ALL-WAVE RADIO

DECEMBER
1935

Vol. 1

No. 3

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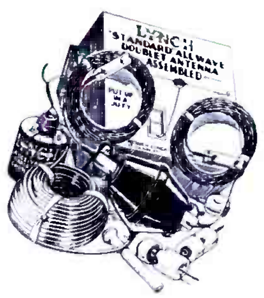

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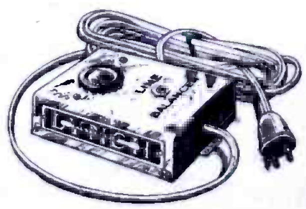

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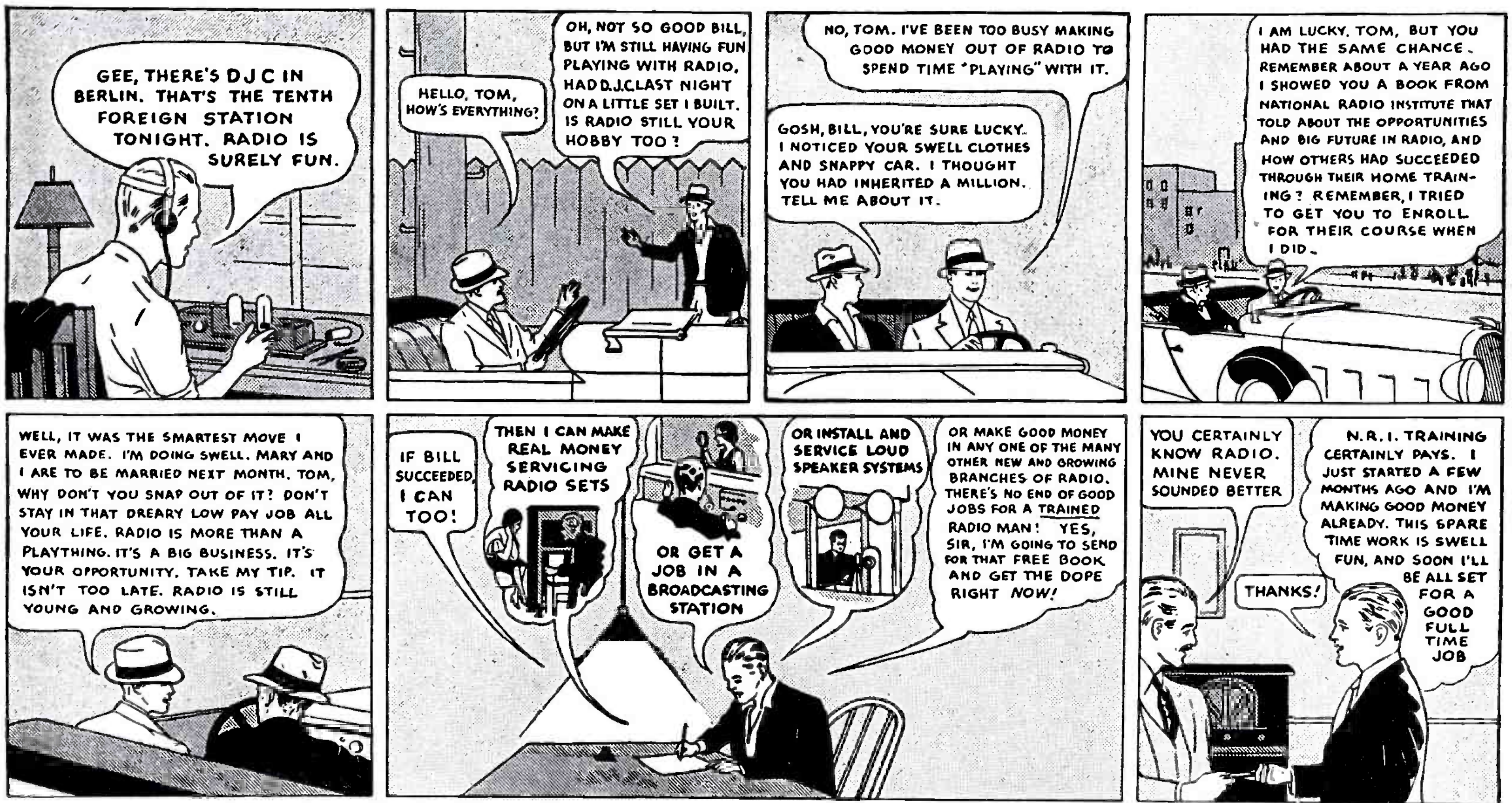

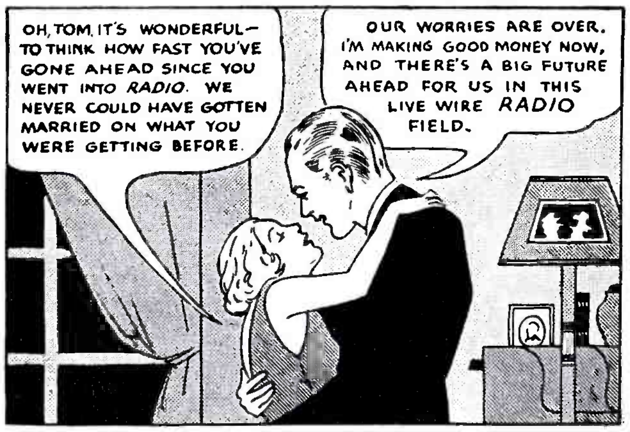

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ALL-WAVE RADIO

VOL. 1 NO. 3

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Cover Illustration

Multiplexing Apparatus In The Empire State Building, A Part of Major Armstrong's Frequency-Modulated Transmitter

(See Page 106)

Features

Departments

Published Monthly by the

CLARENCE W. EMERSON
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Treasurer

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"I found it an easy and simple job to set up and operate. My wife, who is a musician, immediately complimented its tone".—F. H. Dodge, Colorado Springs, Colo.

Doubled Reception Range!

"The world shrinks again, as your engineering skill . . . has virtually doubled the range of reception heretofore available".—Robert Rossi, Philadelphia, Pa.

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"The 'crowded 49 meter band' is another story with the MASTERPIECE IV and its superlative bandspread arrangement. In one evening tuned in following stations (lists 27 stations on 49 meter band from approximately 5700 kc to 6600 kc) . . . almost all came in clearly without interference . . . that's selectivity!" —C. A. Pickett, St. Louis, Mo.

Australia First Day!

"Simply amazed and delighted with the clarity and tonal range. Tuned in VK3ME—Melbourne . . . the volume was excellent with little static and no fading".—I. O. Thorley, Detroit, Michigan.

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"Have never seen anything like it . . . the tone is wonderful".—H.L.Kleinbrodt, St. Joseph, Mo.

Used Phones as Antenna!

"Tuned in all of London's six transmissions one after another . . . Received London at 6:00 P.M. with one lead from a pair of phones hanging on wall for antenna".—B. E. Dickensheets, Milton, W. Va.

We announce the following new features of the new MASTERPIECE IV for 1936:

Octal Sockets—All MASTERPIECE IVs are now equipped with the new eight-pin sockets which take either the new Octal-based glass tubes or (still inferior) metal tubes. This change does no mean, in any sense, that we recommend or accept present metal tubes. What it does mean is that if metal tubes later prove successful, your MASTERPIECE IV is ready for immediate change, simply by replacing tubes. Either way, you are assured that the MASTERPIECE IV which you buy now offers you the best in radio . . . today . . . tomorrow . . . next year.

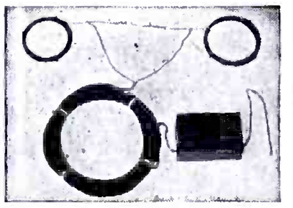
New Detector and Power Tubes—The new 6L7, a better, quieter, more efficient and more selective tube, is now used as first detector. The result is even greater sensitivity, selectivity and freedom from noise. In the power output stages are four 6B5s, increasing undistorted power output from 36 to 40 watts. This increase, in itself, means little . . . the real advantage is a tremendous improvement in already exceptional high-fidelity tone quality.

27 Tube Functions—The new tube equipment of 19 tubes gives a total of 27 separate tube functions . . . the equivalent of 27 separate and distinct tubes in circuit. The net result is finer, smoother, fuller and more brilliant tone . . . and an even finer receiver than that which has won the highest praise of critical users, engineers, musicians and champion DXers the world over.

+Metal tube merit on short wave is indicated by a measurement made at 10 megacycles, or 30 meters.

Three MASTERPIECE IV tuned circuits alone showed an excellence of 220. Glass tubes connected to them dropped merit to 215—2.3% less. A large number of brand-new and good metal tubes connected across the circuits cut Q or merit to 185—a net loss of 16%! Time, with dirt and moisture would give an even greater loss for metal, but not for glass. 16% loss seems a lot to pay only for metal envelopes on vacuum tubes on short waves!

DOUBLE YOUR SHORT WAVE RECEPTION for only $8.85 with the new



R9+ TUNED ANTENNA

In practical tests the new R9+ Tuned Antenna has increased short wave signal volume on weak signals by from three to six times over present antenna equipment. It will give your reception a tonic equal to one to two stages of radio frequency amplification ahead of your receiver, tremendously reduce noise, and increase selectivity. Representing, as it does, years of research on antenna problems—and beginning where all other antennae leave off—its cost of $8.85 net, fully assembled, soldered and ready to put up in half an hour, will prove to be the greatest and most beneficial value you have ever obtained.

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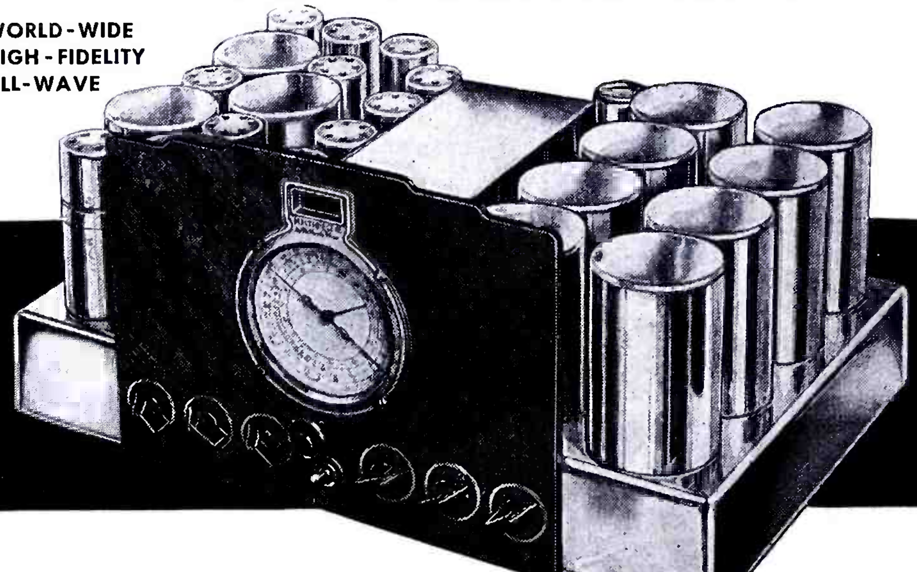

TRY IT FOR 10 DAYS

Try the new MASTERPIECE IV for 10 days in your own home or laboratory, under your own reception conditions. It it fails to meet your every expectation, return it undamaged and your money will be promptly and cheerfully refunded, less only transportation charges.

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12-AW

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DIAL LIGHT

BEGINNING WITH THIS issue, we are instituting a series of full-page Data Sheets for all-wave listeners and all-wave experimenters. These sheets may be clipped as they appear and mounted in a scrapbook, or punched to fit a looseleaf binder.

Data Sheet No. 1 is, as you will observe, a map of the United States on which is indicated the area covered by each radio amateur call district. This is handy in determining from what section of the country an amateur signal is being received.

Subsequent Data Sheets will provide further information of this nature, as well as tables, graphs, etc., of value to the experimenter.

If the idea is well received, and we find from the opinions of readers that more than one Data Sheet per issue would be favored, we may enlarge upon it.

What do *you* think?

❖ ❖ ❖

WE REGRET THAT IT has been impossible to include in this issue the constructional article on the new type of broadcast receiver we promised last month. Our work is not entirely completed, and we trust that you will bear with us for one more month.

It has also been necessary to hold over the article on the inside story of the manufactured receiver. We read the completed draft of this article last week, and it is a honey. We believe you will find it a revelation.

Metal tubes are again to receive attention next month: We have completed all tests, and the necessary data to round out the subject has been obtained.

We don't mind telling you now that the entire staff of ALL-WAVE RADIO give their unqualified approval to the metal tube . . . . but read the article in the January issue.

EXPERIMENTERS WILL BE pleased to know that the Raytheon people have brought out a metal tube of the duo-diode triode type . . . . the first one of this nature in the metal-tube line. It is known as the 6Q7.

It will be recalled that Mr. Granger stated in his article on 1936 receivers, in the November issue, that metal- and glass-tube sets could not be judged on the basis of the number of tubes used, since no duo-diode triode was available in the metal-tube line. Now that the 6Q7 is out, it will soon be possible to judge certain sets tube-for-tube.

For the benefit of the experimenter, we might add that the 6Q7 diode section has the edge on the type 6H6 metal-tube diode and, everything considered, the 6Q7 as a whole has the edge on glass tubes of the same type. Better characteristics all around.

❖ ❖ ❖

IS TELEVISION JUST around the corner? Many people have come to the belief that it is, principally for the reason that RCA has dispensed with its stock holdings in RKO, and sold its English interests.

Financial quarters are of the opinion that RCA is out to clarify and strengthen its cash and stock position, which is undoubtedly true. But there are those who believe that RCA eased itself out of RKO to prevent any possible embarrassment in the near future, when, as and if Television is sprung, and that the strengthening of its cash position is obviously a sign that they are ready for a new and far-reaching venture in a new direction.

What do we think? Well, what we think is of no value, and since we have no definite knowledge as yet, we shall keep quiet. Draw your own conclusions.

❖ ❖ ❖

AFTER A RAPID survey of the short-wave receiver circuit Mr. Worcester presents in this issue, you may ask yourself where you have seen it before. The answer is, of course, that you have seen it literally hundreds of times. It is the good, old tuned r-f, regenerative detector combination which has been with us since the days of the original Roberts and Browning circuits.

But . . . . it has had some engineering applied to it, as you will find after reading the article. It is the same circuit throughout, but it has been made to sit up and beg. No tricks, and no trick name. Just the matter-of-fact data.

Let us know how it works for you.

❖ ❖ ❖

WINTER WILL BE with us shortly. Many listeners are looking forward to the cozy evenings at home, and the anticipation of many pleasant turns over the short-wave bands.

But, before the air becomes bitter and ice forms on the roof, give your aerial the once-over. Get it in ship-shape order now, before winter sets in. You'll be glad for it later.

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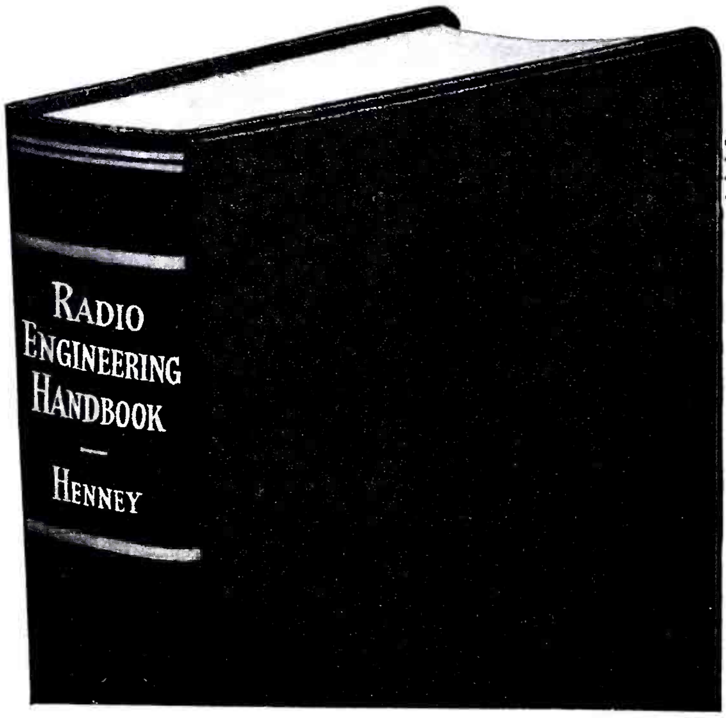

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RADIO OPERATING QUESTIONS AND ANSWERS

By A. R. Nilson and J. L. Hornung, 389 pages, 5½ x 8, 96 illustrations, $2.50. Gives over 600 questions, with answers, typical of those asked on radio operator license examinations, and covering operating essentials of broadcasting, marine, police, aeronautical, and amateur radio.

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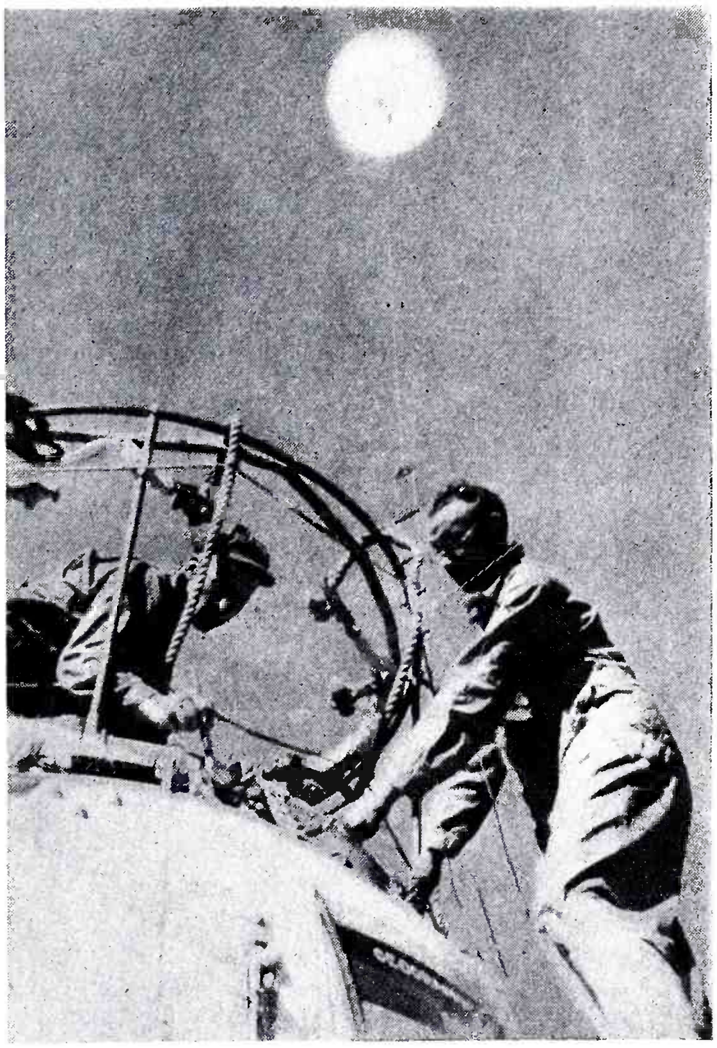
ALL-WAVE RADIO

FOR DECEMBER, 1935

THE *STRATOSPHERE* FLIGHT

By G. S. GRANGER

THE ELABORATE arrangements which were made far in advance to keep the Army balloonists in touch with the earth during the recent record breaking stratosphere flight were amply justified by the complete success of the radio transmission and reception. Every piece of apparatus functioned at full efficiency from the take-off until the gondola again rested on the ground some eight hours later.



Testing the transmitting equipment on the balloon. The quarter-wave antenna is being held aloft by a meteorological balloon.

Radio Network

During the entire flight a radio circuit was operated which connected a dozen points on the ground, including three shortwave transmitters and four receiving points from coast to coast. In addition to messages relayed at frequent intervals to the balloon from various places on this circuit, there were eight broadcasts from the gondola during the day, including one with an NBC program executive flying in the giant China Clipper over the Pacific off the California coast, and one with London. Fading during the late afternoon two-way conversation between the balloon and the Clipper due to atmospheric conditions was the only deviation from a perfect sending and pick-up record.

Explorer II Transmitter

The big Explorer II was equipped with a specially designed RCA transmitter and receiver, each constructed with a view to giving the best performance with a minimum of size and weight. The transmitter was a 7-tube type with a capacity of eight watts. The set was crystal controlled, with a dual equipment of two crystals slightly staggered, enabling stable operation at 13,046 and 13,055 kc. The station call letters were W10XFH. Power was obtained from 36 "A" and "B" dry batteries which served both for the sending and receiving apparatus. The battery compartment was 15″ x 14″ x 8″ deep. On account of the shifting position of the men in the gondola, who were obliged to operate the scientific instruments while broadcasting at the same time, an audio automatic gain control was installed, which kept the modulation level close to 100 per cent regardless of the position of the broadcaster.

The transmitter as well as the receiver was constructed largely of dow metal. Their combined weight was approximately 60 pounds.

The Receiver

The receiver was a six-tube superheterodyne, designed to cover a frequency band of 6000 to 6500 kc, all ground transmitters having been adjusted to operate within these limits. The dimensions of the receiver were 7″ x 9″ x 9½″. It was a single control device, and earphones instead of loudspeaker were used; however, the signals were so loud that, with the exception of one period during the flight, it was possible for the observers to copy all signals with the headphones hanging loose from the receiver. (So loud, as a matter of fact, that feedback was caused during one of the transmissions).

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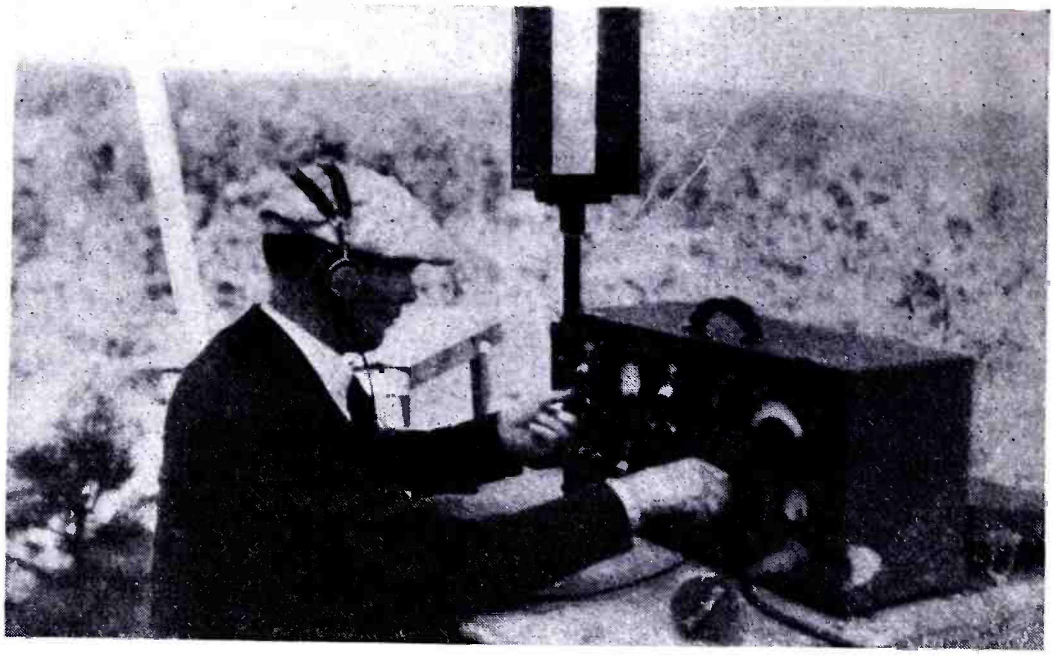
The transmitting antenna was a quarter-wave radiator suspended from the lower catenary band of the balloon, with a pulley arrangement to draw it taut. It was fed by a two-wire transmission line from the transmitter. The receiving antenna was of the ordinary airplane type, dropped out from the bottom of the gondola about 70 feet. The entering insulator was of soft rubber so that air pressure within the gondola would tend to seal the entrance!

In order to insure that the dry batteries used both in sending and receiving would be absolutely fresh at the start of the flight these were kept in cold storage until just a short time before the take-off. The RCA Radiotron transmitter and receiver vacuum tubes were energized three-quarters of an hour before the balloon left the ground, so that a constant temperature and hence maximum stable operation would be reached.



The ground receiver at the Bowl.

