelve of them—contributes its full share to the remarkably high overall performance. The circuit employed on all ranges consists of one stage of RF, separate first detector and high frequency oscillator, two IF stages, a bias type power detector and a transformer-coupled push-pull output stage. Maximum undistorted audio output is ten watts. A separate tube is employed to provide amplified and delayed AVC action, and a separate beat oscillator is included for CW reception. A built-in power supply provides all voltages required, including the speaker field.

But equal in importance to the circuit and tube layout is the long list of small details that make the NC-100 the superlative receiver that it is.

NEW!



MOVABLE-COIL TUNING UNIT

There is no substitute for quality. The heavy cast aluminum coil shield, the thorough use of low-loss insulation, the high-Q coils, and the air dielectric padding condensers, as well as a host of smaller details ranging from silver plated contacts to the non-microphonic speaker cabinet, all contribute to high intelligibility on weak signals.

OPERATING CONVENIENCE

Particular attention has been paid to the convenience of the operator in the NC-100. Swift control of every function of the receiver is at your fingertips. The Movable Coil Tuning Unit permits instant selection of any one of five coil ranges, ranging from 540 KC to 30 MC. Matching the accuracy of this precision unit is the Micrometer Dial, direct reading to one part in five hundred, and having an effective scale length of twelve feet. The tuning of the NC-100 is as smooth as its logging is precise.

A 6E5 tube acts as an indicator both when tuning and when using the RF Gain Control for signal strength measurement. Panel switches permit optional use of automatic volume control and of the CW oscillator, and provide for cutting the plate voltage during periods of transmission. In addition to RF Gain, an Audio Gain Control and a Tone Control are included. These together with the (optional) Single Signal Filter give the operator complete control of receiver characteristics. Even the phone jack has received its share of attention, for it has been carefully located so that the phone cord will interfere as little as possible with the manipulation of controls and the use of the operating table.

NO COUPON NEEDED

Whether you are about to buy a receiver or not, you will want to know more about the NC-100. Send for the free folder describing the NC-100. No coupon is needed, just say you are a *Short Wave Craft* reader. But better yet, drop in at your dealer's and see it. One glance will tell more about its fine construction than any description, and even a short trial will demonstrate its outstanding merit.

NATIONAL CO., INC. NC **MALDEN, MASS., U.S.A.**

I will send you a Lesson Free

to show how I train you at home in spare time for Good Jobs in Radio

J. E. SMITH, President
NATIONAL RADIO INSTITUTE

The man who has directed the home study training of more men for the Radio Industry than any other man in America.

Do you want to make more money? I'm so sure that I can train you at home in your spare time for a good Radio Job that I'll send you a lesson absolutely FREE. Examine it, read it, see for yourself how practical it is to learn Radio at home, how easy it is to understand—even if you've never had technical experience or training.

Many Radio Experts Make $30, $50, $75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Spare time Radio set servicing pays as much as $200 to $500 a year—full time jobs with Radio jobbers, manufacturers and dealers pay as much as $30, $50, $75 a week. Many Radio Experts own and operate their own full time or part time Radio sales and service businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to $6,000 a year. Automobile, police, aviation, commercial Radio, and loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I have trained are holding good jobs in these branches of Radio. Read their statements in my 64-Page Book. Mail the coupon.

Broadcasting Stations

Employ managers, engineers, operators, installation and maintenance men for fascinating jobs and pay up to $5,000 a year.

Set Servicing

Spare time set servicing pays many $5, $10, $15 a week extra while learning. Full time servicing pays as much as $30, $50, $75 a week.

Loud Speaker Systems

Building, installing, servicing and operating public address systems is another growing field for men well trained in Radio.

There's a Real Future in Radio for Well Trained Men

Radio already gives jobs to more than 300,000 people. In 1935 over $300,000,000 worth of sets, tubes and parts were sold—an increase of 20% over 1934! Over 1,100,000 auto Radios were sold in 1935, 25% more than in 1934! 22,000,000 homes are today equipped with Radio, and every year millions of these sets go out of date and are replaced with newer models. Millions more need servicing, new tubes, repairs, etc. Broadcasting stations pay their employees (exclusive of artists) more than $23,000,000 a year! And Radio is a new industry, still growing fast! A few hundred $30, $50, $75-a-week jobs have grown to thousands in less than 20 years.

Many Make $5, $10, $15 a Week Extra in Spare Time While Learning

Practically every neighborhood needs a good spare time serviceman. The day you enroll I start sending you Extra Money Job Sheets. They show you how to do Radio repair jobs that you can cash in on quickly. Throughout your training I send you plans and ideas that have made good spare time money—from $200 to $500 a year—for hundreds of fellows. My training is famous as "the Course that pays for itself."

I Send You Special Radio Equipment to Give You Practical Experience

My Course is not all book training. I send you special Radio equipment and show you how to conduct experiments and build circuits which illustrate important principles used in modern Radio receivers, broadcast stations and loud speaker installations. I show you how to build testing apparatus for use in spare time service work from this equipment. You work out with your hands many of the things you read in the lesson books. My Free Book tells you about this 50-50 method of training—how it makes learning at home interesting, fascinating, practical. Mail Coupon.

Save Money—Learn at Home Money Back Agreement Protects You

I am so sure that I can train you at home successfully that I agree in writing to refund every penny you pay me if you are not satisfied with my Lessons and Instruction Service when you finish my Course. I'll send you a copy of this agreement.

Get My Lesson and 64-Page Book Free Mail Coupon

In addition to my Sample Lesson, I will send you my 64-Page Book, "Rich Rewards in Radio." Both are free to any fellow over 16 years old. My book describes Radio's spare time and full time opportunities and those coming in Television; describes my Training in Radio and Television; shows you actual letters from men I have trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL THE COUPON in an envelope, or paste it on a penny post card —NOW!

J. E. Smith, President
National Radio Institute,
Dept. 6KB3 Washington, D. C.

HERE'S PROOF

$10 Week In Spare Time

"My work has consisted of Radio set servicing, with some Public Address Systems work—all in my spare time. My earnings in Radio amount to about $10 a week."—WILLIAM MEYER, 705 Ridge Road, Hobart, Ind.

Earnings Tripled By N.R.I. Training

"I have been doing nicely, thanks to N. R. I. Training. My present earnings are about three times what they were before I took the Course. I consider N. R. I. Training the finest in the world."—BERNARD COSTA, 201 Kent St., Brooklyn, N. Y.

LESSON on Radio Servicing Tips—FREE

I'll prove that my Training gives practical, money-making information, that it is easy to understand—that it is just what you need to master Radio. My sample lesson text, "Radio Receiver Troubles—their Cause and Remedy" covers a long list of Radio receiver troubles in A.C., D.C., battery, universal, auto, T. R. F., super-heterodyne, all-wave, and other types of sets. And a cross reference system gives you the probable cause and a quick way to locate and remedy these set troubles. A special section is devoted to receiver check-up, alignment, balancing, neutralizing and testing. Get this lesson Free. No obligation.

MAIL COUPON NOW

The Tested Way to BETTER PAY

Good for FREE SAMPLE LESSON and BOOK on RADIO'S OPPORTUNITIES

J. E. SMITH, President
National Radio Institute, Dept. 6KB3
Washington, D.C.

Dear Mr. Smith: Without obligation send me free the Sample Lesson and your 64-Page Book "Rich Rewards in Radio," telling about spare time and full time Radio opportunities, and how I can train for them at home in spare time.

(Please write plainly)

Name..... Age.....

Address.....

City..... State.....

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If you do not want to cut this cover—simply write us on a post card