Complex Network, But—

The entire staff of NBC engineers, with several announcers, was on duty at Radio City, Chicago and Rapid City during the flight. Efficient work also was done by the R.C.A. Communications engineers at Riverhead, Point Reyes and Bolinas, Calif. Constant communication was maintained with the big balloon and with the many points on the ground circuit during the more than eight hours that the Explorer II was aloft, and the frequent switches from the balloon to ground points, and to the China Clipper and London, were made without delay and with perfect coordination. There was never a hitch or a fumble in this, one of the most complex series of broadcasts ever put on the air.

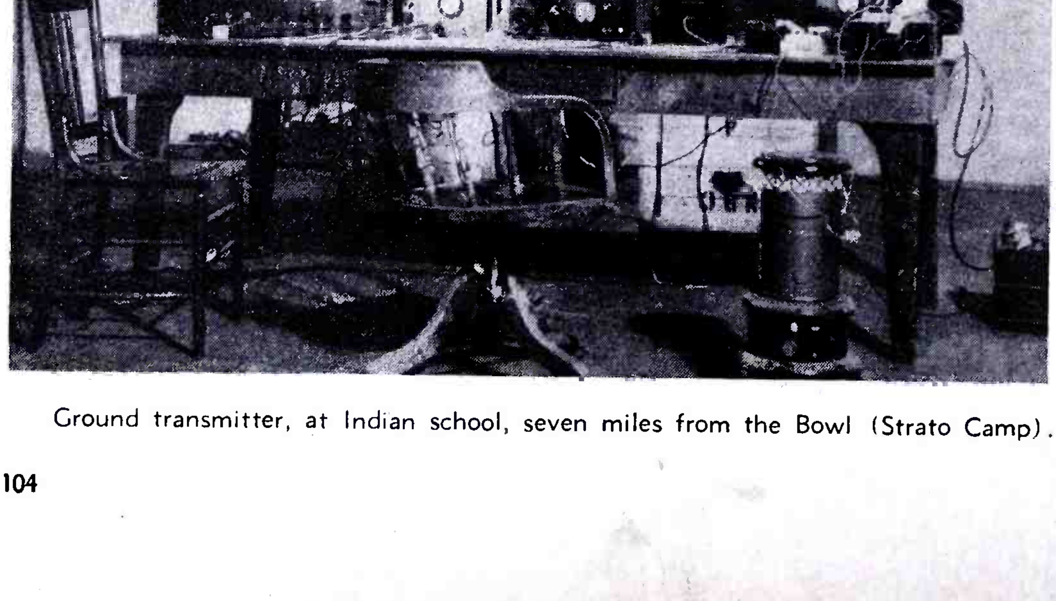
Ground communication was established by a combination of telephone trunk lines feeding various radio transmitters and receivers. Any point could talk to any other point, and everything that was said went out over three transmitters so that it would be sure to be picked up by the balloon. This circuit, known as a full-talk circuit, ran from New York to the Bound Brook 20-kw radio transmitter, W3XL, operating on 6425 kc; thence to Washington to the headquarters of the National Geographic Society and the U. S. Army Air Corps; thence to Chicago to the 5-kw radio transmitter W9XF, on 6100 kc; then to Rapid City, S. D., to the strato camp and the 200-watt radio transmitter W10XF, operating on 6350 kc at the Indian School seven miles from the camp.

Signal Pickups

Signals from the balloon transmitter were picked up by the R.C.A. Communications receiving stations at Riverhead, L. I., and Point Reyes, Calif., by the NBC receiving station at the strato camp, and by the broadcasting receiving headquarters of the National Broadcasting Company at Chicago. The early pickups were made at the strato camp, then they were shifted to Riverhead, then to Chicago, and finally to Point Reyes in accordance with conditions brought about by the changes in the atmosphere due to solar radiation.

When on the air, all speakers were fed to the full-talk circuit, but they could also be placed on a special program circuit with one-way repeaters which brought in the incoming messages from the balloon.

A great mass of information was obtained during the flight as to the propagation of electro-magnetic waves through the atmosphere. Not only was this learned from the transmitting and receiving results of the balloon itself, but also from the experiences of the 100-watt radio transmitter on the China Clipper, flying off the California coast. Signals from both of these conquerors of the air were picked up by Point Reyes and transferred to San Francisco; then put on the NBC network, and transferred from it to the full-talk circuit. The balloon heard the signals from the airship from this full-talk circuit, whereas the Clipper listened to her lighter-than-air sister from the R.C.A. Communications transmitter at Bolinas, which was fed from San Francisco. The balloon at this time was at a height of 23,000 feet.



Ground transmitter, at Indian school, seven miles from the Bowl (Strato Camp).

Link to London

A further feature of interest was a two-way conversation between a reporter of the London Daily Mail in London, who talked over the regular trans-Atlantic telephone service to Netcong, N. J., where the signals were transferred by landwire to the National Broadcasting

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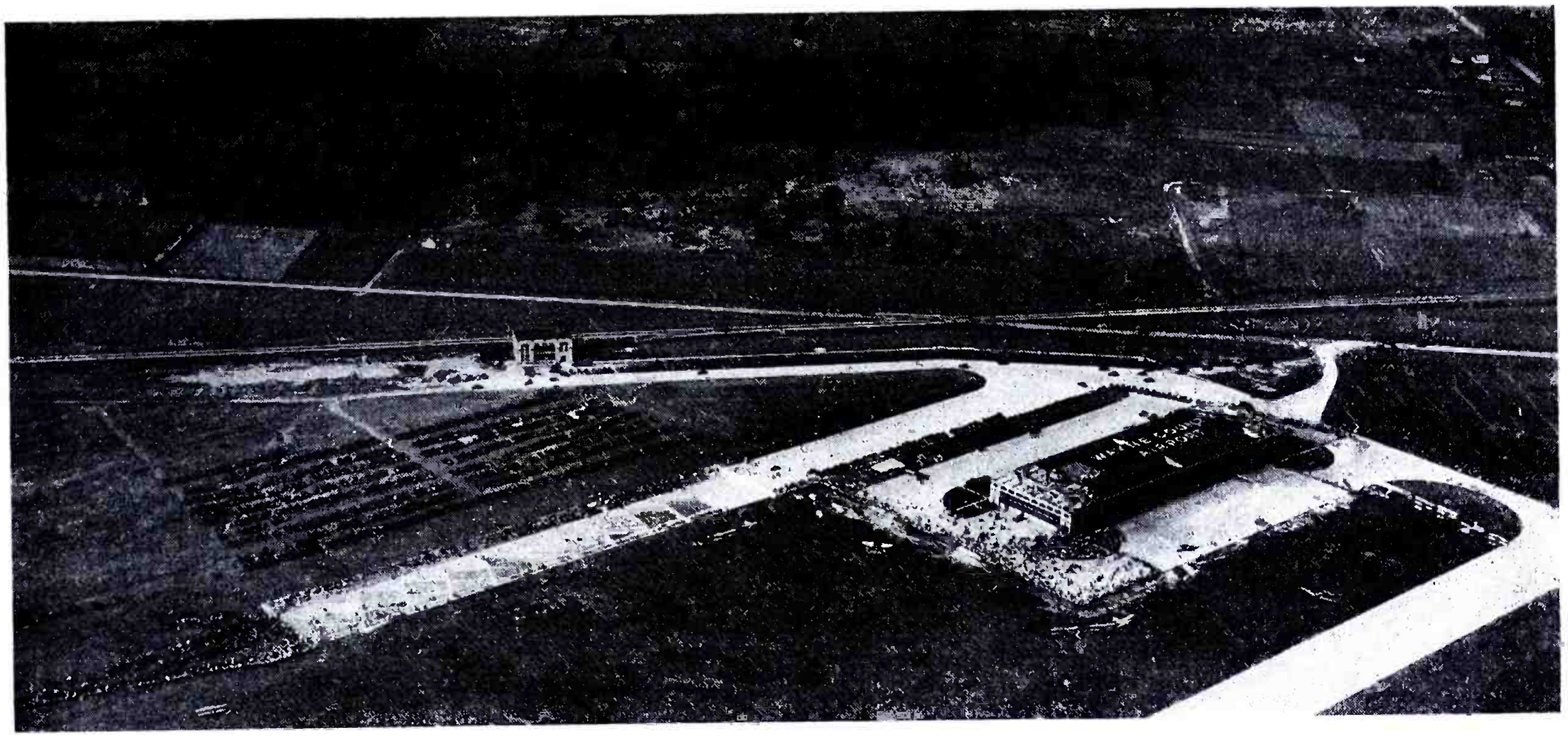

Bird's eye view of the Michigan Air Circus.

THE NEWSPAPER OFFICE OF THE AIR

BETWEEN THE thrills of daring stunt flying at the Michigan Air Circus on the Wayne County Airport, Detroit, September 14 and 15, James V. Piersol, aviation editor, flying The Detroit *News* airplane, Early Bird, gave an impressive demonstration of the scientific progresses made in speedy news coverage and in aerial photography.

Radio Enters

By means of radio communication from the "newspaper office of the air," spectators heard for the first time a complete, uninterrupted description of his flight by the pilot, speaking directly from the controls of the airplane. Mr. Piersol explained by means of his special microphone, picked up by amplifiers located on the field, all of the interesting details connected with the handling of the ship and demonstrated the operation of the automatic pilot-operated camera, mounted in the left wing of the plane. He also described the crowd, the highway congestion surrounding the airport and the field itself.

"I am throttling back to 105 miles an hour," Piersol told the crowd of 35,000 at one point in his demonstration. "The nose of the ship is up 20 degrees above the horizon. Now I am starting the dive. You are all in the machine-gun sight right here in front of me. Powder your noses, girls! I am going to take your picture right now! . . . There it is!"

Special Mike Used

The complete success of this broadcast was due largely to the special microphone harness designed by Piersol, which he has adapted from equipment tried by the original mail pilots and then abandoned. By means of the harness, the microphone is always in correct position, and Piersol has both hands free to operate the plane and camera.

"One reason most aircraft broadcasts have been unsuccessful, or unsatisfactory to listeners, is because the announcer either gets 'lost' as to his location, or he becomes a sight-seer and in his enthusiasm, turns his head so far from the microphone that his voice becomes unintelligible," Piersol states. "Our harness 'mike' eliminates this.

"Another reason is the terrific back-

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J. V. Piersol, Aviation Editor of the Detroit News, with the self-aligning microphone.

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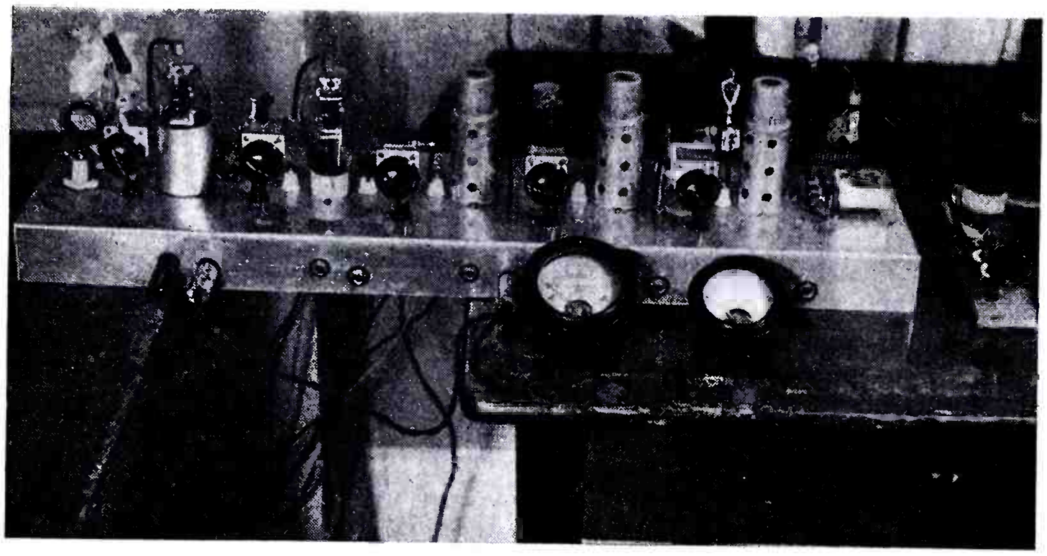
MAJOR ARMSTRONG'S FREQUENCY



Series of frequency multipliers of intermediate power which feed the frequency-tripling stage.

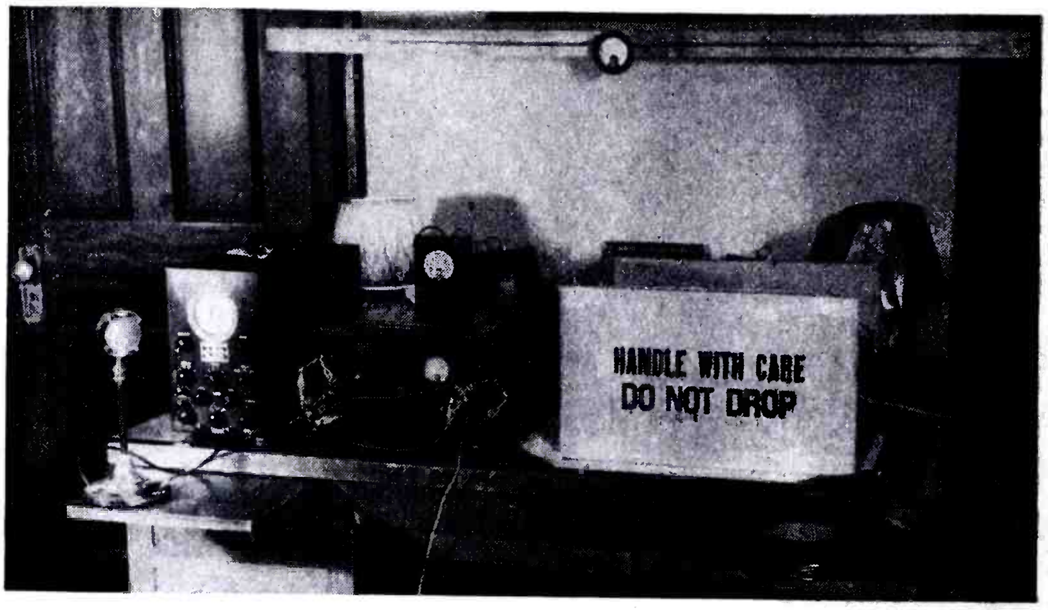
MAJOR EDWIN H. ARMSTRONG, now Professor of Electrical Engineering at Columbia University, has again startled the radio world with another series of inventions which seem to hold more than ordinary promise, not only in the field of broadcasting, but also in facsimile and television transmission.

The entire system, as far as the man in the street is concerned, may be covered by a few relatively simple statements, but the apparatus necessary for the operation of his new system is extremely complex in appearance, as well as in manipulation. Some idea of its complexity may be had from the accompanying illustrations.

In April Armstrong issued a statement claiming, for his new system, an improvement in signal-to-noise energy ratio of one-thousand-to-one response for a given area, at a given power level for the transmitter.

The Institute of Radio Engineers, on the night of November 6th, heard him describe his new system and heard him pay glowing tribute to the old time amateurs who assisted him in its development, as well as in the demonstration which followed the outline of his work. Since then he appeared before the IRE at the Rochester Fall Meeting, where these claims were substantiated before the majority of leaders in the radio field.

As a practical demonstration of the improvement his system provides, Armstrong had some phonograph records made of signals transmitted from the Empire State Building and received at the home of Harry Sadenwater, located at Haddonfield, New Jersey, about eighty-five miles away. These phonograph records were made during the time when a lightning storm was in progress and when many actual strikes occurred within ten miles of the receiving equipment. Similar records were made of some of the more powerful New York broadcasting stations and though the distances were almost identical, the interference created by the storm was so bad in connection with the ordinary system, as to make the programs practically valueless, while little or no interference was evident in connection with this newer method. Furthermore, when it is considered that but two thousand watts were employed by Armstrong and nearly twenty-five times that amount of power was being used by the regular broadcasting stations, the effectiveness of the new



Studio at W2AG, Yonkers, N. Y., C. R. Runyon, Jr., one of the oldest of the oldtimers.

One of the preliminary receiving aerials was hung on the mast shown here. This was erected at Haddonfield, N. J.

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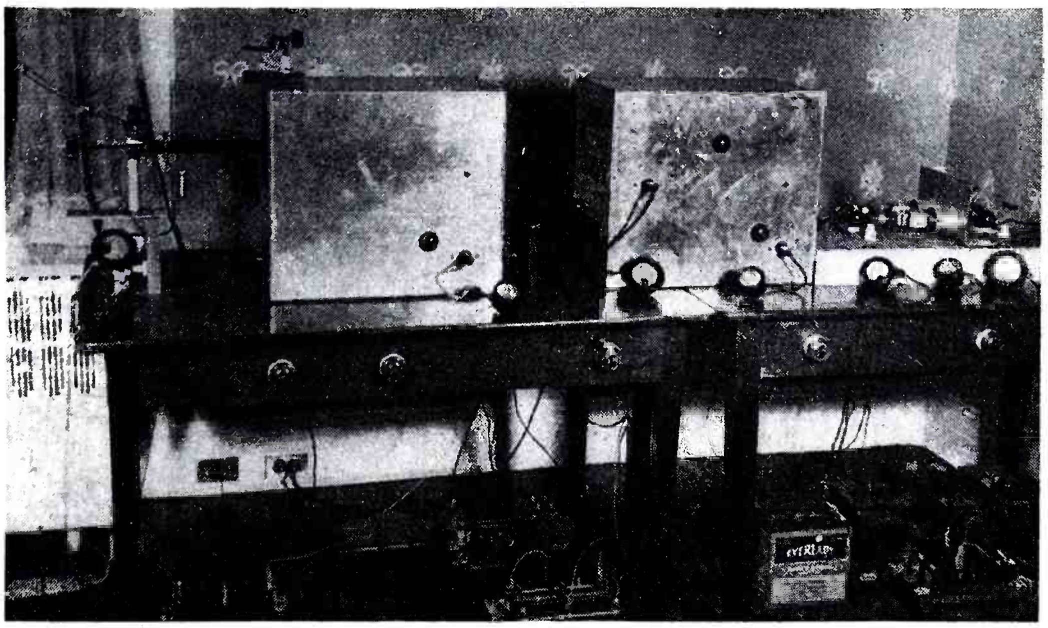
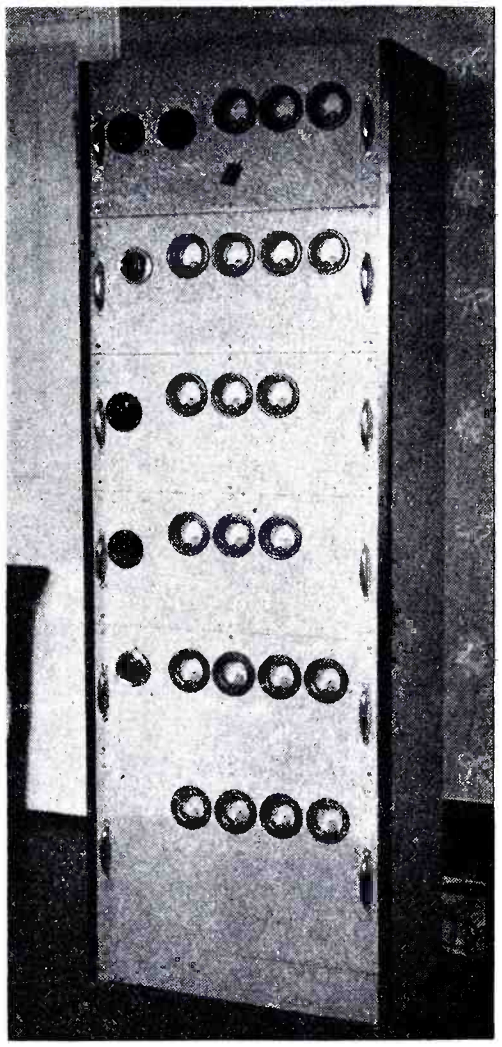
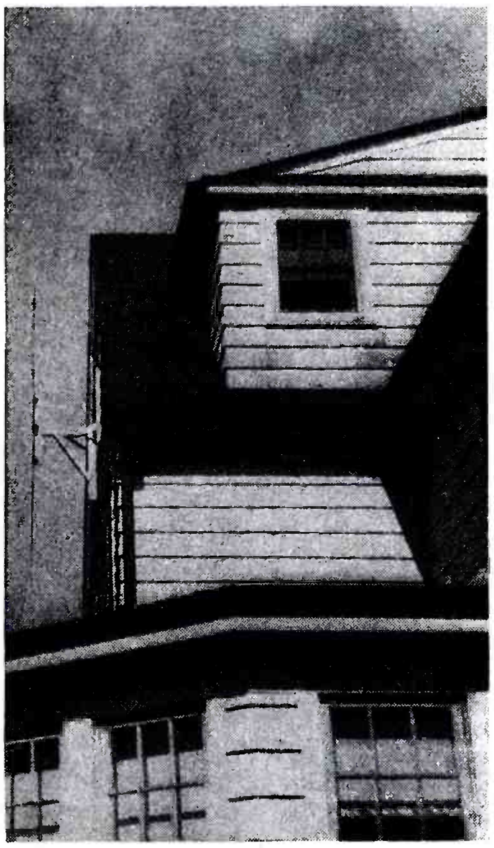
MODULATION SYSTEM

By ARTHUR H. LYNCH





Above left: The high power frequency tripling stage and final amplifier. Above right: Modulating and frequency multiplying equipment. This is the work of Jack Shaugnessy, of the Garden City Radio Club, and Thomas J. Stiles.



The half-wave dipole later used to replace the antenna illustrated on the opposite page.

arangement becomes more noticeable.

Some confusion has existed regarding this phase of Armstrong's work, and many ultra-high-frequency experimenters have suggested that there is not much point in eliminating static in that portion of the ether spectrum because it is not very noticeable there. The first news releases were not very clear on this point.

Even the skeptics, who have scoffed at the mention of static elimination, agree that ignition noise from automobiles does exist on the ultra-high frequencies. At his lecture before the IRE, the inventor said that signals emanating from Yonkers are picked up at his Columbia University Laboratory with as much freedom from ignition interference as occurred during the demonstration at the Engineering Society's Building on 39th Street. None was noted by this observer, in the latter case, though he was watching for it with care. The antenna at the University is close enough to several busy streets and severe auto ignition interference is noted when the ordinary method of transmission and reception is employed.

Transmissions from the experimental set-up at W2AG, were picked up with great volume and more than ordinary quality by Frank Lester of Bergenfield, New Jersey. He was using a resistance-coupled superheterodyne on 2.5 meters. Likewise, they have been received by George Shuart, W2AMN, at Ramsey, New Jersey, using a conventional super-regenerative receiver.

Preliminary reports indicated that little or nothing would be heard with ordinary receivers.

While it has generally been thought that interference would increase as the acceptance width of a radio receiver is increased, Armstrong has shown that by the application of his system, the actual effect of interfering noises is materially reduced. The explanation is a bit involved and will be found in the *Proceedings* of the Institute of Radio Engineers when the paper is published in its entirety.

An excellent, semi technical, description of the system appears in the November issue of *Electronics* and we recommend it to those who do not wish to wait for the full paper to appear.

There is no question but that this new system will find many who will desire to look into it more thoroughly and who will wish to produce the equipment necessary for duplicating it. It has unbounded possibilities.

In passing, we cannot refrain from calling attention to the fact that some seventy-three tubes were used in Armstrong's transmitter and approximately twenty-five were used in the receiving equipment. This would seem like a staggering handicap. However, it is well to remember, that in their earlier forms, the super-regenerative and the superheterodyne circuits were very involved affairs and their practical application came several years after their introduction to the radio engineering field.

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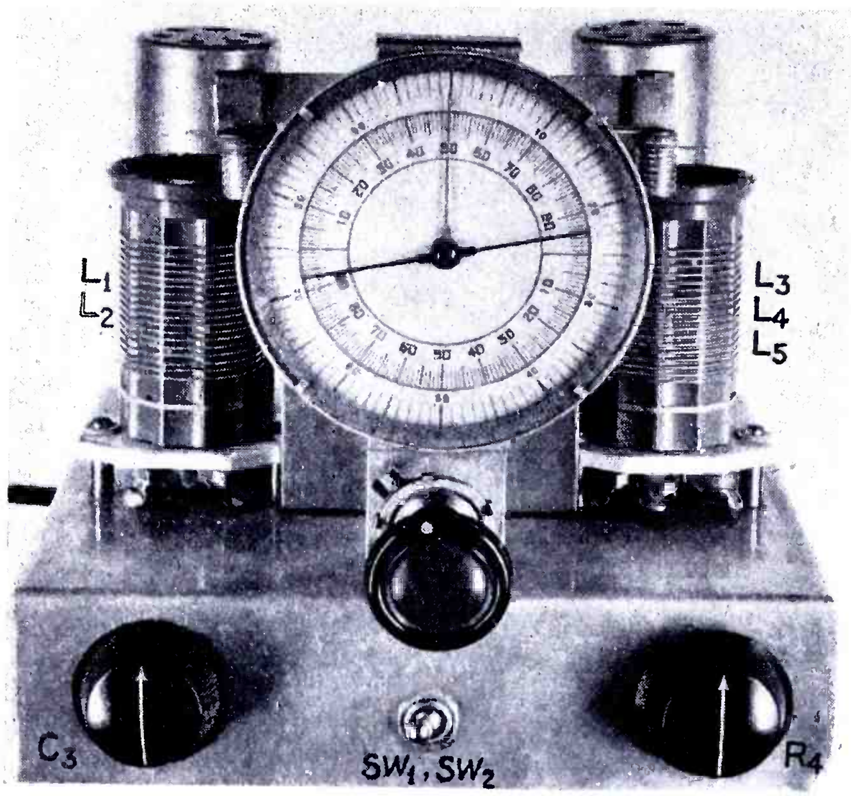
IMPROVED

By J. A. WORCESTER, Jr.

ALL-WAVE RADIO APPROVAL



Front view of completed receiver.

THE RECEIVER HEREIN described is presented for the constructor desiring to build a short-wave receiver somewhat more complicated than the simple regenerative type, but not as involved and costly as the superheterodyne circuit. This set will pull in most anything that the more complicated superheterodynes will and, as a matter of fact, will outperform the simpler types incorporating only one stage of i-f amplification. Its only drawback is its lack of razor-edge selectivity which is something of a disadvantage when operating in the more congested bands.

No Shielding Required

The circuit itself includes several new features which permit cheaper construction, easier operation, and improved performance.

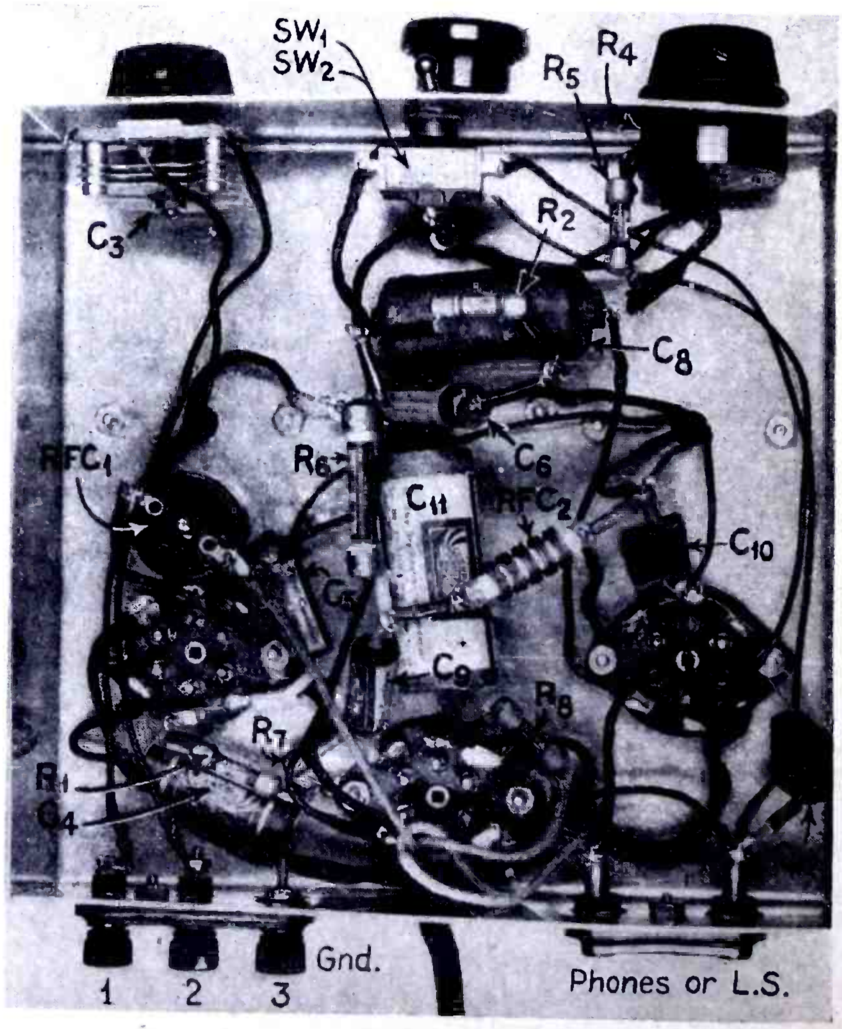
The main constructional difficulty with this type of circuit has been its tendency to oscillate even when the most elaborate shielding and wiring precautions have been taken, and suitable decoupling provided. The writer has studied this problem with the view in mind of determining the source of the difficulty and of overcoming it; as well as the possibility of eliminating unnecessary precautions tending to complicate the construction.

It was soon found that when the antenna and detector coils were separated by as much as 5 inches the feedback due to magnetic effects was negligible, and consequently the bothersome precaution of shielding the stages could be dispensed with. This procedure enables a marked decrease in the constructional cost to be effected by conserving chassis space and eliminating extensive shielding materials.

Eliminating Feedback

When the usual by-pass condensers were employed it was also discovered that feedback due to common impedance coupling in the various return circuits was likewise of a negligible order. The main source of feedback was found to be of a capacitative nature, which hitherto has not been considered in screen grid t-r-f amplifiers. This statement may appear questionable when it is recalled that the grid-to-plate capacitance of a type 58 tube is less than .01 mmfd; but it should be remembered that there are various other sources contributing to the overall capacitance. If the reactance of the net grid-to-plate capacitance falls much below 500,000 ohms it can be shown that an oscillatory circuit may be produced.

To check on the above conclusion, the primary of the r-f transformer was rewound with a large number of turns of fine wire so that it resonated, in conjunction with the various stray capacitances, to a frequency just below the lowest frequency covered with each coil. Hence, throughout the entire tuning range the primary will present a capacitative reactance. It can be shown that when the plate load is capacitative



Under chassis view of receiver, showing location of parts. See Legend for values.

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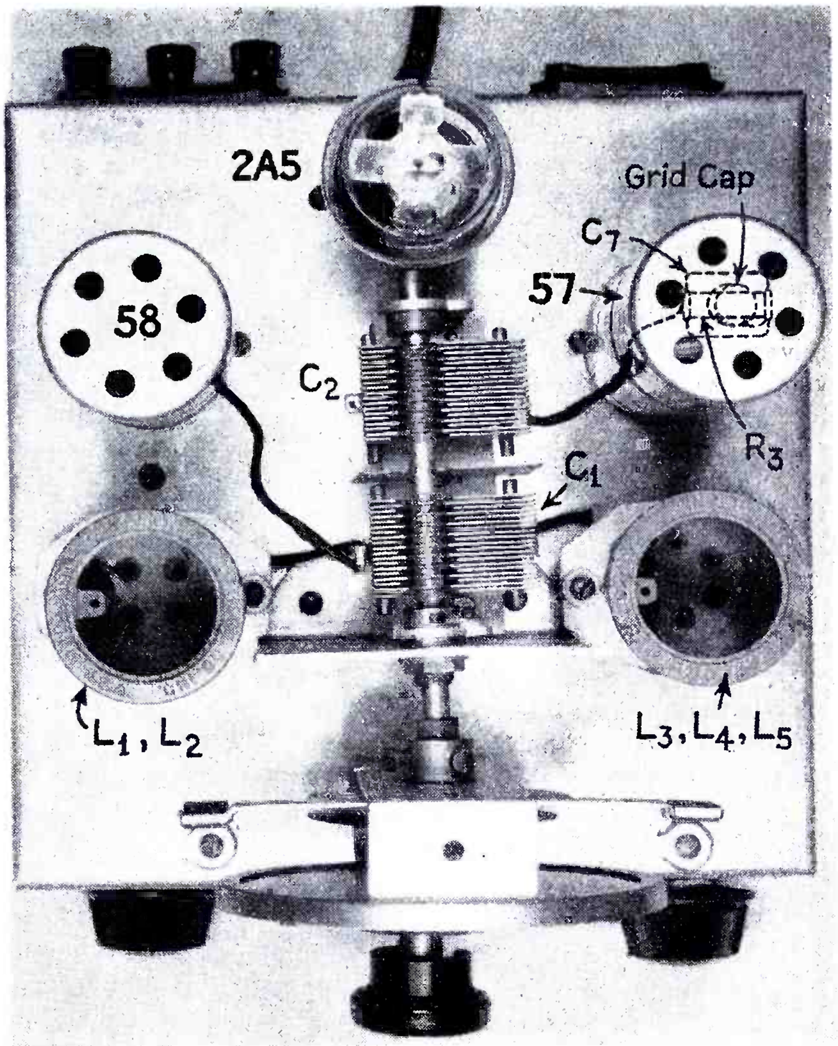
S. W. SET

An Easily Constructed Tuned R-F Short-Wave Receiver Featuring Stability, Performance and Low Cost



Top view of chassis, showing layout of parts. See Legend for values and descriptions.

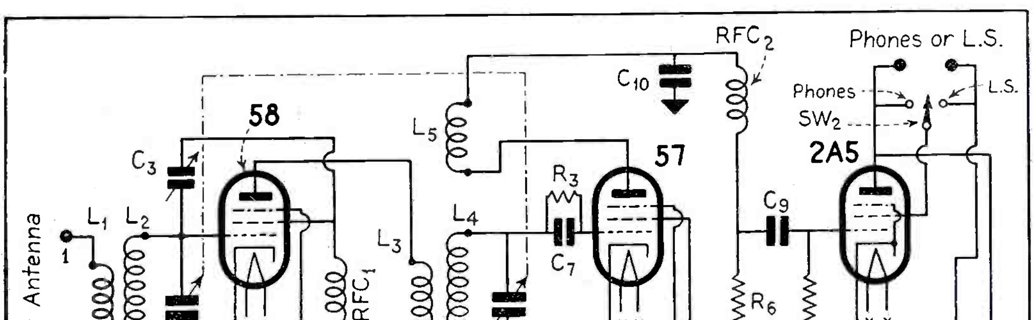
the feedback through the grid-to-plate capacitance is degenerative instead of regenerative and a stable condition should exist. This was found to be true in practice and is of considerable interest in that the coils were spaced on five-inch centers with absolutely no shielding. It might be pointed out in this connection that this type of construction is employed by one of the largest manufacturers of short-wave receivers in their two stage signal-frequency amplifiers; ostensibly for the purpose of providing uniform gain.

While the above construction is effective as far as providing an inherently stable amplifier is concerned, it has the disadvantage of requiring specially designed r-f plug-in coils which might serve to discourage the average constructor. A further disadvantage is the fact that the net feedback is degenerative, resulting in decreased gain and a loading effect on the detector circuit sufficiently large to require an increase in the tickler turns in order to provide adequate regeneration.

The Circuit

In order to enable the use of standard plug-in coils and eliminate the degenerative effects noted above, the circuit shown in the schematic diagram was evolved. It was reasoned that the inclusion of a capacitative reactance in the screen circuit should provide the same effect as one in the plate circuit, and would have the added advantage that its effect could be increased by deliberately providing a suitable screen-to-grid capacitance, thus obviating the necessity of employing critically wound coils and enabling the use of a simple r-f choke as the capacitative load.

In practice, this system was found to work to perfection. The choke, RFC-1, provides the capacitative load and has a value of 85 mh. The variable condenser, C-3, provides the desired amount of degenerative feedback to compensate for the regenerative effects produced by the resistive load in the plate circuit. Although this control is brought out to the front panel, it is not in the least critical. It can generally be left at its maximum value (50 mmfd) and forgotten except at the lowest settings of the tuning condensers where an over-compensating effect, as evidenced by the necessity of increasing the regeneration control above its nominal position, is noted. This condition can easily be remedied, of course, by merely decreasing C-3 until the detector circuit slides into oscillation at the proper point. The r-f amplifier will not oscillate unless C-3 is decreased below 25 mmfd, while the maximum variation required for a constant regeneration-control setting is from about 40 to 50 mmfd.



Circuit diagram of the receiver described. Note condenser coupled from screen to grid of 58 tube.

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Antenna Trimmer Eliminated

Another desirable effect introduced by this construtcion is the fact that the screen-grid input capacitance loads the antenna coil to a point where the usual trimming condenser can be entirely eliminated. This eliminates a bothersome control and still further simplifies the construction.

Another interesting feature of this receiver is the dual pointer dial which provides a very fine band-spreading action by mechanical means. The reduction ratio of the knob to the main pointer is 125 to 1, thus permitting easy tuning on even the shortest waves; while the band-spread pointer, traveling 36 times faster than the main pointer, enables stations to be accurately logged. The dial is beautifully smooth in operation and will effect a worthy improvement in any short-wave receiver not equipped with other means of band-spreading.

The plug-in coils employed are also worthy of comment, since, as far as the writer is aware, they are the only commercially available coils in which the tickler windings have been specifically designed for use with screen-grid tubes. Invariably coils that have sufficient tickler turns to enable satisfactory operation with low-gain triodes break immediately into violent, irregular oscillation at low settings of the tuning capacity when employed in conjunction with present-day r-f pentodes. As anyone experiencing this condition can attest, the result is very discomforting, especially if the gain is sufficient to provide satisfactory volume when normal regenerative operation is obtained.

LEGEND

L-1, L-2—Hammarlund SWK-4, 4-prong short-wave coil set.
RFC-1—I.C.A. 85 mh. r-f choke, unmounted.
L-3, L-4, L-5—Hammarlund SWK-6, 6-prong short-wave coil set.
RFC-2—Hammarlund 2.3 mh. r-f choke, Type CH-X.
C-1, C-2—Hammarlund Dual Condenser, 140 mmfd. per section, Type MCD-140-M.
C-3—Hammarlund Star 50 mmfd variable condenser, Type SM-50.
C-4, C-5, C-6, C-9 Cornell-Dubilier .01 mfd tubular by-pass condensers, Type DT4S1.
C-7—Cornell-Dubilier .0001 mfd mica condenser postage stamp size. Type Type 2W5T1.
C-8—Cornell-Dubilier .05 mfd tubular paper condenser, Type DT4P5.
C-10, C-12—Cornell-Dubilier .0005 mfd mica condensers, Type 1W5T5.
C-11—Cornell-Dubilier 25 mfd, 25-volt dry electrolytic condenser, Type ED-2250.
R-1, R-8—I.R.C. 500-ohm metallized resistors, 1 watt.
R-2—I.R.C. 2000-ohm metallized resistor, ½ watt.
R-3—I.R.C. 2-megohm metallized gridleak, ½ watt.
R-4—Electrad 50,000-ohm volume control, Type 205.
R-5—I.R.C. 100,000-ohm metallized resistor, ½ watt.
R-6—I.R.C. 250,000-ohm metallized resistor, 1 watt.
R-7—I.R.C. 250,000-ohm metallized resistor, ½ watt.
2—Hammarlund tube shields, Type TS-50.
1—DeJur-Amsco bandspread dial, Type 540, equipped with P-55 planetary attachment.
1—Aluminum Chassis, 8" by 8" by 2", 14 gauge. (Leeds 8" x 8½" x 2" demibase).
1—Hammarlund 4-prong isolantite socket, Type S-4.
1—Hammarlund 6-prong isolantite socket, Type S-6.
3—I.C.A. 6-prong wafer sockets.
2—Grid clips.
1—Eby triple binding-post assembly.
1—Eby twin speaker jack assembly.
2—I.C.A. S.P.D.T. toggle switches, Type 1236.
1—R.C.A. Type 57 Radiotron.
1—R.C.A. Type 58 Radiotron.
1—R.C.A. Type 2A5 Radiotron.
Miscellaneous wire and hardware.

A rather unusual feature is incorporated in the audio stage making it possible to use the 2A5 output tube as either a triode or pentode as desired, by connecting the screen to the plate or B plus by the toggle switch, S-2. This makes it possible to reduce the normal gain of this tube for satisfactory headphone reception on local stations and powerful CW transmitters.

Construction Details

The placement of the various components is evident from an inspection of the photographs and layout drawing, while the proper procedure for making the various connections can be noted from the schematic diagram. The tubes employed are a 58, a 57, and a 2A5. An external power supply is required and should provide 2.5 volts for the heaters and a well-filtered plate voltage of 180 or 250 volts, with a 100-volt tap for the screen circuits.

When constructing the set, the first step is to procure a 12" by 12" piece of 14-gauge aluminum and drill the various holes as indicated in the layout drawing. The chassis is then bent and the various parts mounted. The isolantite coil sockets are mounted above the chassis by bushings provided for the purpose. When mounting the variable condenser, C-3, it is necessary to insulate the threaded bushing from the chassis. This is accomplished by employing insulated washers and by drilling a larger mounting hole than customary to provide sufficient clearance. A continuity test should be applied to make sure that the shaft is properly insulated.

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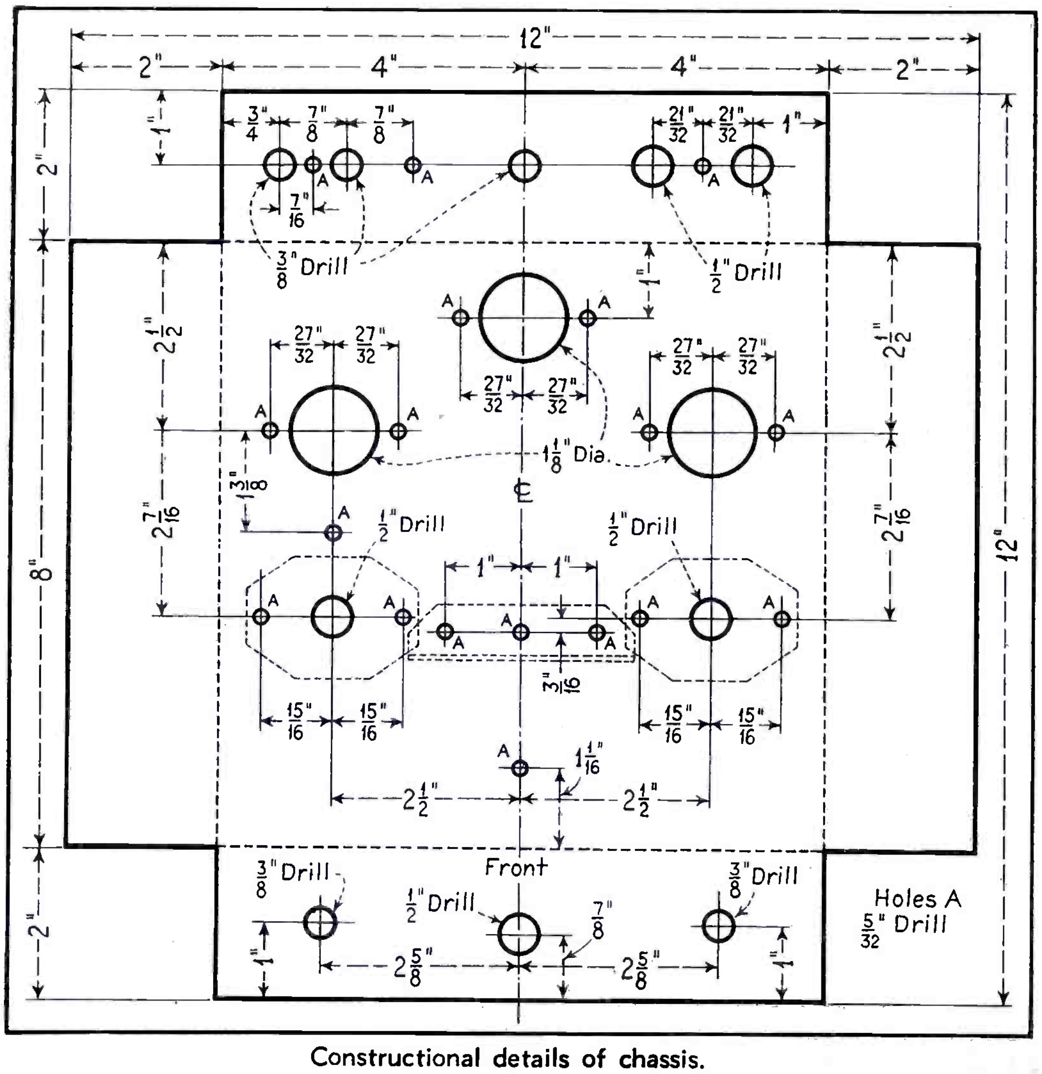

Constructional details of chassis.

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Frequency Standards for Checking Receivers

THE NATIONAL Bureau of Standards, Department of Commerce, provides a standard frequency service which is broadcast by radio. Beginning October 1, 1935, this service will be given on three days each week, from the Bureau's station WWV, Beltsville, Md., near Washington, D. C.

Receiver Calibration

The object of these radio emissions is to provide a standard for scientific or other measurements requiring an accurate radio of audio frequency or time rate. They are likewise useful to radio transmitting stations for adjusting their transmitters to exact frequency, and to the public generally for calibrating frequency standards, it was stated. These standard frequencies may also be effectively used for checking the calibrations of an all-wave or short-wave receiver.

On each Tuesday and Friday the emissions will be continuous unmodulated waves (cw); and on each Wednesday they will be modulated by an audio frequency. The audio frequency will be in general 1,000 cycles per second. (There will be no emissions on legal holidays.)

Nature of Transmissions

On all emissions three radio carrier frequencies will be transmitted as follows: noon to 1 P. M., Eastern Standard Time, 15,000 kc, 1:15 to 2:15 P. M., 10,000 kc; 2:30 to 3:30 P. M., 5,000 kc.

The emissions on 5,000 kc will be found particularly useful at distances within a few hundred miles from Washington, those on 10,000 kc will be useful for the rest of the United States, and those on 15,000 kc will be useful in the western half of the United States and to some extent in other parts of the world.

During the first five minutes of the one-hour emission on each carrier frequency, announcements will be given. For the cw emissions, the announcements will be made by telegraphic keying and will consist of the station call letters (WWV) and a statement of the frequency; this announcement will be repeated every ten minutes. For modulated emissions, the announcements will be given only at the beginning of the hour; they will be given by voice and will include the station call letters and a statement of the carrier frequency and the audio modulation frequency.

Except during the announcements, the cw emissions will consist of continuous, unkeyed carrier frequency, giving a continuous beat note in the telephone receiver in heterodyne reception. The radiated power in the cw emissions will be 20 kilowatts.

Modulated Emissions Experimental

The modulated emissions, except during the voice announcements at the beginning of the hour, will consist of an uninterrupted audio frequency superposed on the carrier frequency. The radiated power will be only one kilowatt; reception is therefore not as reliable as for the cw emissions of Tuesdays and Fridays; it is hoped to increase the power later. The modulated emissions are somewhat experimental, and for this reason an audio frequency other than 1,000 cycles per second may be used on some occasions. The presence of the audio modulation frequency does not impair the use of the carrier frequency as a standard to the same high accuracy as in the cw emissions.

Accuracy

The accuracy of the frequencies as sent out from the transmitting station will be at all times better than a part in five million. Transmission effects in the medium (Doppler effect, fading, etc.) at times may result in slight fluctuations in the frequency as received at a particular place. However, these will practically never impair the reception of the carrier frequency to the accuracy stated. Under some conditions, momentary fluctuations as great as 1 cycle per second may occur in the modulation frequency. It will generally be found possible, however, to use the modulation frequency with an accuracy better than a part in a million by selecting that one of the three carrier frequencies which has the least fading. The use of automatic volume control on the audio frequency will be found helpful.

How To Use Emissions

Information on how to receive and utilize the standard frequency service is given in a pamphlet obtainable on request addressed to the National Bureau of Standards, Washington, D. C. From any single frequency, using harmonic methods, any frequency may be checked.

All-Wave Radio

Tin-Pan Alley invades the home of Mrs. Van Ripper.

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BROADCAST—SHORT-WAVE . . .
Why Does Reception Differ?

All-wave receivers do not give the same results on all bands. The listener should know why, and what he has to contend with in short-wave reception, so he may get the most out of his set. Here's the dope.

THE OWNER OF a broadcast receiver very seldom finds cause for complaint with respect to the reception of programs. Moreover, if the receiver is modern, the owner should find no great difficulty in obtaining satisfactory reception from distant stations. Why, then, is this not also the case with all-wave receivers?

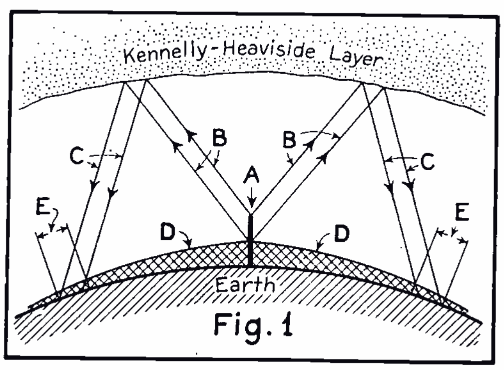
Most people find it difficult to understand why an all-wave receiver should act any differently in the short-wave bands than it does in the broadcast band, particularly in view of the fact that it is the same receiver in both cases. Why, in other words, should the mere turning of a band-selector switch make such a marked difference in the apparent operation of the receiver?

The second point with regard to the functioning of an all-wave receiver that often lends confusion to the picture, is the demonstrable fact that one of two identical receivers may literally run circles around the other, even though both receivers may be located in the same block.

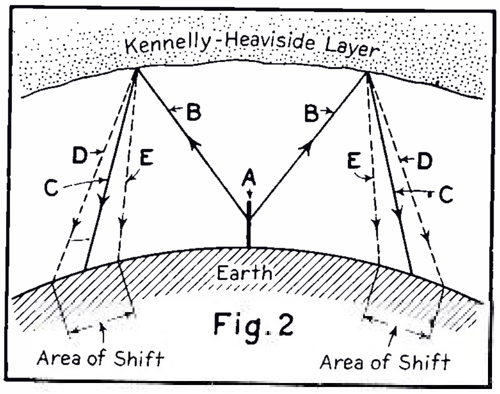
Sky and Ground Waves

The prime reason an all-wave receiver appears to function more satisfactorily in the broadcast band than in the shorter wavebands, may be accounted for by the characteristics of the radio waves.

All radio transmitters emit two waves: a ground wave and a sky wave. (see Fig. 1) The ground wave is earth-bound, follows the surface as the water ripples



Sky waves are beams. B is the radiated wave from transmitter A. C is the reflected wave which is shown interfering with the ground wave, D, over the area E.



B is the sky wave radiated from transmitter A. The reflected wave, C, changes angle, as indicated by D and E, thus causing fading.

on a lake, and is comparatively free from distortion effects. This wave dies out very rapidly, but covers a sufficiently wide area to make it highly valuable for local broadcasting purposes. Broadcast stations therefore use special antennas and high power for the express purpose of favoring the ground wave. This is the wave picked up by your receiver when it is tuned to a local broadcast station.

The sky wave is not earth-bound. It travels upward, like the rays from a searchlight directed into the sky, and returns again to earth only because there is a reflecting layer in the upper atmosphere that returns the wave to earth, just as a huge mirror would return the rays from a searchlight. The difficulty is that this reflecting layer continually alters its relative position to the earth with the result that the reflected radio sky wave strikes one area of the earth one moment and some other area the next moment, as the upper layer shifts (see Fig. 2). You can do the same thing with light rays on a wall by wiggling a mirror in your hand.

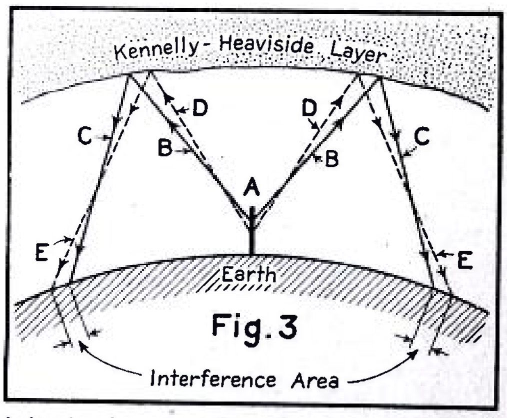
Multiple Waves

This phenomenon is further complicated by the fact that the sky wave from the transmitting station antenna is not a single ray, but a series of rays, each striking the reflecting layer at different points and consequently returning to different points on the surface of the earth. Moreover, the reflecting layer in the upper atmosphere is not a rigid surface, such as the face of a mirror, but is billowy, like the surface of the sea. Therefore, with a series of sky waves and an undulating reflecting layer, there is a huge amount of wave diffusion from the sky to the earth. Were we able to see this, and at the proper moments, it might appear like a blanket of wavering light.

When you hear a distant station on your receiver, it is the sky wave you hear—not the ground wave. The sky wave travels over immense distances and that is the only reason you hear such a station at all. You will understand from the previous explanation that, because of the recurrent shiftings of these waves, the signal may be loud one moment and weak the next moment as its intensity changes in the vicinity of your receiving antenna. We refer to this condition as "fading" and with the purpose in mind of maintaining a constant signal from the loudspeaker of the receiver, we have equipped the receiver with an automatic volume control which increases the sensitivity of the receiver when the signal weakens and decreases the sensitivity of the receiver as the signal strengthens. This increase and decrease in receiver sensitivity is always proportionate to the increase and decrease in signal strength, with the result that the relative loudspeaker volume remains the same.

Signal Distortion

Signal fading is not the only result of the shifting layer in the upper atmosphere. The very manner in which this layer shifts quite often causes one portion of a sky wave to overlap another portion of the same wave. Since the two portions of the same wave are reflected



Multiple sky waves do not travel equal distances and are therefore out of phase. If they mingle at their point of return to earth, as indicated by C and E, distortion is created.

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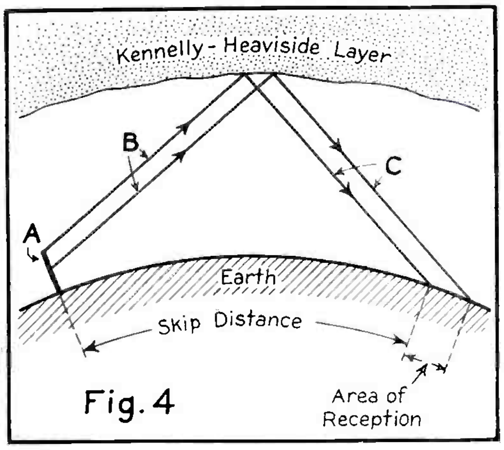

A sky wave from the transmitter can be heard only in that area where it strikes the earth. The distance in between is "skipped." Since there are multiple sky waves, the situation is not as bad as it appears above.

from the different points on the surface of the layer, one portion tends to get ahead of the other portion. Then, when they both chance to be reflected at the same spot on the surface of the earth, they are no longer in phase—that is, they get out of timing in much the same way the gears of an auto ignition system can lose their proper operating sequence (see Fig. 3). The result is that these two waves, though inherently similar in every respect but timing, do not augment each other. Instead, these two waves, having become dissimilar through a difference in timing and length of travel, interfere with each other and create frequency distortion.

If you are near the fringe of the ground wave from a broadcast transmitter, the same form of interference may be noticeable, except in such a case the ground wave is interfered with by a returning sky wave.

Station Interference

The foregoing explanation clears up two points, namely: why the signals from distant stations are apt to fade in and out, and why signals from distant stations may be distorted. It should be added now that both fading of a kind, and distortion, may also be created by interference between the signals from two transmitting stations. This is not so apparent in the broadcast band—except possibly at the high-frequency end of the dial—because all stations in this band are assigned definite channels in which to operate, each channel being separated from the others by a satisfactory margin that will insure against such interference or, in the event that two or more stations employ the same channel, by the allocation of this channel to stations either well separated geographically or having antenna systems that confine the radio wave to the area the station serves.

Thus we have an explanation for the reasons why even distant stations in the broadcast band may be received satisfactorily in the event that the set is of modern construction, has automatic volume control, and is used in conjunction with a moderately good aerial. It does not, however, explain why general reception on the shorter wave lengths should be inferior.

"Distance"

The first reason is simple: Much greater distances are covered and one cannot expect the wave arriving from, say, London, to be the equivalent of a wave arriving from a station some 100 miles distant. Furthermore, the sky waves from these short-wave stations are, if anything, less reliable than the sky waves from stations in the broadcast band. The conditions are much the same in both cases but the wave length makes a difference. The shorter the wave length used at the transmitter the more pronounced is the effect referred to as "skip distance." The angle of the sky wave from the transmitting antenna may be less pronounced with the result that it travels through space for a greater distance before striking the reflecting layer. Moreover, the shorter waves *penetrate* the layer and are *bent* back to earth. For this reason, the wave skips great distances before again striking the earth. Thus, a station in Australia may "lay down" a very good signal in the heart of New York City, but no signal at all in San Francisco (see Fig. 4). Under such conditions a listener in New York might presume his receiver to be unbeatable whereas a listener in California might be gravely considering the idea of chucking his set out the window. Yet, a few hours later the Australian station might be laying down a good signal in San Francisco and no signal at all in New York City! Why? Because, firstly, the reflecting layer is not always at the same height from the earth—and in consequence changes the angle of reflection—and secondly, the Australian station might have changed its wavelength. Since the shorter wavelengths are superior for transmission during daylight and the slightly longer waves superior during darkness, stations move from one wave band to another as the day progresses.

Comparisons

If we sum up the situation, we find that: (1). In the broadcast band a ground wave is steady, comparatively free of distortion and consequently provides consistently good local reception both day and night. (2). The sky wave from a station in the broadcast band is subject to fading and possible distortion, but is still fairly reliable over considerable distances. (3). A short-wave station has practically no ground wave and, unless the receiver is very close to the station, only the sky wave is picked up. (4). That the sky wave of a short-wave station is decidedly more freakish in character than the sky wave from a station in the broadcast band and consequently cannot provide an equal degree of consistency in reception. (5). That satisfactory reception in the short-wave bands depends to a great degree upon the knowledge of the listener with regard to the wavelengths employed at different times of the day and night, and the times at which to listen for certain stations.

Noise

The second point to cover has to do with the fact that, aside from the vagaries of waves, receivers do not seem to be quite the same efficient units when the wave-band switch is turned to the shorter waves. For one thing, there appears to be more noise than signal, which leads many to the belief that the receiver is at fault. How is this to be explained when the receiver seems so quiet in operation in the broadcast band?

There are two very good reasons for this. First, most broadcast signals are fairly strong and in consequence it is not necessary to run the receiver at full sensitivity, or "wide open." If your receiver has automatic volume control, the sensitivity is automatically reduced, otherwise, you merely turn down the manual sensitivity control which in turn reduces the sensitivity or "pick-up" of the receiver. Since noise, or "man-made static" in this band is weak to begin with—lower than the signal from the broadcast station—it is much too far in the background to be heard.

Second, for the reception of short-wave stations other than the "big fellows," such as London, Berlin, Madrid, etc., when they are putting in a strong signal, it is necessary to operate the receiver wide open. This is required because the signals picked up in your aerial are weak and need plenty of amplification before they may be built up to loudspeaker volume. Because so much amplification or sensitivity is required, it is only natural that the noise background is much higher or louder than in the broadcast band, since the noise is amplified along with the signal (See Fig. 5). Moreover, there is

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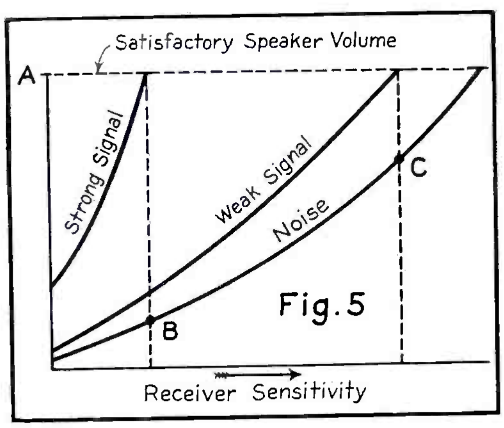

So little receiver sensitivity is required to bring a strong signal up to good speaker volume A, that noise is increased only slightly, B. Greater sensitivity is needed to raise a weak signal to the same level, A, and in consequence, the noise is brought up as well—point C.

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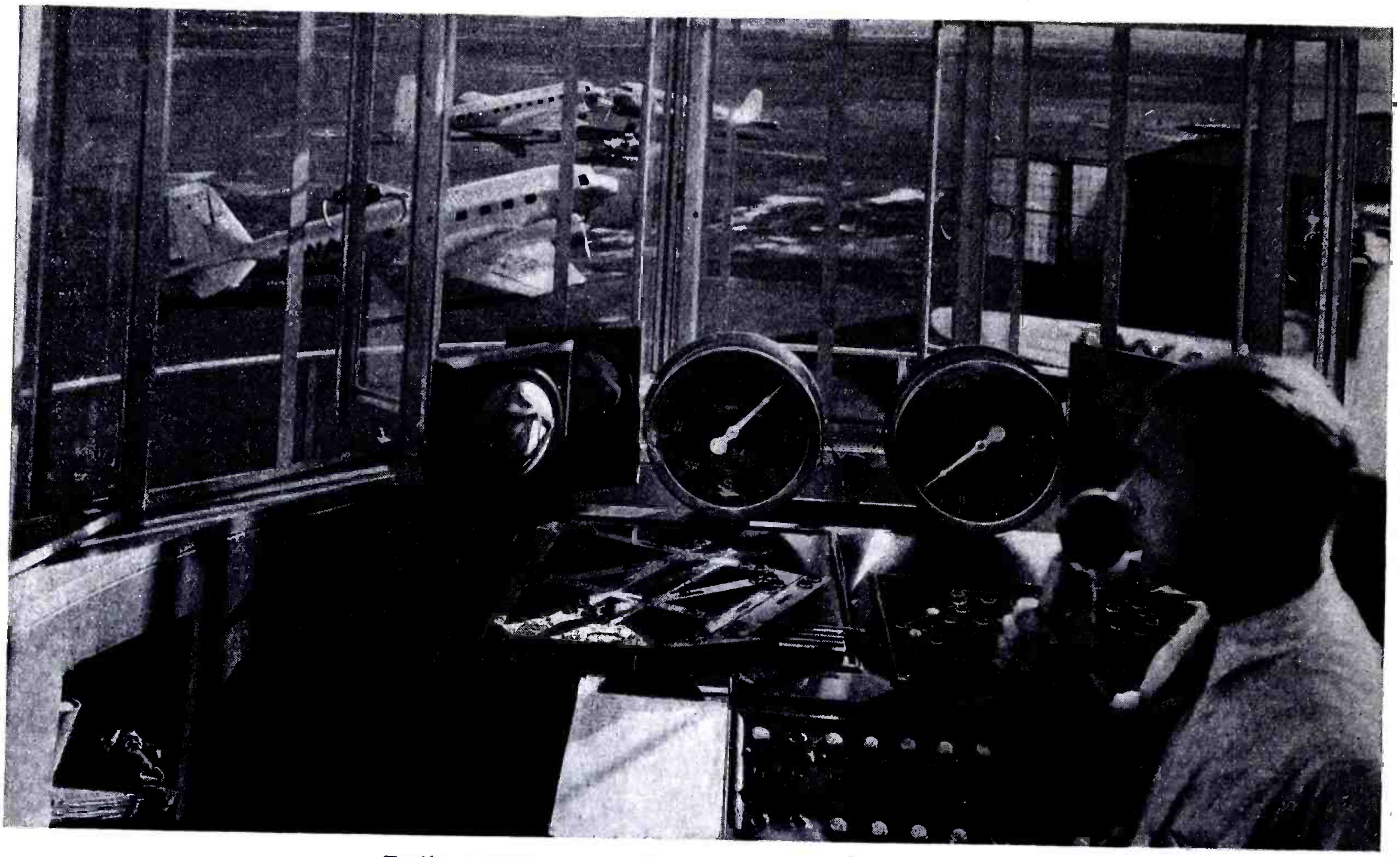

Traffic control tower at Newark Airport, Newark, N. J.

"THE TOWER"

THE FLYING FIELD at Newark is, or seems to be dominated by the small glass enclosure on the roof of the Administration Building, and is known to the men working on and around the field as the Traffic Control Tower, or more simply "The Tower." To look at, it does not seem to be of any importance at all; it is small and is somewhat like a greenhouse attached to the side of a dwelling, yet no plane of the ninety-five scheduled trips, leaving and arriving at Newark each day, can land, take-off or taxi about the field without orders from this pivot or heart of the Newark Airport.

The Tower is manned by four men, one of whom is on constant duty for an eight hour trick. He is not permitted to leave the Tower for any reason whatever during this period. They work in three shifts, with the fourth man rotating to allow them a day off at set intervals. The two men whom I met on my visits are Christian Rauscher and W. J. Conrad. They were extremely helpful and assisted me in every way possible.

The operator on duty sits at a large kidney-shaped desk, on the left hand side of which there is a telephone connecting him directly with one of the Air Line offices on the field, also two magnetic speakers connected to fixed frequency, crystal-controlled receivers. Across the front of the desk are an Anemoscope from which he gets the direction of the wind, an Anemometer for surface velocity, and three banks of switches controlling the boundary lights, the lane lights and the landing flood lamps. On his right hand side are three more magnetic speakers and two more telephones. Grouped at his back are the five receivers and the crystal-controlled Western Electric transmitter WREE. This transmitter is on a fixed frequency of 1795 kilocycles.

The atmosphere of the Tower, when several ships are arriving at once, reminds one of a boiler factory. The transmitting and receiving sets are never shut down, and since all ships must ask permission to land, the noise is terrific. However, the men are so accustomed to it they can catch the plane's calls with ease. The men in the Tower know all the pilots and talk to them practically every day, but in some cases months go by without their seeing each other. Their life on duty is marked by the same quietness that is the lot of the average citizen, at least that's what they'd have you believe. The arrival or departure of world famous celebrities means just another ship landed or sent on its way, to these men perched on the top of a building.

I was startled to learn that their greatest excitement occurs when a plane reports the loss of a motor. Visions of motors dropping from planes and frantic scurryings about trying to locate said motors flashed through my mind. The Public had never been told of such goings-on, I was sure; was I about to hear very grave secrets in strict confidence? I was brought back to earth by being told, quite calmly, that such occurrences were not at all dangerous, and in fact quite common. It merely meant that one of the two motors of a plane had ceased to operate, and since present day planes are perfectly capable of flying and even climbing on one motor, there was no risk involved. The only change made in the routine, in such an event, is the pre-

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cedence given the plane with a "lost motor" over any other ship approaching the field for a landing.

They had an exciting evening recently, while Conrad was on duty, when a Fire Chief burst into the Tower demanding to know where the burning plane would be grounded. His presence there was against rules, as no one is allowed in the Tower without permission. However, there he was. Conrad had heard nothing of a burning plane and tried to calm the Chief at least long enough to get what information he could. It seems someone had phoned the Fire Station that a plane in flames was flying over Elizabeth, New Jersey, and the Chief had rushed ahead of his men to the flying field. While this was taking place in the Tower, three engines had arrived at the field blowing sirens, ringing bells and causing everyone within hearing to rally round. Conrad proceeded to contact all planes known to be in the vicinity. The air was soon clogged with calls. For about twenty minutes life was anything but calm in the Tower. Anticlimax—it was a false alarm.

At this point a short survey of the equipment carried on planes and a few of the rules for approaching landing fields, may be of interest. The rules, necessarily, are rather strict. All planes arriving at a port must fly at an even altitude, that is, at two, four, six or eight thousand feet. All planes leaving an airport must fly at an odd altitude, such as three, five or seven thousand feet. Each airport has a "dead" altitude, at Newark it is three thousand feet. This lane is used for bringing planes in for a landing. When a plane has taken off and been released by the Traffic Control Tower, it is then picked up by its Company's tower and is in touch with it until it approaches another airport.

The planes carry three receivers and one transmitter. The transmitter and one of the receivers are on the same fixed-frequency, and are used to communicate with their home tower, and other planes of the same Air Line. The second receiver is a variable-frequency receiver and is used to tune in on the beam stations enroute. It is also on this set that they receive their landing instructions from the Traffic Control Towers. The third receiver is an emergency set operated on batteries, and is used in the event of a failure in the generator supplying the other sets.

The pilots are in touch at all times with beam stations, their home tower and the various Traffic Control Towers of the fields on which they are going to land. Any Air Line can speak with all of its planes at once and each plane can talk with another, but only Traffic Control Towers can communicate with all planes of all lines. The sets and transmitters of the various Air Lines are tuned to different frequencies; the Tower is tuned to the same frequency as the beam stations and is thereby enabled to talk to the ships of all lines.

The most interesting part of my visit was watching how the ships were handled on the take-off and in landing. On the take-off the procedure is as follows: The ship taking off calls,

"Calling WREE. O. K. for take-off? Ship 318, Chicago at 2:11."

"O.K. 318, wind North-Northeast, surface velocity 18-20 miles, gusty; use end runway, go ahead."

The plane then taxis to the runway and heads into the wind. WREE calls,

"O.K. 318, all clear, go ahead when you're ready, good luck."

"318, Thanks Chris., see you later." When the ship is in the air the Tower may have to call again,

"318, Number 214 due in from Cleveland, just reported over Camden, watch out for him."

"Okey-Doke WREE, thanks."

and another plane has left Newark for any one of the many terminals to which they fly.

However, the real thrill comes when it gets good and soupy, or what the pilots call "tight weather," when there is a visibility of one-quarter of a mile and a ceiling of 500 feet. This ceiling means that the ground cannot be seen from any greater height than 500 feet, which is the lowest limit at which the Department of Commerce will permit a plane to attempt a landing. If the ceiling is lower the plane must be sent to the nearest field where the ceiling is higher. Usually, they are re-routed to Floyd Bennett Field. In order to visualize the routing operation, think of a circle with a dot at the center, the dot being the Tower. The circle is elongated, since the three radio beam lanes have "squawker" beacons at different distances, one at Camden, or about 90 miles from the Tower, one at Martin's Creek, about 60 miles out on the Chicago leg, and one on the Boston leg about 45 miles out. Four planes arriving at the following times, would be handled in this manner:

"Ship 316, Eastern Air Lines, reporting over Camden, 6000 ft. 5:10 p.m." "O.K. 316, come along in at 2000 ft., all clear on your leg."

"Ship 318, TWA at 4000 ft., over Martin's Creek, 5:12 p.m." "O.K. 318, circle at 4000 ft. until notice."

"Ship 312, United Air Lines, over Martin's Creek, 6000 ft. 5:14 p.m." "O.K. 312, circle at 6000 ft. until further orders."

"85, over Martin's Creek, 8000 ft., 5:18 p.m." "O.K. 85, circle at 8000 ft. until called."

Ship 316, being the first to report, is given preference. If the fog is really bad it may take a half hour or longer before it breaks below the ceiling. In the meantime, all the other planes are circling at the appointed altitudes. No plane but the one landing would be at an altitude of 2000 ft. or lower within a fifty-mile circle. As plane 316 breaks through, the operator on duty calls 318 in on the 2000 ft. level, and so on down the list. If any others have arrived in the meantime, they are kept at different altitudes until their turn comes. There have been as many as eight planes in the air at once, waiting for a landing.

It is a very impressive sight to see one of these huge transport planes, weighing between eight and ten tons, land—even on a clear night. Sitting in the Tower after a ship has been reported, you suddenly see a small light floating in the sky. The Tower operator notifies the plane that it has been sighted and switches on the landing flood lights. The pilot calls back and usually asks that the flood lights be turned off; most pilots prefer making landings with the plane's lights. That small light in the sky, accompanied

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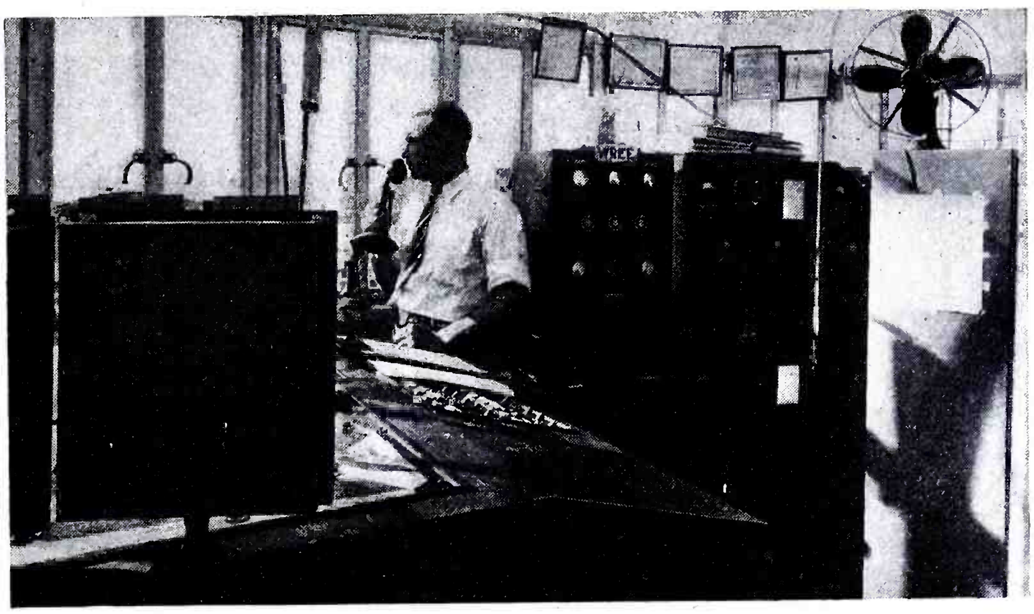

W. J. Conrad directing landing and take-off of planes by radio. Behind him are the receivers and the transmitter.

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RADIO FLASHES

ADDIS ABABA STATION PICKED UP DIRECTLY

JUST AS THE Navy Department has dispatched four radio technicians to Addis Ababa to insure communication between the American legation and the State Department, short-wave listeners are trying to pick up the only station in Ethiopia. It is ETA, at Addis Ababa, and broadcasts either on 7,620 or 18,270 kilocycles.

George M. Lilley, writing in the *Philadelphia Inquirer* (September 29), explained that it was RCA Communications, Inc., which changed the transmission of the station from unintelligible code signals to "jabbering voices" because of the Italo-Ethiopian conflict.

Despite its limited power of 2 kw, ETA broadcasts have been picked up clearly at RCA's Riverhead (L. I.) station without relays.

"Personal observations, however, soon showed that Addis Ababa isn't received so clearly by we average fans as it is at RCA's highly elaborate terminals of interception," Lilley said. The signals, he added, "clearly showed effects of their ceaseless journey over nearly half of the world's mountains, deserts, and restless seas."

"But it's surely well worth listening for and a wonderful thing to hear," he concluded.

◆

TG2X

IF YOU HEAR someone announcing, "La Voz de Polica Nacional," you've got Station TG2X (The Voice of the Guatemalan Police) on 5,960 kc or 50.3 meters.

◆

SIX CAUSES OF SHORT-WAVE INTERFERENCE NOTED BY BBC

DECLARING that the "problem of interference in the short-wave bands has become of steadily greater importance to broadcasting," L. W. Hayes, empire and foreign service engineer of BBC, cites the following six types of inter-station interference:

(a) Between short-wave broadcasting stations owing to insufficient separation between the stations.

(b) Between stations which have 10-kc. separation, but cause interference because the receiver is not selective enough.

(c) Caused by fixed point-to-point services, generally telegraph stations, working in the broadcasting bands, or vice versa.

(d) With broadcasting stations situated near the ends of the short-wave broadcasting bands, caused by fixed point-to-point stations and insufficient selectivity in the receiver.

(e) Caused to broadcasting stations working in their correct bands by fixed point-to-point telegraph stations working in their correct bands; due to second channel or image signal in the receiver.

(f) Caused by the harmonics of broadcasting and/or fixed point-to-point stations.

"Of the above types of inter-station interference," Hayes said, "there is nothing that can be done by the listener to remove types (a) and (c). Of the other types, while the listener can do little to remedy this on existing receivers, he can encourage manufacturers to do so by refraining from purchasing new receivers which show these faults."

◆

RADIO ATLAS ENLIVENS GEOGRAPHY

NO LONGER IS "geography" something dull to be studied out of a dull, oversized book. The New Philco Radio Atlas of the World, brings home to over a third of a million children, fascinating items of present-day interest that link the farthest corners of the globe with the radio standing in the corner of the room. Geography has become as transporting as a fairy tale of old.

Distributed free to adults by Philco distributors and dealers, the Atlas is a 36-page, profusely illustrated book containing up-to-the-minute, double page maps of all the continents, printed in five colors, with the principal short-wave stations located and named on the maps.

One of the features of the Philco Radio Atlas is a new and simplified Airline Distance Chart, which tells quickly the distance between principal world cities. Another feature is the write-ups, by countries, of the many and interesting foreign broadcast programs that may be heard, with descriptions of the type of programs to be expected from each country.

The Atlases are 7 by 10 inches and fit into the standard school geographies.

◆

DX CLUB CLAIMS LISTENERS IN 25 RECORDED COUNTRIES

A UNIQUE weekly program for short-wave listeners is offered by the KDKA DX Club every Friday night at 12:30 A.M. over W8XK, Pittsburgh, (6,140 kc). Founded by Joseph Stokes, the program carries DX tips and news relative to short-wave changes, special programs and the like. DX fans in 25 recorded countries tune in weekly, according to Stokes.

DEUTSCHLANDER ON A.M. WINTER SCHEDULE

DURING THE winter months, November to February, the German short-wave station DJB, in Berlin, will be heard in the United States on 19.74 meters from 8 A.M. to 11:30 A.M., EST, Kurt G. Sell, Washington representative of the German Broadcasting Company advises. This is in addition to the evening broadcasts on 49.83 meters (DJC) which are being sent out from 5 P.M. to 10:45 P.M. EST.

◆

ALL-WAVE SETS APPROACH THE 5,000,000 MARK

BY THE END of 1935, according to a representative of one of the largest radio manufacturers in the country, there will be about 5,000,000 all-wave sets in the United States.

By years, this breaks down as—

Prior to 1933	Very few
1933	500,000
1934	1,500,000
1935	3,000,000

In the opinion of this authority, 80 percent of the receiving sets now being made for the home in the United States are all-wave receivers.

All-Wave Radio—long may it wave.

◆

PANAMA PROPOSES SHORT-WAVE RELAY SERVICE

A RELAY SERVICE for foreign short-wave programs has been proposed by the Republic of Panama, according to U. S. Consul James L. Park, of Colon.

"Short-wave reception is difficult and interference sufficiently great that set owners often find the necessary manipulation too great," he said, "and as radio interest appears to be more strictly for the programs than for DX accomplishment, the popular choice promises more following for relayed program than for direct reception."

◆

INDIA SOON TO ENTER SHORT-WAVE SPECTRUM

INDIA IS about to step into the short-wave spectrum as a part of a general improvement in radio broadcasting instituted by the Indian government.

One of the plans of an expert hired from the British Broadcasting Corporation is to make the short-wave services of Great Britain and Europe available to Indian listeners by relay. Another is to arrange for the transmission of Indian programs to listeners over the world via short-waves.

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Roses and RAZZBERRIES

By BEAT NOTE

THE GERMANS are a funny race. Have you observed, for instance, that for all their love for Hitler, no sooner does he show face to microphone in these short-wave broadcasts, than the people rise as a body and shout, "Heel!—Heel!"

◆

A TEA ROSE to a tot in Chicago for being much too clever for his age . . . he is collecting all manner of box tops, labels and bottle caps against the day when the companies will stage prize contests over the air.

◆

TIMID, GENTLE and soft, the little Carpinchoe cautiously threads its way through the South American jungle, and bothers no one. No one suspected what its purpose might be on this earth of ours—certainly the Carpinchoe never knew, or cared.

But now, after the passing of centuries, during which periods our scientists have learned that bees were created for polinating flowers and providing honey for our sweeties, it turns up that the sweet Carpinchoe, sister to the chamois, but more tender of hide, was put on this earth to provide cone supports for Stromberg-Carlson loudspeakers.

When you next listen to the 7500-cycle murmurs of a Stromberg, think of the shy Carpinchoe pushing its nose into the waters of the Amazon. And also think shame on the Stromberg scouts searching the wilds of the jungle for hides as pliable as a zepher.

◆

IT IS our own opinion that the radio manufacturer is a melancholy fellow, and entirely devoid of imagination. Witness the names he gives to products.

For example, a low-frequency loudspeaker is known in the trade as a "whoofer" and a small, high-frequency speaker as a "tweeter." You put a whoofer and a tweeter together and you're supposed to get high-fidelity, but there is always the feeling that the big speaker will suddenly break out into animal sounds and the little speaker commence twittering like a canary.

What the industry needs is a professional namer—a Czar of synonyms—a man who would call a whoofer a Belly-Buster, and a tweeter a Femme.

◆

AND SPEAKING of names—why not name radio receivers like Pullman Cars? Star of the Wilderness, for example. Advertiser's Delight; Voice of America; All Points West; The Ionosphere Special. And how about Little Box, What Now?

◆

WE WERE UP the night of the earthquake (California papers copy). Being addicted to sudden bursts of the palsy, it was natural that we paid no attention to the phenemona . . . until we saw the lamps shaking like a Model T.

The last little shiver of the building found us standing in the middle of the floor with Moo-Moo (it's a cat, not a cow) in our arms, waiting to determine if we might resume our listening in the 75-meter phone band, or listen to back-wash in another world.

Finally we returned to the set and, as might be expected, the first thing we heard was: "How's my modulation?"

We and Moo-Moo gave up and raided the ice box instead.

◆

WE MUST admit that cw has a way with us; after the first few sentences we are sound asleep.

We experienced this very thing a few nights ago. When we awoke, we found the following in our mill:

A dashing young dotter at KIM
Has a psychoneurotical whim:
He speeds up the ditter
Of KIM's code transmitter
To work off a bit of his vim.

◆

THE WAY TO get Moo-Moo going is to turn on the beat oscillator and tune in a carrier. A bit of dial rocking makes a beautiful cat noise. Moo-Moo thinks it's the Life-Of-The-Party and tries to jam her head through the speaker cone.

All good, clean fun for us, but hard on Moo-Moo.

◆

WE HAD A very high regard for a certain radio engineer of considerable fame, until we visited his home recently.

We had found the subject of automatic bass compensation fraught with interest and were well on our way into the heart of the discussion when our ears were assailed by the vilest sounds we have heard since experimenting with early super-regenerative receivers.

No doubt we registered pain, for the engineer quickly explained that the receiver was there only temporarily while his own set was being repaired and adjusted.

Almost immediately following this weak explanation, the signal intensity dropped to a whisper. This, we learned, was due to the fact that he was using an indoor aerial composed of a section of lamp cord run under the carpet, and every time someone closed a light circuit, the set went phooey.

Wishing to relieve the evident embarrassment, we quickly switched the subject to the set which was being repaired —evidently a beauty, as radios go. This, we learned, uses 26's in a tuned radio-frequency circuit and is, so the engineer said, the nuts.

We left for home wishing we had become a Monk in our youth.

◆

VINCENT LOPEZ wants to know what *we* think—at least, he has written to the "What Do You Think Editor" of the New York *Sun*, and our assumption is that he is waiting with baited breath (incidentally, how does one bait one's breath?) for our opinion of a very moot subject—*very* moot.

Vincent wonders if radio isn't just a trifle too effette. He points to the theatre, the screen (the *silver* screen), and to literature, as professions supporting lusty, glamorous or colorful personalities.

But radio? What of radio? Where are the Drews, the Tully's and the Garbo's (that isn't *our* selection), Vincent asks. He believes that of the current crop of air entertainers, there are none whose exploits will live for any length of time.

We dare say there is something to this. As neat a trick as it will be, no doubt Kate Smith will eventually fade into obscurity as readily as yesterday's murder: Jack Benny will go down in a rush of Jello, and it will take a heap 'o somethin' if Eddie Guest is to hold his own along with Shelley and Lord Byron.

But what about Major Bowes, Vincent—what about Major Bowes?

We've got you there!

◆

AS WE SAT listening to the ever-recurring call, LQE, being flung to the four corners of this cockeyed world, our thoughts turned to the history and development of communication: The call of the wild, the smoke signals, printing, the telegraph and telephone—and radio. All really marvelous.

But, as we sat there listening to LQE, we knew that in far-off Ethiopia the primitive drums were spreading the news of war like wildfire. We knew that in the space of the few hours we sat there listening to LQE that a whole nation had been mobilized by the beating of drums. Natives were collecting in the villages, ready to march against the foe; the

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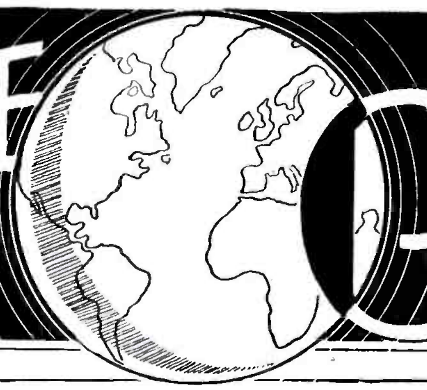
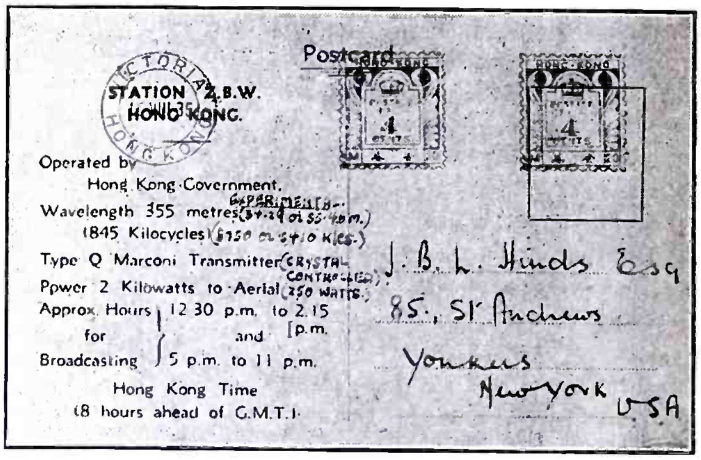
GLOBE GIRDLING



CONDUCTED BY J.B.L. HINDS

A STANDARD DICTIONARY defines a hobby as a subject or pursuit in which a person takes extravagant or persistent interest. A diversion is that which diverts one from care or labor and so affords recreation to mind and body. Walter B. Pitkin in his introduction to Earnest Elmo Calkin's little book on the "Care and Feeding of Hobby Horses" comments that "work comes and goes, for better or for worse. But the hobby well chosen and growing naturally out of your desires, needs and abilities, goes on forever. It is a natural and joyful part of your life when things go well, and something to which you can turn for wholesome solace when all the world seems against you." As Mr. Calkins puts it, "We all need an outlet, a pastime, an interest of some kind as different as possible from our daily tasks, which will give us a better balance, and develop at least two sides of our nature."



Postcard

STATION Z.B.W.
HONG KONG.

Operated by
Hong Kong Government.
Wavelength 355 metres
(845 Kilocycles)
Type Q Marconi Transmitter (CRYSTAL CONTROLLED)
Power 2 Kilowatts to Aerial (250 WATTS.)
Approx. Hours for Broadcasting 12 30 p.m. to 2.15 p.m. and 5 p.m. to 11 p.m.
Hong Kong Time
(8 hours ahead of G.M.T.)

J. B. L. Hinds Esq
85, St Andrews
Yonkers
New York
USA

A verification card received by Mr. Hinds from station ZBW, Hong Kong, China. Read the notations.

Hobby of Hobbies

That diversion has been supplied to a great many people through the medium of the hobby of "DXing" for stations in all corners of the world. And until you come in contact with this pleasant pastime, you little realize how many are following the game. And each, though busily engrossed in his own enjoyment, is constantly endeavoring to be of service to those of similar desires.

It is to be admitted therefore, that no one could follow radio DX work as long as the writer has, and still have it be a pleasure to him, unless he really enjoyed it. I derive as much enjoyment, however, by contact and service to others as from the contacts with the stations. The hobby of radio does not confine itself alone to stalking down broadcasting stations, for there are many branches of radio. You will find some who follow the airplanes and airports, on voice; some who devote a greater share of their spare time to listening to the police bands; those who do likewise with the amateur bands and who have one desire to receive an amateur station in every country in the world. Then you will find those who listen to the ships talking with the coastal stations, some who secure verifications to code stations, and many who follow the long waves strictly. You will not, however, find many who derive pleasure in following all the branches mentioned. The point is that each to his following gains his objective according to his desires.

The writer confines his endeavors mostly to receiving short-wave broadcasting, phone and experimental stations. As you no doubt know, I followed long-wave receiving for some years and still have my verifications for over 700 stations. The short waves appeal more to me on account of the distance involved, although I really enjoyed DX work on the long waves and have many pleasant memories of those days, and verifications from many, many stations now out of existence.

Mr. Hinds in his receiving room, at Yonkers, N. Y.

Station Lists

The station lists and schedules have been revised in this issue and it is hoped that they will meet the needs. Your comments and assistance in making these lists as complete as possible will be appreciated. All time shown is Eastern Standard Time. It is our intention to make mention of new stations on the air and not take up too much space in comments of regular stations on the air in this section. In addition, it will be our endeavor to include information which it is thought will be of benefit and interest to the readers of ALL WAVE RADIO.

I am frequently asked as to when is the best time to tune for the Australian stations, how long they will continue to come in so well, or what season is the best in which to receive them. These stations are on the air regularly at stated times and their schedules are shown in the station lists in their order of frequency. The writer is of the opinion that VK2ME and VK3ME are as consistently received stations the year around as any on the air. They announce their call letters after each number. It might be interesting and helpful to know that notwithstanding the preceding comments that the seasons of Australia are as follows: Spring is September, October and November; Summer is December, January and February; Autumn is March,

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April and May; Winter is June, July and August. Within the same latitude zones, and similar elevations and ground cover, there is only a small difference in the range of temperature in Australia and North America.

Addis Ababa

The New York newspapers recently published information regarding the establishment of direct wireless service between New York and Addis Ababa, Ethiopia, which would end the present British control over radio communication between Ethiopia and the United States. The Federal Communications Commission states that Press Wireless, Inc., has been authorized to communicate with call letters WJS on the frequency of 15,700 kc from Hicksville, L. I., New York and the R.C.A. Communications, Inc., with call letters WQF, 17,920 kc, and WEC, 8930 kc. It is not known at this time who will control the station or stations at Addis Ababa.

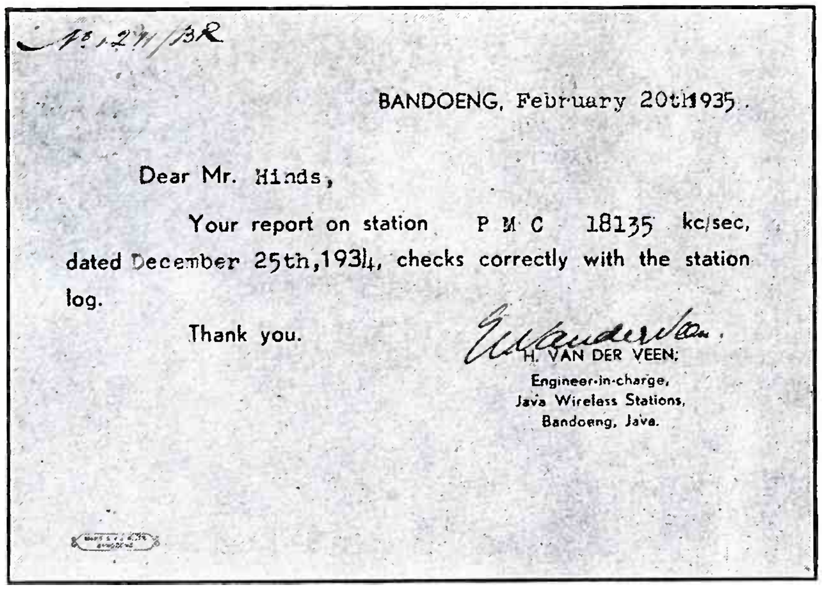
The four Navy radio operators recently sent to Ethiopia have set up transmitters and communication has been established, with good results, with the U. S. station, NAA, at Arlington, Va.

With regard to the Addis Ababa frequencies, the Berne list shows the following—each with the call letters ETA; 18,270 kc (16.42 meters); 11,955 kc (25.01 meters); 7620 kc (39.37 meters) and 5880 kc (51.02 meters). Reports of reception have been cited on the first three mentioned frequencies. Information from reliable sources is that the frequencies 18,270 kc and 11,955 kc have been heard quite consistently in New York and that but two transmitters are at Addis Ababa, one directly to London and the other to Cairo, Egypt. It is understood, unofficially, that the power of these stations is only 500 watts, but because of the strength of the signals, it is believed that greater power is being employed. The Columbia Broadcasting System is rebroadcasting a program from Ethiopia on 11,955 kc each Wednesday at 5 P.M. and this frequency is being contacted before and after the broadcast mentioned.

Mr. James Waters, 4865 East 85th Street, Cleveland, Ohio, has a letter from the Columbia Broadcasting System, that he was listening to a program coming from Addis Ababa on 11,955 kc. Further information will be published in later issues of ALL WAVE RADIO as received.

New Stations

Two new stations have recently opened up in Eritrea, Africa: IRG, 14,710 or 14,635 kc, located at Massawa, and IDU, 13,380 kc located at Asmara, an inland city. Massawa is a seaport. Both of these stations have been heard



No. 274/BR

BANDOENG, February 20th1935.

Dear Mr. Hinds,

Your report on station P M C 18135 kc/sec, dated December 25th,1934, checks correctly with the station log.

Thank you.

H. VAN DER VEEN,
Engineer-in-charge,
Java Wireless Stations,
Bandoeng, Java.

From PMC, Java, February 1935 . . .

on voice talking with Italy and Japan and testing with musical recordings of operatic numbers.

Since making the station list we note from the Short Wave Reporter, the Quixotte Radio Club of Hendersonville, N. C., that HP5F, Colon, Panama, is now on the air testing on 4934 meters or 6080 kc.

Some say HJ4ABB, Medallin, has moved to 5780 kc or 51.90 meters, but no verification has been as yet received. A new Colombian, HJ1ABK at Barranquilla is on the air at 7074 kc. HJ4ABJ, Ibagne, Colombia, is on the air each evening, except Sunday, on 6460 kc, or 46.44 meters.

It is said that CT1GO and CSL Lisbon are off the air, but verification has not been made as yet. Report has it that a new station, CTV, is testing from Lisbon on about 1150 kc or 26.91 meters, and the station is to be known as "Mansanto Radio."

Changes

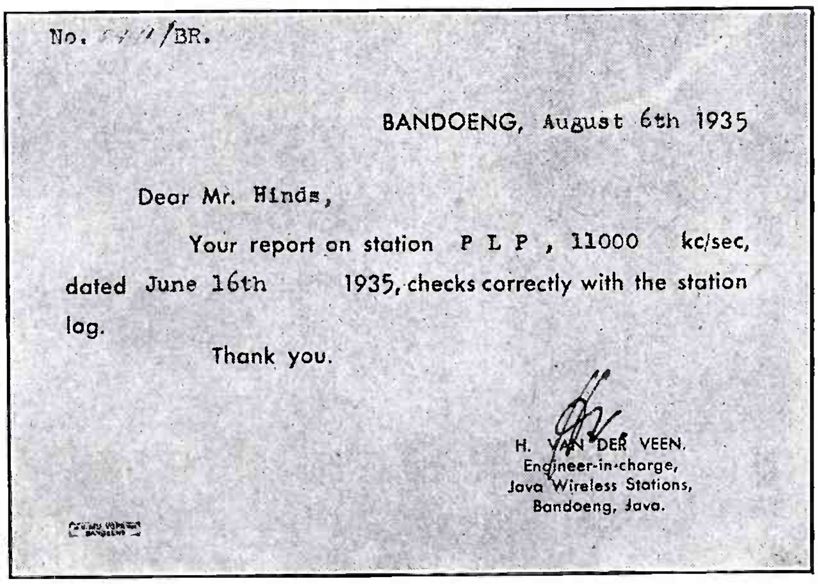
It will be noted that certain changes and additions have been made in frequencies of Canadian Marconi Co.'s transmitters at Drummondville, Quebec, as shown in the station lists. VE9DN and VE9DR are retained in the list. Both temporarily off the air but expected to resume transmission early this winter. Phone station CGA operates to Europe, CJA to Australia, and CFA to North American stations.

XBJQ Mexico City, 11,000 kc, or 27.26 meters, is being heard with good signal. They say they are operated by the National Capital Bank of Mexico, P. O. Box 2825. The writer in answer to report filed received one of the scenic post-cards of XEW but no mention of short-wave station XBJQ or any information regarding the station.

HCW, Quito, Ecuador is shown in list as 5900 kc. It is again reported on the air, although there seems to be quite a little discussion as to where it works. Mr. Clarence W. Jones, Director HCJB, Quito, informs me that it broadcasts on 5679 kc with 50 watts power each night except Sunday, from 8 to 10 P.M. Your report on this station would be appreciated.

A stranger can be heard 6 to 7 A.M. each morning close to VK3LR on the 31-meter band. It is thought to be a Java station, although the writer has not yet heard the call given.

PPQ, Rio de Janeiro, 11,660 kc, is being heard broadcasting musical programs in early evenings of late.



No. [illegible]/BR.

BANDOENG, August 6th 1935

Dear Mr. Hinds,

Your report on station P L P , 11000 kc/sec, dated June 16th 1935, checks correctly with the station log.

Thank you.

H. VAN DER VEEN,
Engineer-in-charge,
Java Wireless Stations,
Bandoeng, Java.

. . . and one from PLP on August 6th of the same year. How are you doing?

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YUDA Managua, Nicaragua, a new station on 8590 kc, or 34.92 meters, is being heard between 8 and 10 P.M., although meeting with considerable interference and not regularly coming through clearly.

In a recent letter of verification from the Icelandic State Broadcasting Service, it is stated that TFJ is now broadcasting regularly each Sunday a program in English from 8:40 to 9 A.M., on 12,235 kc, or 24.52 meters.

Verification of OPM

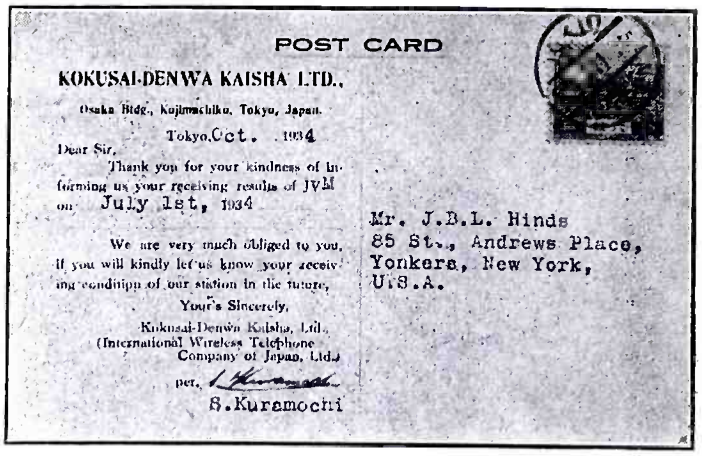
A letter of verification of the writer's reception of OPM, Leopoldville, Belgian Congo, of broadcasts in connection with their commercial fair has been received. A greater share of the music furnished on these broadcasts was rendered by musicians from their black soldiers and natives, with their native tools and musical instruments. Mr. Van Calk, the genial director of the station, advises that no more broadcasts of this nature will be transmitted for one year, and the station will only be heard on voice.

It will be noted the station list now shows CEC, Santiago, Chile, on a new frequency; 9545 kc, to which they are changing by the time this is printed. Advice from Santiago states that concession for broadcasting has been obtained and authority to change the frequency from 10,670 kc. They have also opened up a new telephone service on the same new frequency with Antofagasto, a city in the north of Chile. Their phone service is from 8:00 A.M. to 6:00 P.M. Santiago also advises that a new Chilean station has opened up on 9600 kc, or 31.25 meters, broadcasting musical programs. Here is a chance for a new one. Who will report the first?

Radiodifusora HIH, La Voz del Higuamo, San Pedro de Macoris, Dominica, on 6796 kc, is now sending out its new verification cards, done in white and black with the call letters HIH in large red letters.

New Mexican

Verifications are being received from the new Mexican station XEFT, located at Vera Cruz and transmitting on 6120 kc. This station is known as La Voz de Vera Cruz, El Primer Puerto de Mexico, and is getting out with fairly good signal with its 20 watts power.



A choice verification card from the Japanese station, JVM. The reverse side of the card is shown below.

TGX, Guatemala City, is broadcasting on 1630 kc, but at present is not on 5940 kc, or 50.50 meters. TG2X is on short wave as shown in list, but according to our understanding has no connection with the first mentioned station.

Much comment has been made about HC2AT and HC2CW on 8400 kc, 35.71 meters and some insisting that they heard HC2AT. Here are the facts as recently received from HC2AT: They inform the writer that HC2AT was sold to HC2CW and the latter is on the air. A new station, HC2AT, is to be installed but is not yet on the air.

HJ5ABE, 14,100 kc, Medellin, Columbia, is still being shown in the list, although it is not being heard regularly of late. Reports say that it has gone into long wave, but this has not as yet been verified.

The new station SPN (13,635 kc, or 22.00 meters), at Warsaw, Poland, is being reported quite frequently of late. It is said to have 10 kw power.

Central and South American

The veri cards from VP3MR, the voice of Guiana (7080 kc), Georgetown, British Guiana, bear the coat of arms at top, have rounded corners and gilt edges.

OAX4D, Lima, Peru, on every Wednesday and Saturday 9-11:30 P.M., on 5780 kc. Verification cards show address as 2336 Casilla, Lima, Peru; operators—All America Cables, Inc. OAX4G at Lima, Peru on the air every night 7-10:00 P.M. Long-wave call, OAX4B. Verification shows station operated by Roberto Grellaud, address Avda Abancay, 915-923 Lima, Peru. La Voz De La Victor, San Jose, Costa Rica, first gave call letters as TI2PG, but late verification cards call TIPG. Veri cards from HI3C and HI1J are neat and attractive cards in colors. HIZ, Santo Domingo, R. D. has a new card done in green, black and white.

Readers' Comments

Don Gross, West Asheville, N. C., makes mention that Asheville's new police station is on the air on 2474 kc under call WPFS.

Walter Berger, Short Hills, N. J., advises as we are closing that Germany has a new transmitter on the air; DJJ, 10,042 kc, operating daily 8-10:00 P.M. C. S. Time. Mr. Berger also states VE9DN on air November 30th 11 P.M., 12 A.M. Saturday nights.

The following are understood to be the new rules of broadcasting in Colombia, South America.

1—On short waves can only broadcast with a power of 501 watts up.

2—Radio stations with less power than 501 watts, must broadcast on long waves.

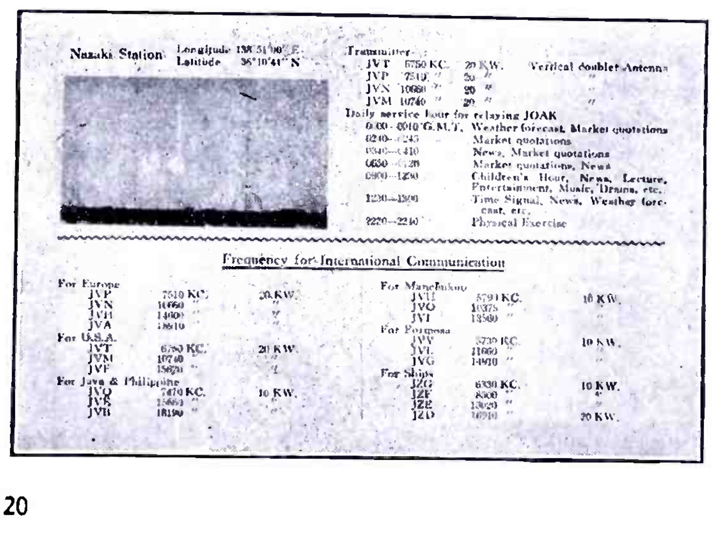
3—No tests or interchange between stations after 12 midnight.

Radio stations classed as follows:
Class A—25 watts (L W)
Class B—26-500 (L W)
Class C—501-5000 (S W)
Class D—5001 up (S W)

Stratosphere

From reports it is apparent that reception of the transmitter in gondola of Explorer II in recent stratosphere flight was heard by a number of people on November 11, 1935. The writer held a carrier on about 22.99 meters for some time on that date which was thought to be the carrier mentioned. It is not our policy to make claims of reception in advance of confirmation.

HJN, Bogota, is said to have moved to 5950 kc, 50.42 meters. This is one of the South Americans who do not make return of verifications promptly. HJ1ABJ, Santa Marta, and HKV, Bogota, are two other Colombia offenders.



Reverse side of the card shown above. Note all the station listings.

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CHANNEL ECHOES

BY ZEH BOUCK

AMONG ALL classes of radio listeners, the American Housewife merits our supreme sympathy—not merely because her drudgeries run the gamut from diapers to vacuum cleaning, but because of the fact that radio fails in what should be a simple task of lightening her morning and afternoon labors with purely entertaining programs.

Just after she has washed the breakfast dishes, when the next meal is probably the last thing in the world she wants to think about, what does she hear over the radio? Talks on how to use left-overs by the *tour de force* of buying a lot of mushrooms and other things that cost more than a perfectly good beefsteak. Recipes for new combinations of foods—formulas would be the better word, being more descriptive of complexity. These formulas, expostulated by dulcet voices, the owners of which probably could not boil water without burning it, are first tried on the family, then on the dog, and finally on the cat. If the housewife would only test it on the cat first, both the dog and the family would be spared. There being an almost infinite variety of foodstuffs, the permutations and combinations afford a still closer approach to infinity. Thus the harangue can be kept up *ad infinitum,* recommending pistachio nuts served with Worcestershire sauce, tomato juice, lady fingers and a grated box top for antipasto; followed with lamb chops stewed in vinegar, essence of peppermint, henna leaves and a dash of facsimile. The result is that most housewives have forgotten how to fry ham and eggs. Husbands have developed the habit of 'phoning home just before leaving the office to find out what the menu is for dinner. If it is something the wife has just learned over the radio, his return route includes a restaurant—which is hardly fair to the wife. Before radio, we men delighted in left-overs. Now they're just hang-overs.

Interspersed between abortive salads and desserts—during the few minutes she has perhaps set aside for relaxation and recreation—Mrs. America will listen to programs sponsored by manufacturers of soaps and washing powders. Each manufacturer will assure her that his product is the only one that protects the hands, the only one that dissolves instantly, the only one that will not ruin her undies, the only one that will preserve her silk stockings and the only one the film stars use. No wonder she won't believe her husband when he has to sit

ZEH BOUCK

Radio's Severest Critic

up with a sick friend, or a conference detains him at the office.

◆

TO THE HOUSEWIFE who would like to get away from all this—from box covers, labels, wrappers, reasonably exact facsimiles and recipes that insult the intelligence and do worse to the stomach—to such housewives who would emancipate themselves, we recommend the short-wave channels of a good all-wave receiver. While a large choice of stations is available, and a list will be found in another section of this magazine, we suggest the Holland transmitter in the morning, and the English and German stations in the afternoon. These broadcasters are all high-powered and are almost as easily located and tuned as any local on the standard broadcast band.

The police broadcasters are the next best bet. At least you won't find, Clara, Lou and Em there.

◆

"FACSIMILE THEREOF . . ."

"Turn on the set, my love, tune in the fight."
"I won't! The mouth-wash contest's on tonight
For me." "Oh yeh' Who's master in this house?"
SOCKO! "Ouch! You've blacked my eye, you louse!"
"Tut tut. 'Tis nothing of the kind my love—
That's just a good facsimile thereof."

The prisoner stood before the bar and judge.
"Your honor, this jury simply bears a grudge.
The witness lied, and half the facts are hid—
No court can send me up for what I did!
I didn't forget that check; you must agree
That scrawl is just a good facsimile."

His honor listened gravely; then with a nod,
"Perhaps you're right. 'Tis not for me the rod—
Perhaps I cannot send you up to stir
As if a forging criminal you were—
Instead of life, you'll get—thus speaks the law—
The best facsimile you ever saw!"

'Twas Christmas time, and Scotty asked his wife—
"What would you like, my love, my soul, my life?"
"A Rolls Royce, dear, would be so sweet of you—
A Cadillac perhaps would even do—"
The Scotchman groaned and frowned. "Sweetheart," said he,
"Best hang your sock for a facsimile."

There're programs on the air that give me fits;
Some day I'm gonna blow them up to bits—
Announcers, sponsors, box tops, labels, all—
Nor give a damn where may the pieces fall.
And when I do, at least I guarantee
To dynamite—and no facsimile!

◆

WE DIRECT THE attention of those who are partial to radio drama (or drama *per se,* and who may be doubtful as to the heights it can attain via radio presentation) to the dramatic broadcasts over the G-string (GSA-B-C-D-E-F-I and L). There are usually one or two of these every week, and by means of electrical recordings they are featured on almost every transmission one day out of the week. (There are six transmissions from Daventry daily, covering with minor gaps, from 3:00 A.M. Eastern Standard Time, to 11:00 P.M.) Daventry is best received in our location (central New York State) this time of year on the

(Turn to page 141)

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Tuning The Antenna For More Volume

By McMURDO SILVER

NOISE-REDUCING antennae have found wide-spread use in the last several years, and quite recently an attempt has been made in their design to obtain physical sizes that would approximately resonate to short-wave broadcast bands. In these antennae, approximate tuning has been sought by cutting the antenna flat top to a physical length which causes it to resonate at say, 6,000 kc or 49 meters, and again at the second harmonic, or 12,000 kc, 25 meters. In some cases, two flat tops have been used together (double doublet) to effect resonance at several fundamental and their harmonic frequencies, or wave lengths.

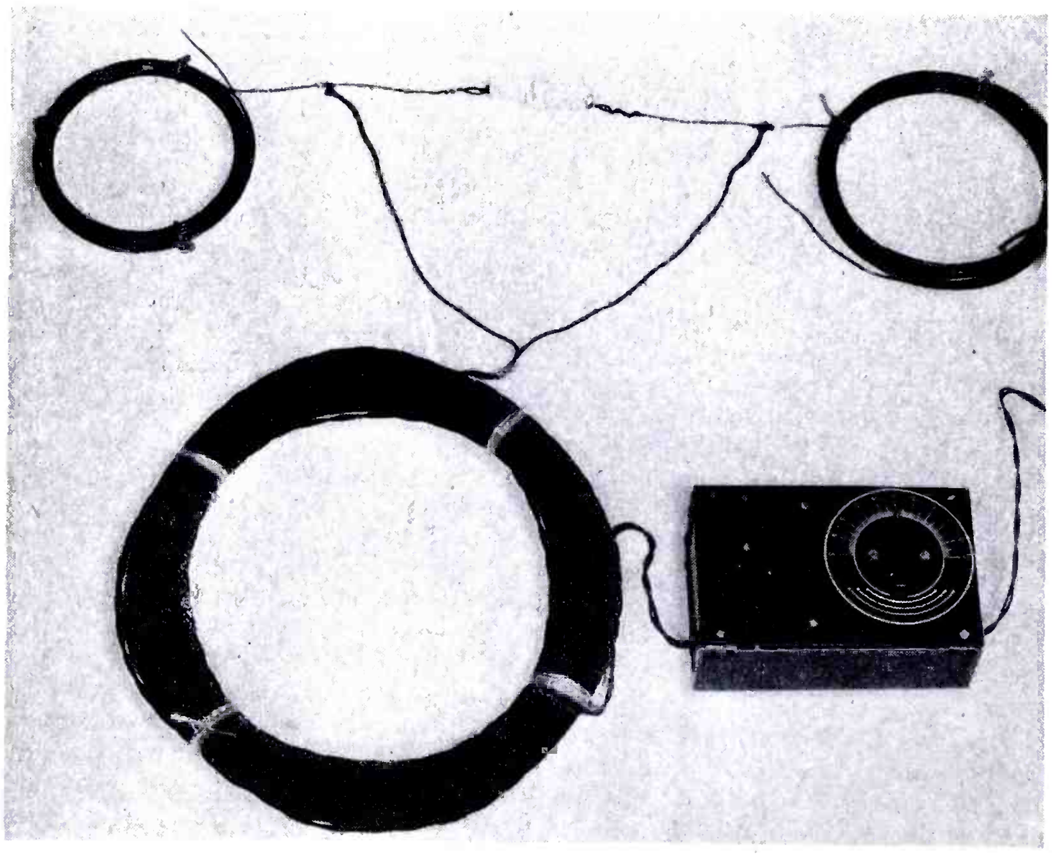
Often variation in individual local and terrain conditions upset the resonance characteristics of the antenna, characteristics predicated upon its physical size, proximity to nearby objects, need of definite flat-top and lead-in length, and finally of terrain conditions, varying in a manner imperceptible to the naked eye.

New Design

The writer has given this subject much thought, and been confronted not with the difficulty of tuning an antenna so it would work at maximum efficiency in any location, but of coupling the tuned antenna to a standard all-wave receiver in such a manner that it would not upset the receiver, and still be coupled sufficiently tight to give a real gain. The problem finally boiled down to trying to find out how to tightly couple two tuned circuits (the antenna and the first tuned circuit of a receiver, for example) without the tuning of one circuit upsetting that of the other.

At this point, what started out to be antenna investigation had gone far afield, but it produced the desired result, plus the believed new discovery of how to relatively tightly couple two tunable circuits without one reacting on the other, and vice versa.

The result of the investigations is the R9+ antenna which consists of a doublet 50 feet long (25 feet per side), three special insulators, 131 feet of weather-proof twisted pair noise rejecting transmission line lead-in and the tuner and switch box, as illustrated herewith. It comes with all connections soldered and all insulators in place. To erect it, it is merely necessary to tie a rope to each of the two insulators at the ends of the 50 foot flat top, uncoil the transmission line lead-in and hoist the antenna on its supports, which may be poles on a house, eaves of a house, house and garage, house and tree, or two trees. The higher up it is, the better, and the further away from electrical apparatus, such as motors, and auto roads, the better also. The lead-in is carried down to a window near the radio, the tuner box pulled in through the window, its leads fastened to the antenna binding posts of the set, and the job is done. If too much lead-in is left over, it can be coiled and placed out of the way, or exactly 78 feet—no more or no less—can be cut off. If a longer lead-in is needed, as many extra 78 foot lengths of twisted pair as are required may be spliced into the original 131 foot lead-in.



The complete tuned antenna system.

Gain and Noise

The direct noise elimination benefit of the R9+ tuned antenna is initially equal to that of competitive noise reducing antennae. In practical use it is much greater, due to the longer lead-in of 131 feet, permitting antenna flat-top placement well outside local noise fields, to the selective noise rejection attendant upon its tuning, and finally to the 5 to 15 db signal volume increase, which effectively drops local noise 5 to 15 db.

The Tuner

The tuner box contains three balanced non-reactive coupling transformers, the antenna tuning condenser, and the five position selector switch. Three positions of the switch select the three balanced coupling transformers for different wavelengths, the fourth feeds the doublet transmission line directly through the tuning condenser to the receiver, and the fifth position cuts off one-half of the antenna to connect it to the antenna for broadcast reception.

This switching arrangement provides any desired type of antenna for broadcast band or short-wave reception, from a fully tuned antenna to simply the usual noise-reducing doublet, and finally, a simple L antenna. It is not tuned for broadcast band reception simply because physical dimensions would be excessive, and high power, relatively strong stations and little local noise on the broadcast band do not justify such extra complication and bulk.

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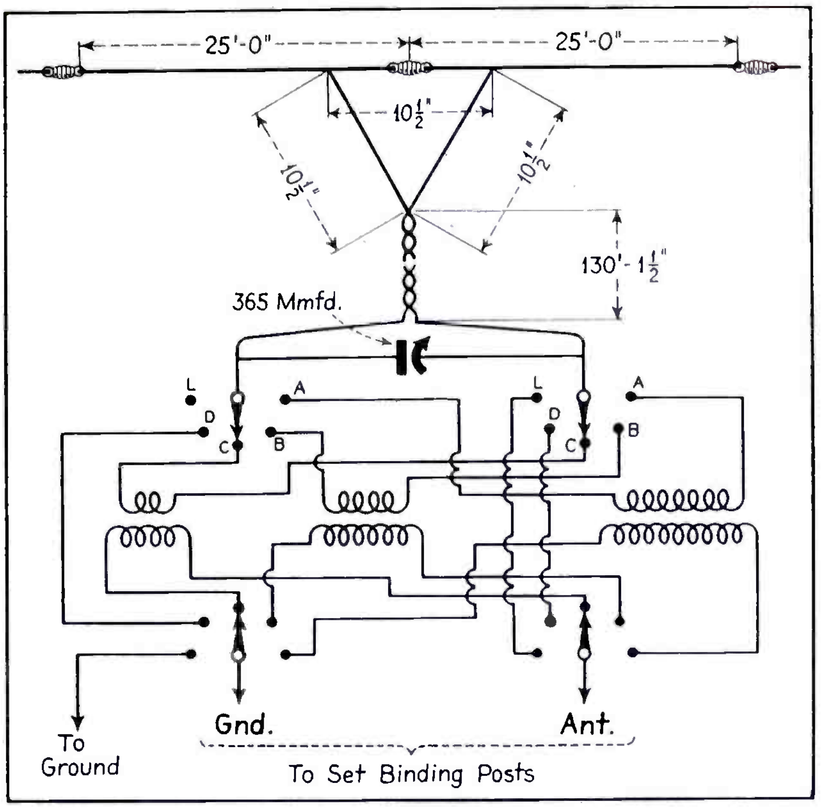
Operation

In operation, once erected and tuner box leads connected to antenna binding posts of any all-wave receiver, short-wave operation consists only in initially selecting that dial setting, which in conjunction with one of the four switch positions, gives greatest volume on any short-wave band. Readings noted down, it is only necessary to reset for maximum results on this band, and similarly on all other short-wave bands after noting best switch knob and dial settings for each short-wave band. It is not necessary to reset the tuner dial for each different station but to only once set tuner and switch knobs for loudest signals or greatest R-Meter deflection, on the 16, 19, 25, 31 or 49 meter broadcast (or the amateur) bands. In extreme DX-ing, individual station tuning will improve volume a little, however, practically equal results are obtained by one initial setting for the desired band.



Schematic of the complete tuned antenna system for all-wave reception.

BOOK REVIEW

THE RADIO AMATEUR'S HANDBOOK, 1936 Edition, by the A.R.R.L. Headquarters Staff. 480 pages (including a 96-page catalog section), with approximately 500 diagrams, charts and photographic illustrations. 6½ by 9½ inches, double-column format. Published by The American Radio Relay League, West Hartford, Conn., U.S.A. Price, paper binding, $1.00 postpaid in U.S.A. and possessions, elsewhere, $1.15; buckram binding, $2.50 in all countries.

The present 1936 edition of The Radio Amateur's Handbook, published by The American Radio Relay League, is the completely revised and greatly enlarged successor to the previous series of 12 editions. In these nine years the Handbook has established itself the world over as the standard manual of amateur radio communication, and has been widely adopted as a practical reference by radio technicians and as a course book for radio study by many schools. The present edition actually constitutes an entirely new book, having a total of 21 chapters with an appendix of miscellaneous information and an exceptionally comprehensive topical index which makes quick reference easy.

The opening chapters on the history of amateur radio and getting started are up-to-the-minute, with new illustrations. The electrical and radio fundamentals chapters are completely new treatments serving as the foundation for the thirteen apparatus chapters which follow.

An entirely new 30-page chapter on vacuum tubes contains comprehensive tabulated tube data, including 10½ pages of rating and characteristic tables for all types of metal and glass receiving tubes, as well as for transmitting and special-purpose tubes, supplemented by practical information on operating characteristic determinations and applications. The new receiver design chapter contains a wealth of circuit features described in concise, practical detail. Modern receiver construction is given a separate chapter, the how-to-make-it of a complete line of successful models from a simple two-tuber to a Single-Signal Superheterodyne with 12 of the new metal tubes.

In the chapter devoted to transmitter design, the theoretical and practical considerations involved in transmitter circuits are given sectionalized treatment, while in the chapter on transmitter construction the very latest circuit developments of proven merit are exemplified. Only modern transmitters are described, including multi-band models with coil switching. An enlarged chapter on keying methods is followed by a chapter on the principles of modulation and fundamentals of radiotelephony circuits, from microphones to controlled-carrier systems. The constructional chapter on radiotelephone transmitters gives design and operating details of successful types ranging from low to high power.

Ultra-high-frequency communication has two chapters devoted to it, telling how super-regenerative receivers work, and how to build them, describing superhets and the new Super-infragenerator receiver. Construction of types with acorn, glass and metal tubes is included. The u.h.f. transmitter chapter is a practical treatment of proven circuits, from the simplest self-excited oscillator through linear oscillators, and oscillator-amplifiers.

Power supplies are treated in greater detail than ever, covering receiver-packs, voltage dividers, and supplies for grid-bias, as well as all the standard rectifier-filter equipment.

Antenna design is especially complete. Numerous charts facilitate the planning, from simple single-wire antennas to complex directional arrays; transmission-line design being given particular attention. A new chapter is devoted to instruments and measurements, including the cathode-ray oscilloscope. The chapter on station assembly illustrates new arrangements which the new equipment has made possible. Communications Department chapters give complete information on good operating practices and field organization set-up. Following these 21 chapters is the appendix, with its wealth of general information, and a complete topical index.

The concluding catalog section, in which leading manufacturers of amateur radio equipment are represented, gives the specifications and prices of standard apparatus for the amateur.

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SWISS BROADCASTS

An official announcement by the Swiss Short-Wave Association, (USKA), Bern, *Switzerland,* states that short-wave broadcasts are to be radiated the first Monday of each month from several Swiss stations for the benefit of Swiss countrymen abroad.

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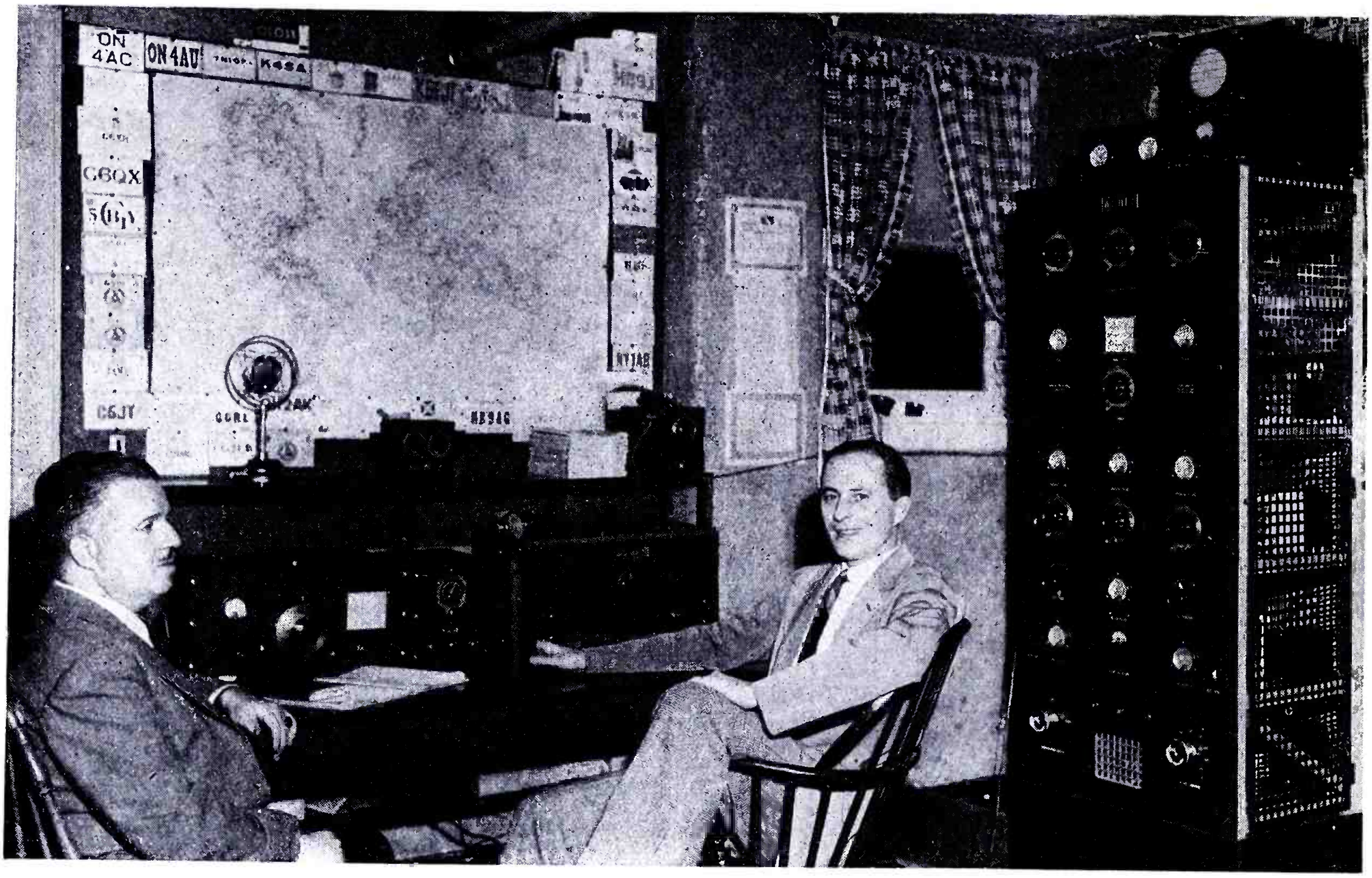

Amateur station W2HFS, Mount Vernon, N. Y. At the right; Mr. Lockwood, the owner. At the left; none other than Mr. Lawrence Cockaday, (W2JCY), Editor of Radio News!

Amateur Station W2HFS--An Ocean Hopper

By C. F. MULLEN

AMATEUR RADIO station W2HFS is owned and operated by Henry Lockwood, of Mount Vernon, N. Y. Both station and owner are well known in amateur circles throughout the world.

For that matter, Mr. Lockwood, or "Hank," is an amateur of the old school. He was pounding brass as early as 1913 along with E. H. Armstrong, Irving Vermilya, A. G. Runyon, Mort Stearns, H. A. Boeder and a few other local ether blasters. His call in those days was 2ANB.

Hank rode the ether with this call from 1919 to 1924, when he left the air. In 1933 he returned to the game, as many of the old timers have. Now it is "W2HFS" that cleaves the ether, not 2ANB, and Hank rides the waves, not with his fist, but with his voice.

And W2HFS gets places. There are 400 fighting watts in the transmitter, and fractional-microvolt sensitivity in the receiver. Hank figured on getting places when he designed the equipment in collaboration with W2CPA and W2AIF who undertook the actual construction. The QSL cards which may be seen on the wall in the accompanying illustration attest to this.

Station W2HFS is established in the corner of a Rumpus Room in the basement of Mr. Lockwood's home in Mount Vernon. On the operating table are the receiver, the microphone, operating switch and speech amplifier. To the right of the table is the transmitter, on top of which is a cathode-ray oscilloscope used for checking modulation, etc.

The Receiver

The receiver is a 9-tube superheterodyne comprising a regenerative tuned r-f stage, first detector, high-frequency oscillator, regenerative first i-f stage, straight second i-f stage, diode second detector and separate diode automatic volume control, and a triode a-f voltage amplifier feeding a triode-connected 59 tube operating Class A. The ninth tube is the beat-frequency oscillator.

Plug-in coils are used, and electrical band-spread is provided for each 'phone band. The regeneration in the r-f and i-f stages is used principally for obtaining sharp resonance peaks when interference is particularly bad. It provides a degree of selectivity bordering that of a crystal filter.

The microphone is a Western Electric 394-W condenser head feeding a two-stage, resistance coupled amplifier using two 864-A tubes. This amplifier is battery-operated.

The mike amplifier feeds a transformer-coupled speech amplifier using a 56 in the first stage, and a pair of 56's in push-pull in the second stage which function as drivers for a pair of 2A3's operating Class A with fixed bias. The 2A3's in turn drive a pair of Class B 203A's through a 500-ohm line. The 203A modulators have carbon plates and are operated at 1000 volts.

The Transmitter

The r-f section of the transmitter is composed of a 2A5 crystal oscillator, an 865 doubler, an RK-32 buffer and push-pull 203A's in the final stage, operating Class C, and coupled to the antenna feeder through a Collins network.

(Turn to page 143)

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A Simple Five-Meter Directional Antenna

A Beam Antenna of This Type Will Make Five Watts Sound Like Fifty—Or What Have You. Its Directional Characteristics Are Quite Pronounced

By R. J. HAGERTY, W6JMI

FEW PERSONS realize the possibilities and desirability of a simple directional antenna. It is only as we approach the higher freuencies that it becomes physically possible to build such an array, and in the five-meter band they especially prove their worth.

Provides Greater Gain

For instance, when pointed in the desired direction, this antenna system has raised the reports an average of two R's on the amateur R scale. This means the same as quadrupling the power input to the transmitter, and obviously this antenna is much cheaper and easier to construct.

And it works equally well on receiving. Many a signal that is only R3 on the ordinary antenna will become R5 on this antenna. It might be also mentioned that this is a simple way to eliminate QRM or interference. A case in point is a station that is R9 on an ordinary antenna that will drop to R4 on this antenna when it is pointed in the opposite direction.

Field Pattern

Most people desire to work in one general direction and this antenna is ideal for this purpose as it is not too sharp so as to confine one's activities to one particular direction. The field strength pattern is similar to Fig. 3. In other words, it has a decided gain in the direction in which it is pointed; it works equally as well as the ordinary antenna on stations that are on either side; and it has a nullifying effect on stations that are in the opposite direction.

Constructional Details

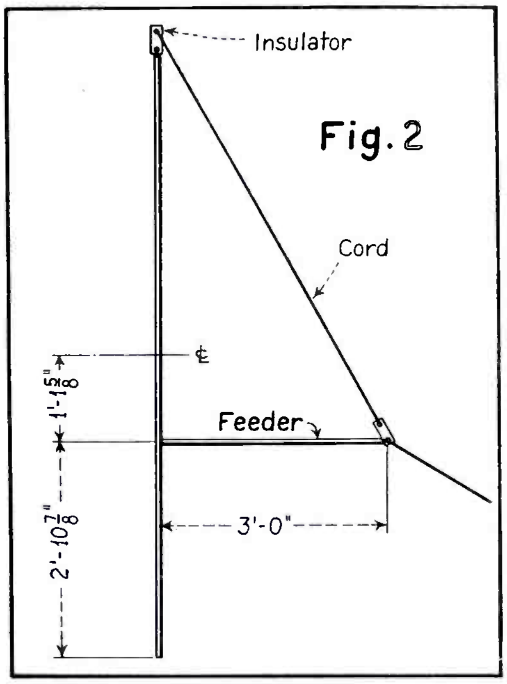
Full details are shown in Fig. 1. It is designed to resonate in the middle of the 5-meter band and the dimensions and the spacings are critical. The whole array is suspended on a heavy rope that has been boiled in linseed oil to prevent weathering. A similar rope is attached to the bottom ends of the rods in order to keep the structure taut. On account of rigidity it is desirable to make the rods of ¼" copper tubing or a similar material.

The Feeder

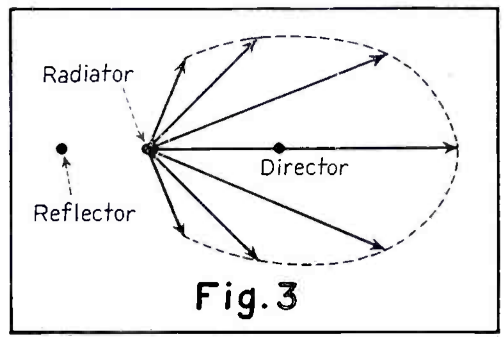
The single wire feeder can be of any length, and is attached at a point 13⅝" from the center, or 2'10⅞" from one end of the antenna rod. It should run at right angles from the rod for a distance of at least 3 feet, and a convenient way of supporting is shown in Fig. 2, where the 3-foot section is made of similar tubing as the antenna rods and supported at the far end by means of a cord.

In addition to running at right angles from the antenna rod, the feeder should also run at right angles to the plane of the antenna, as shown in Fig. 4. The bottom end can be attached in any of the conventional ways.

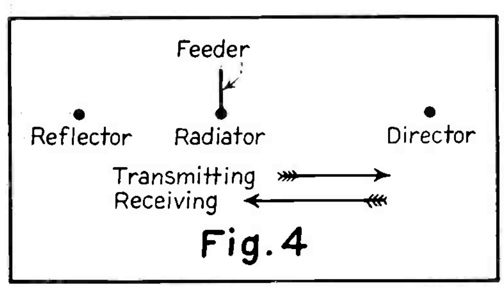
Real results can be expected from this simple directional antenna and it will well repay the time and effort expended.



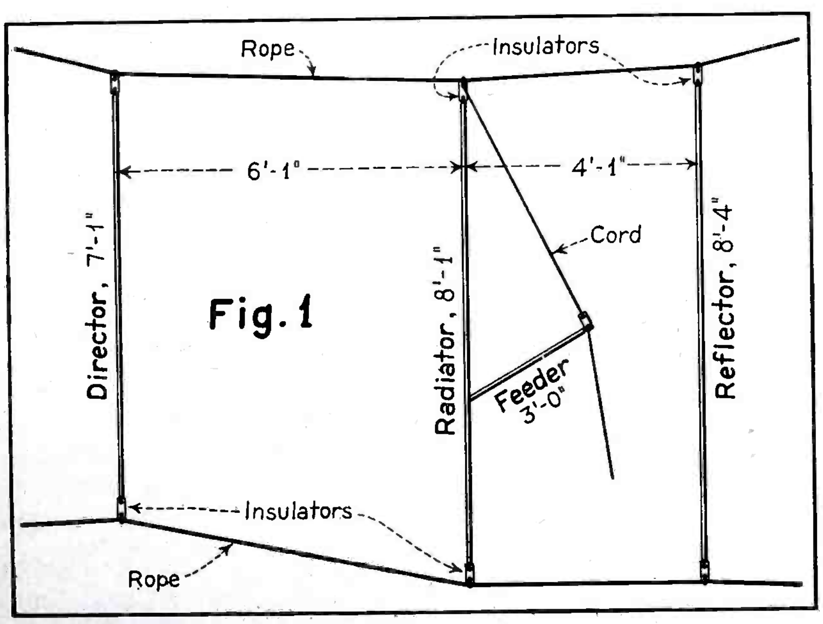
Showing how the feeder is connected to the radiator. The dimensions should be closely followed.



The approximate field pattern of the five-meter antenna.



Directions in which the antenna functions at maximum efficiency for transmitting and receiving.



Constructional details of the five-meter directional antenna. The feeder is at right angles with the radiator, as shown in Fig. 2.

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WHAT FREQUENCY?

A NEW AND ORIGINAL METHOD FOR LOCATING THE FREQUENCY OF ANY RECEIVER BELOW 200 METERS

By CHARLES H. ROOF

W6KTC

Printed through the courtesy of "Radio Engineering"

THE QUESTION, "To what frequency is a receiver *actually* tuned?" is not an easy one to answer. Any operator who has set out to discover the answer by a "Tune and Guess" method has in all probability encountered many difficulties.

It is generally agreed that a calibrated oscillator, with its family of harmonics, is capable of rendering valuable assistance. However, the writer asks, "How many agree regarding *which harmonic* is *actually* being received, especially when the receiver is tuned to frequencies close to, or within, that band known as ultra-high?"

Of course, a satisfactory answer to that question can easily be obtained by using the formula:

$$F_x = \frac{F_1 F_2}{F_1 - F_2}$$

where F_x is the unknown frequency to which a receiver happens to be tuned and where F_1 and F_2 are frequencies corresponding to the two adjacent settings of a calibrated oscillator, both of which settings give beat notes with the receiver at its particular setting.

(e.g.) Let $F_1 = 25$ kc and let $F_2 = 20$ kc, and let it be required to find F_x.

$$F_x = \frac{F_1 F_2}{F_1 - F_2} = \frac{25 \times 20}{(25 - 20)} = 100 \text{ kc.}$$

This example, while serving its purpose as an illustration, is hardly sufficient to indicate the complications which are likely to be encountered when substitutions are made with figures obtained in actual practice. Moreover, if it is desired to set a receiver to some particular frequency other than F_x but close to it, one must proceed to divide F_x by either F_1 or F_2 in order to determine *which* harmonic is being used so that the necessary computations may be made.

The sum total of work involved when one attempts to solve this expression with pencil and paper is closely akin to manual labor. It is, therefore, at this point that further light on the subject is welcome.

THE SLIDE RULE

The slide rule, that invaluable mathematical assistant, is capable of giving that light and, while it is true that the operations could be performed step by step as before by means of this instrument, there is still an inherent function of the rule which makes the calculation virtually *automatic!*

To start the explanation, let it be agreed that we are using an oscillator which has maximum dial spread for frequencies included between approximately 1200 kc and 2200 kc. This particular band is chosen for several reasons (viz.)

1. Such an oscillator possesses a fair degree of stability.

2. It is extremely easy to calibrate both by means of harmonics carried down from the broadcast band and from its own harmonics which beat with other stations of known frequency.

3. An oscillator with this approximate fundamental range, together with its harmonics, will cover practically every frequency from 200 meters to below 5 meters (only 200 kc in the neighborhood of 2300 kc being "uncovered.")

4. The slide rule, being so constructed that at points corresponding to similar frequencies it has one division on its scale for 10 kc, lends itself very well to the idea of using a knob with a pointer for the oscillator control and marking a cardboard scale behind the pointer directly in kilocycles (10 kc per division), thus eliminating the use of a calibration curve in transferring readings from the oscillator to the slide rule.

Assuming that we have an oscillator of the type described and a rule, we may proceed to tune our receiver to any frequency below 200 meters. We then vary the oscillator tuning until a beat note from one of its harmonics is heard in the receiver, and the fundamental frequency of the oscillator, as read under the pointer, is noted.

Next, we slowly turn the oscillator condenser in either direction until the *next* beat note is heard and this fundamental frequency is noted. Let us assume that the two frequencies as indicated are 1520 kc and 1900 kc. These two values are then located on the "D" scale of our slide rule as in Fig. 1.

The next step consists in finding two *consecutive whole* numbers on the "C" scale which are separated by *exactly the same distance* as are 1520 and 1900. Re-

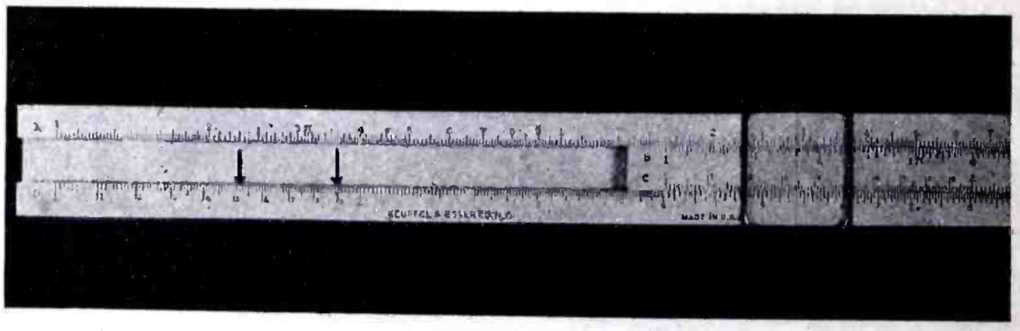

Fig. 1. On an oscillator calibrated to read directly from 1200 kc to 2200 kc, two readings, one of 1520 kc and one of 1900 kc, have been obtained. Note their location on the D-scale of an ordinary slide rule.

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ferring to Fig. 2 (a) we see that the spacing between 3 and 4 on the "C" scale is too great. By a similar observance we see that the spacing between 6 and 7 on the same scale is too small, Fig. 2 (b). But, upon further trial, it is determined that the spacing between 4 and 5 coincides *exactly*, Fig. 2 (c), and it is evident that these are the two *consecutive whole* numbers which we were seeking.

Having found them we know, without further calculation, that the receiver is tuned to the *fifth* harmonic of 1520 kc, and to the *fourth* harmonic of 1900 kc. *Multiplying the lower frequency by the higher harmonic, or vice versa,* we see that the rule indicates 7600 kc, which is the value for F_x in this particular case. See Fig. 3.

Let us further suppose that we desired to set our receiver at some particular frequency (e.g.) 7120 kc. Since 7120 kc is lower in frequency than 7600 kc there will be two points on our oscillator respectively lower in frequency than 1520 kc and 1900 kc, and which will have their fourth and fifth harmonics located at 7120 kc. Dividing 7120 kc on the slide rule by either 4 or 5, whichever we choose, we see that the answers are 1780 kc and 1424 kc. This means that we may slowly tune the oscillator either from 1900 kc to 1780 kc, or from 1520 kc to 1424 kc, at the same time following along with the receiver which will be tuned to 7120 kc when we have finished the operation. After some practice *this entire procedure should not occupy more than about one and one-half minutes!*

There are several other points which are worth mentioning. For example:

To avoid making mistakes it should be constantly borne in mind that, having found two harmonics on the "C" scale, it is *the lower frequency which is multiplied by the higher order of harmonic, or vice versa.*

It should also be understood that in practicing this method without an oscillator actually in use, one must *first* select an arbitrary value for F_x and then work the problem backwards to determine F_1 and F_2 as it is seldom that frequencies for these expressions can be picked at random on the "D" scale and the method made to work.

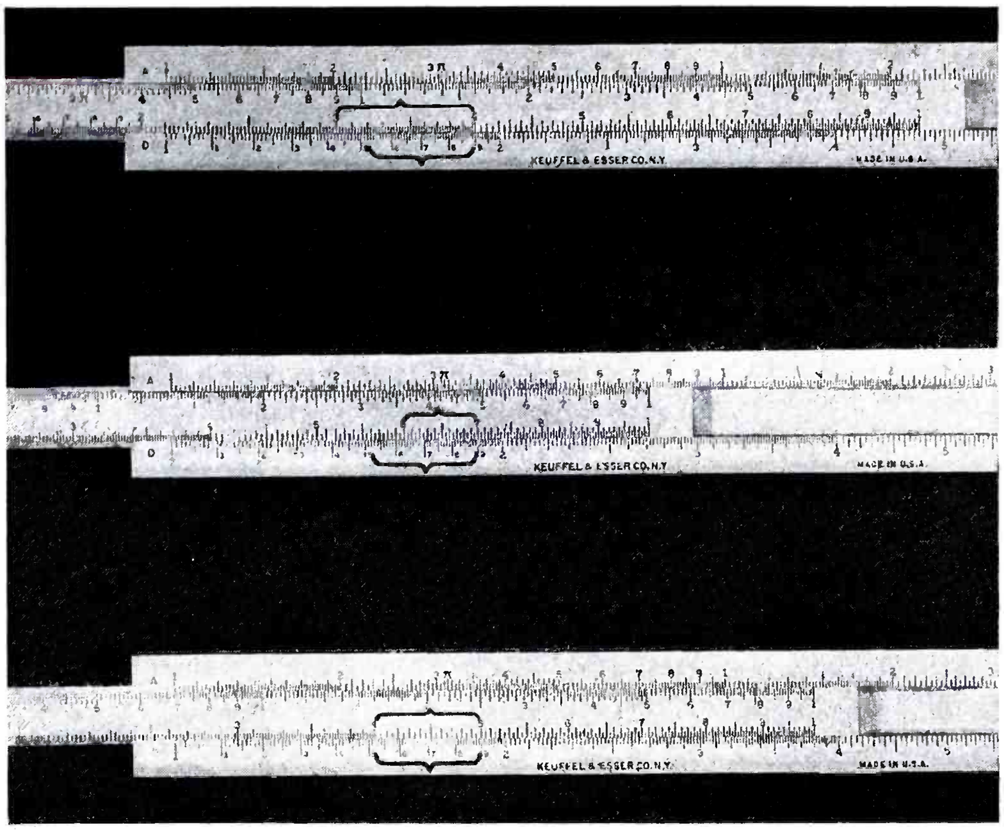

Fig. 2A (Top). The object being to find two consecutive whole numbers on the C-scale which coincide exactly with the two known frequencies shown in Fig. 1, it will be noted that 3 and 4 on the C-scale are too far apart. Fig. 2B (Center). Likewise it is noted that 6 and 7 on the C-scale are too close together. Fig. 2C (Bottom). This is correct. Observe that 4 and 5 on the C-scale correspond precisely with 1520 and 1900 on the D-scale. Thus we learn that our receiver is tuned to the 4th harmonic of the higher frequency (1900 kc) and the 5th harmonic of the lower frequency (1520 kc).

It will be noted that an idea of the location of the receiver setting in kilocycles may be had by counting the number of beats heard when the oscillator is swung over its complete range. That is, if there are from 2 to 4 beats the receiver is set somewhere between 3500 kc and 9000 kc. If the beats heard number between 6 and 10 the receiver is between 15,000 kc and 30,000 kc. At 56 mc the number of beats heard should be about 21.

Since there is only a very slight difference in the spacing of the whole numbers on the "C" scale which would correspond to the order of harmonics giving beat notes at or near 56 mc, it is suggested that an additional coil for the oscillator be calibrated to cover about 3000 to 4000 kc, which will cut the order of harmonics in half, thereby increasing the spacing and allowing these values to be more accurately determined.

Any one of several varieties of oscillators will do provided the oscillator is calibrated as suggested.

Where a "super" is employed as the receiver, a beat oscillator must also be used or else a modulated type of oscillator for frequency locating.

For those not in possession of, or familiar with, the slide rule, it should be stated that they may be obtained together with a booklet of instructions concerning their manipulation at prices ranging upwards from 75 cents. The 10-inch size is recommended. Anyone who can multiply and divide with pencil and paper can learn to use the rule for this same purpose and in general it will be found to be a worth-while investment for its many additional functions.

The practicability of this system has, for several months, been in the process of demonstration at the homes of two short-wave experimenters, neither of whom had had previous experience with either an oscillator or a slide rule. Each of them after four hours of instruction and practice were able to determine the receiver setting to within from 7 kc to 20 kc. Also, they were able to set the receiver with the same precision, to any desired frequency below 200 meters.

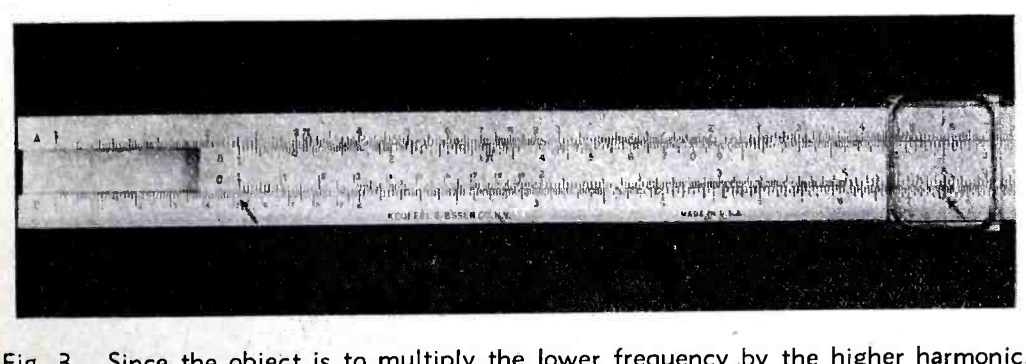

Fig. 3. Since the object is to multiply the lower frequency by the higher harmonic, we next place the left index (numeral 1) of the C-scale over the known lower frequency (1520). Then by moving the runner until its hairline is directly over 5 on the C-scale (which is the higher harmonic) the exact frequency to which the receiver is tuned is indicated directly beneath on the D-scale, 7600 kc. (A simple **multiplication!)**

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RADIO PROVING POST

National HRO High-Frequency Receiver

THE CIRCUIT and an illustration of the National HRO High-Frequency Receiver accompany this report.

The HRO is a 9-tube set (10 tubes if the rectifier in the separate power supply is included). There are two r-f preamplifier stages, using 58s; a 57 first detector; a 57 high-frequency oscillator; two i-f stages using 58s, the first stage including a crystal filter; a 2B7, with one diode used as second detector and the other for avc, and the pentode section functioning as an a-f voltage amplifier. A 2A5 power pentode is employed in the output. This is arranged to feed a magnetic speaker, or a self-excited dynamic. A 57 tube is used in the circuit of the beat-frequency oscillator.

A glance at the illustration will show that straight-line construction is employed. That is, the tubes, coils, etc., are arranged in sequence, almost as they appear in the circuit if the circuit were folded back on itself.

The tuning dial occupies the center of the front panel. Directly below the dial is the high-frequency coil drawer. On the left side of the front panel are: the "S" Meter, which indicates signal strength, the manual volume control, the avc on-off switch and the beat-oscillator control. On the right side of the panel front are: the crystal selectivity control, the crystal phasing control, the "standby" switch and the sensitivity control.

Mechanical

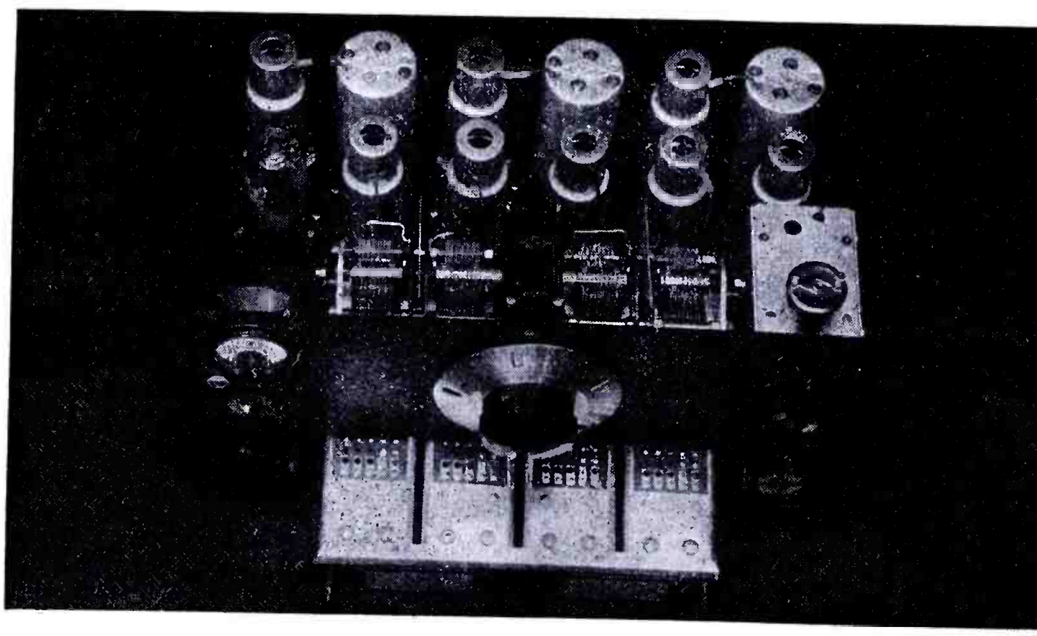
The receiver is husky, yet has the mechanical precision of a watch. The tuning condensers are driven through a worm gearing, spring-loaded to take up backlash. The tuning dial is rotated ten times for 180° rotation of the condensers. The dial numbers appear through windows in the main dial shell and are changed automatically every revolution of the dial so that the calibration is numbered consecutively from 0 to 500. The actual useful length of the equivalent scale is twelve feet! The result is that stations are well spread out on the dial, which makes for easy tuning.

All controls are smooth in operation, with the result that it is an actual pleasure to operate the receiver.

Electrical

The principal electrical features are dealt with under the heading "Listening Tests." But, let it be said here that the electrical band-spread system employed in the National HRO is really quite remarkable. It is possible, for instance, to spread the 14-mc (20-meter) amateur band over 400 dial divisions! On first thought, it would seem that such a large spread would be a hindrance rather than an advantage. Such is not the case; stations are so well separated, and the dial may be twirled with such rapidity, that it is a simple matter to cover the entire 'phone or cw section of a band with as much, if not more, ease, as with a dial having considerably less spread.

The four coil units supplied with the receiver cover a continuous band from 1.7 to 30 mc. Each is so designed that there is an amateur band at 50 and 450 on the dial scale. When the coils are connected for band-spread, the spread band begins at 50 on the dial and ends at 450.



Interior view of the National HRO. Note crystal filter system at the right.

Listening Tests

Listening tests on the National HRO were conducted on each of the amateur bands from the 28 megacycle band to and including the band at 1.7 megacycles.

By comparison with older superheterodyne receivers of the communication type and with new all-wave superhetrodyne receivers, the following outstanding improvements were noted:

1. Lower noise level with high signal-to-noise ratio on all of the frequency coverage from 1.7 mc to over 30 mc.

2. Selectivity on amateur phone and short-wave broadcast signals from a value which passes sidebands up to about 4000 or 5000 cycles to the extreme selectivity furnished by crystal i-f selection for cw signals.

3. Crystal filter action on cw signals without any loss in signal strength over values of audio signal strength with the filter out of the i-f circuit. This is the first receiver in which such excellent crystal filter performance has been observed.

4. Unusual band-spread action provided by the mechanical arrangement in the dial and condenser drive and also by the r-f grid circuit system in which the L/C ratio is improved when band-spread

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is greatest, or rather when the coil tuning is connected for band-spread action.

5. Unusual stability. The stability of this receiver is such that the drift from a cold start with the receiver at a room temperature of approximately 60 degrees F. to a final stable operating temperature was only equal to a 9-kc shift at 14 megacycles. The signal was provided by a local oscillator using an AT-cut crystal working at 3.5 mc. The shift value does *not* take into account any change in crystal frequency during the warming period for the receiver. A complete laboratory check would probably indicate less receiver shift than was indicated here. Also, not less than 50% of the shift is due to the warming of the tubes in the receiver. Under the same test, an all-wave broadcast receiver of excellent design showed a shift over ten times as great, being tested under the same conditions.

Amateur Signal Reception

The receiver was tested during a period when the transmitter in the station was operating on 14-megacycle phone. Therefore, more experience with receiver selectivity was had on this band than on any other. However, rebroadcast transmissions through W2HFS to the 75-meter phone band provided some action on the 75-meter band also. Amateur signals were logged on all bands from ten meters upward in wavelength.

Ten Meters: Listening tests on ten meters show excellent performance in that band. In one listening period of exactly 33 minutes duration beginning at 10:20 A.M. Eastern Standard Time on November 9, the following stations were logged with the signal strength noted: G5BY-R9; G6LK-R9; PAOAZ-R6; G6ZV-R9; G5WP-R9; W7FLU-R9; G6RH-R9; G6CL-R6. The audibility readings in any report are arbitrary. In this case the signal at an R9 level was readable anywhere on the lower floor of the house with the loudspeaker in use and with the r-f gain control at 9.5 and the audio gain control at 2. These values represent 95% of the r-f gain control setting and 20% for the audio gain control.

Twenty Meters: The first twenty-meter phone QSO after the receiver was placed on test was four way with G5ML of Kenilworth, England, VE1DR of Glace Bay, Nova Scotia and W2HFS of Mount Vernon, New York. The signals from G5ML could be compared with peak results during the early part of the summer and it can be said that they were both stronger and steadier than at any time during the summer season. This can be used in forming an opinion of the receiver only to the extent that sensitivity and avc action are good in the HRO.

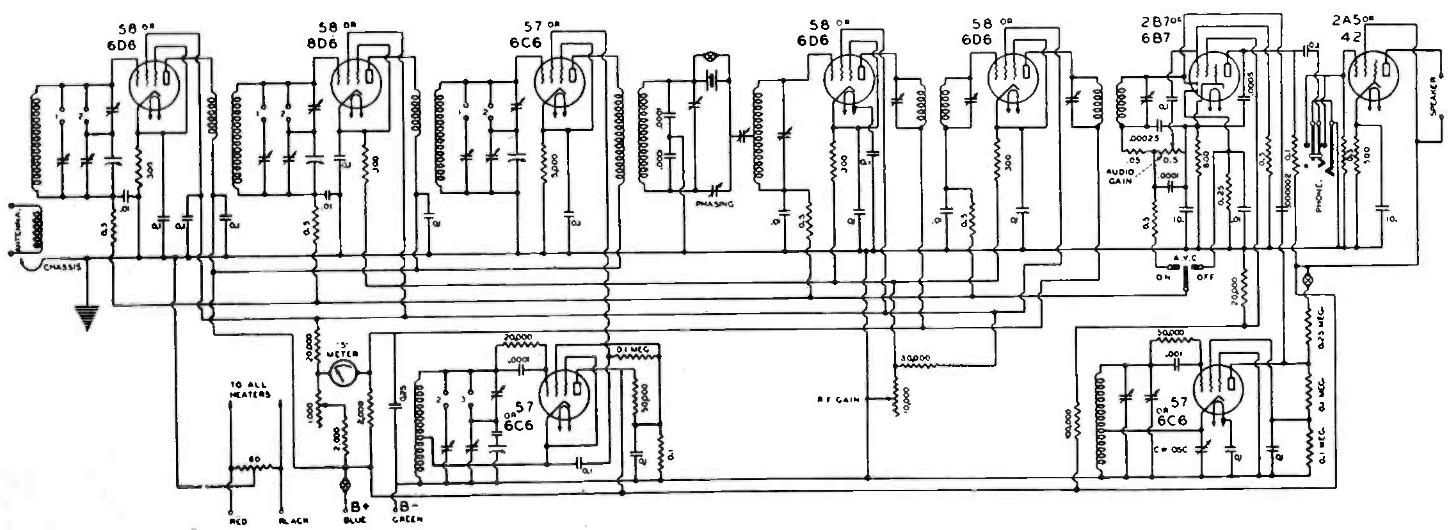
Reception of phone signals from LU6AP, VK2XU, K6KKP and excellent QSOs with W6GRI, W6JYH, and W6IZB show the good selectivity and sensitivity performance, too. The most gratifying performance of all has been the maintenance of a daily schedule with W9HOI on phone. During QRM periods, use of the crystal filter Phasing Control permitted perfect copy of every word.

Forty Meters: The reception of 40-meter signals covered every United States district, all of the countries in Western Europe, Africa, South America and Australia and New Zealand. The only feature worthy of discussion on reception in this band was the excellent performance of the crystal filter in providing selectivity without cutting the audio signal response. The stability of the receiver has already been discussed. This, quite naturally is of importance in single-signal cw reception.

Eighty Meters: The preselection, all under single dial control, was found to be useful in the 75-meter phone band where a number of 20- to 75-meter QSOs were made through retransmission from W2HFS. These were with stations in the First, Second and Third Districts and offered no more than an opportunity to check selectivity.

The cw reception at 80 meters was good, as might be expected. Many single-signal receivers which have been tried in the past show a good ratio of signal strength with the filter and without it on 80 meters but drop off at 40 and 20 meters, whereas the HRO does not, probably because of stability as much as any other one factor. Consequently the HRO

SCHEMATIC DIAGRAM — TYPE H.R.O. RECEIVER.



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cw performance does not stand out particularly in this band.

160 Meters: This band brought in the expected results in both phone and cw reception. The selectivity of the receiver was found to be useful and the level avc action pleasing. No effort was made to log extreme DX. The sensitivity is such that DX might be taken for granted with any kind of antenna.

Short-Wave Broadcasting

Comparison tests were made between the HRO and a good all-wave receiver using only one stage of preselection and the conventional friction drive vernier dial. To say that the operation of the HRO furnished a pleasing contrast would be stating the difference in the most conservative terms. The crowded 49-meter band furnished a total of 23 clearly defined, interference-free broadcast signals in one check at approximately 8 P.M. Similar checks with the HRO on the 16, 19, 25 and 31 meter bands showed good selectivity and ease of tuning not approached by the all-wave set. Without band-spread, which covers only the amateur bands in the HRO, the dial coverage for the 49-meter band is the equivalent of tuning the main pointer on the usual all-wave receiver through 315 degrees—almost a complete circle. Also, the signals were found to drift less and to hold at a more constant level, probably because of avc action applied to a greater number of amplifier circuits. The performance of the HRO on broadcast signals was impressive because an individual listening to broadcasts does not expect the music or speech signal to shift or fade—if these things do occur the listener is likely to be disappointed. Amateur signal reception with the operator constantly manipulating the receiver dial is commonplace and is generally accepted without comment.

The HRO Dial

In testing the HRO, it was expected that the dial twirling would be a laborious job. Actually it was not. To compare the dial action with that of other type drives, one must think of the HRO dial as a vernier drive with mechanical action so perfected that the calibration can be inscribed directly on the vernier itself. Broadcast receiver tuning would be improved tremendously if a mechanism of the same type could be utilized to drive the tuning condenser gang.

(An attempt was made to secure an HRO from the National Company for making these tests. None were available at the time. We were able, however, to borrow one from the stock of the Sun Radio Company, 227 Fulton St., New York, N. Y., to whom we wish to express our gratitude for this cooperation. Ed.)

The Lafayette Professional 9

THE TECHNICAL details and the circuit of this receiver were covered in the November issue. The following data deals with receiver tests only.

Mechanical

The chassis is mounted in an exceptionally well-built metal cabinet. The top is hinged and has a latch lock.

All manual controls are easy to operate with the exception of the avc-beat oscillator switch and the band-selector switch. This is true of most all-wave sets and appears to be necessary in order that the switches may be positive in contact. It is fortunate that these switches are used only occasionally.

The tuning dial on this receiver is a charm. It is superior to the dials on many more expensive sets, and there is no apparent play or backlash. Even the second-hand pointer is free from idle movement. Accurate logging is possible right up to 30 megacycles. That's good.

Both dial and condenser gang are floated on rubber, eliminating the bad effects of vibration.

Speaker cone cannot handle much power without rattling, but is perfectly satisfactory for anything but more-than-room-volume. Tone is surprisingly good on moderate volume, considering the small size of the speaker.

Electrical

The audio-frequency manual volume control is well graduated and quiet in operation. The same is true of the manual sensitivity control. The automatic volume control action.is.better than good.

Sensitivity is slightly greater with avc inoperative (it may be cut out in this receiver). Cutting the avc in and out provides a nice demonstration of its capabilities of reducing fading to an almost negligible degree.

Though the beat-frequency oscillator is quite stable in operation, frequency drift shows up between 20 and 30 megacycles. The drift may be eliminated by lifting the lid of the metal cabinet and letting it rest on the latch lock. This provides additional ventilation. This precaution is not necessary on the lower frequency bands.

Dial calibration is accurate and there are no dead spots or circuit interference in any of the bands. No image interference apparent except on strong, local signals in the 20-meter amateur band: Nothing to worry about.

Tests

Set shows surprising sensitivity and has fairly low noise background. Matched practically all signals intercepted on the "standard" receiver.

Consistent reception, with room volume, was had from W2XEN, Newark Police, on 31.5 mc, about 25 miles distant. The 10-meter amateur band brought in W6DOB, W6EWC, W5EHM, VE3QY, W2TP between 3:50 and 4:10 P. M., sufficient to establish the operation of the receiver at this wavelength.

The list of stations picked up on the 14-mc or 20-meter band is too long to print in its entirety. A few are: K4DDH, W7AOF (possibly the last transmission made by the operator . . . she was electrocuted by coming in contact with a high-voltage lead), W7CGR, CO2LL, CO6OM, CO2KC, CO2OZ, CO2HY, CO7HF, F8EO, F8DR, F8WB, K5AG, X1G, H17G, H12K, HK1Z, G5ML, and G5UF.

On 25 meters we had 2RO, Pontoise, KKQ, HJ4ABA steady and continuous R-9. The 31-meter band brought in a flock of Central American stations, as well as GSC, COCH, 2RO, EAQ, DJA and, as a sidelight, the code station LSD, in Argentina, loud enough to practically fold up the speaker cone. Fifteen stations were logged in the 49-meter band in one evening.

Fourteen stations were logged in the 1600-1700-kc police band in about as many minutes, including the inevitable VYR, and W1XAO. Twenty-four stations were picked up in the 2400-kc police band in slightly over a half hour.

On the broadcast band, we picked up one station for each 1.5 scale divisions. Selectivity in this band is very good, and each station free of actual heterodyning was brought in without interference.

The Lafayette Professional 9 is exceptional in its price class. We are pleased to recommend it to our readers.

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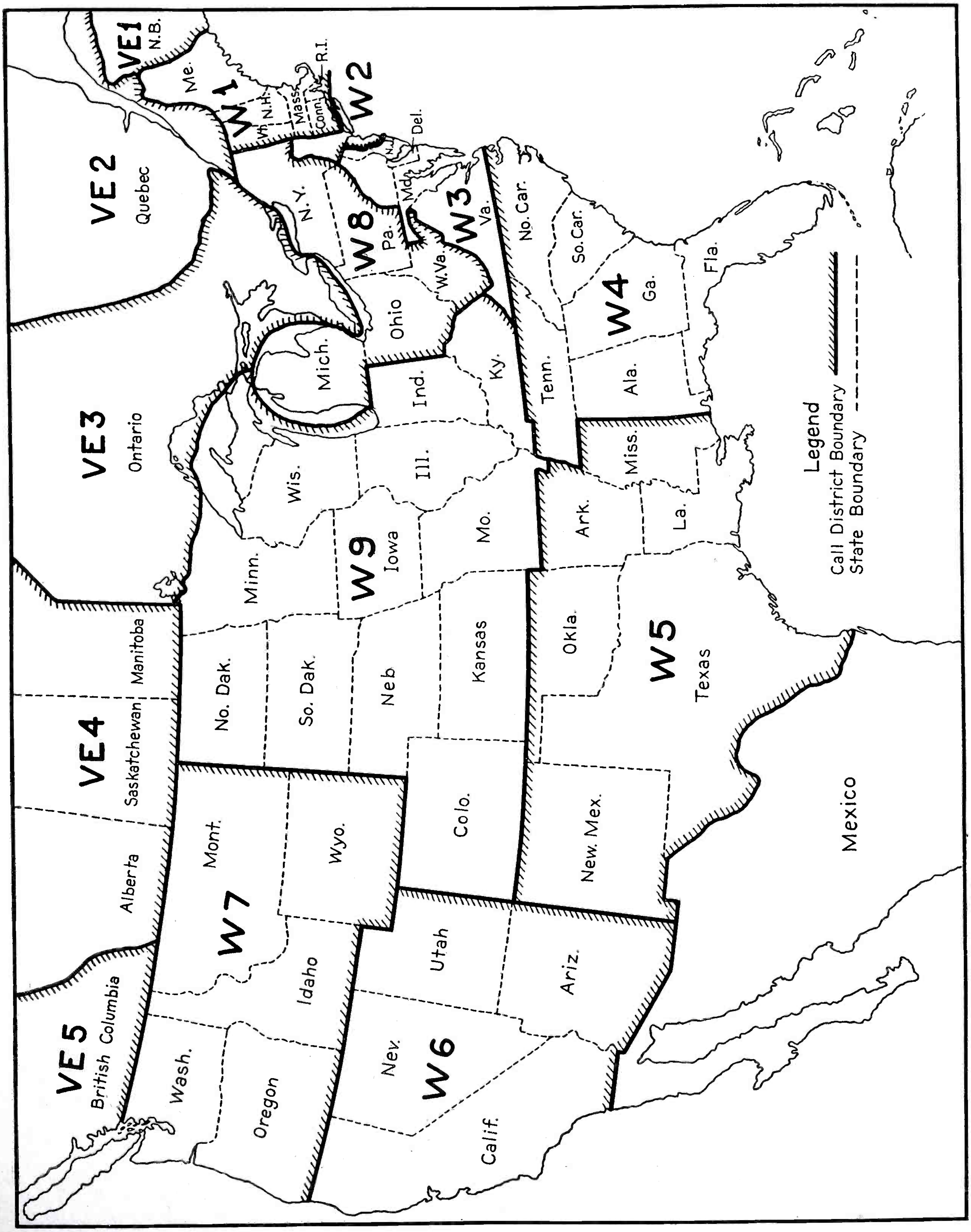
RADIO DATA SHEET NO. 1

A MAP DESIGNATING THE U. S. AND CANADIAN RADIO AMATEUR CALL AREAS.
STATE BOUNDARIES ARE INCLUDED; NOTE LEGEND



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BACKWASH

A PAGE GIVEN OVER TO THE EXPRESSIONS AND OPINIONS OF READERS

ANENT BBC VERIES

THE FOLLOWING *letter, from M. A. Frost, Empire Press Representative of The British Broadcasting Corporation, serves to explain why the BBC does not verify receptions:*

Dear Sir:

"In view of certain criticisms which have appeared in the correspondence columns of the overseas press, we should like to take this opportunity of outlining the reasons why the BBC is unable to give specific verification of the reception of its programmes from the Empire Station in correspondence with overseas listeners. We would, first of all, like to assure our listeners that this policy is not dictated by any lack of courtesy to those who have shown their interest in our Empire Broadcasting Service by writing to us.

"In many parts of the world certain competitions have been inaugurated by newspapers, radio clubs, or other organisations in which a prize (often monetary) is offered to the listener who reports the reception of the greatest number of stations over long distances during a certain period. In order to qualify for these competitions it is necessary for each listener to write to the operators of each station, giving details of one programme, so that his reception can be verified.

"In the case of stations which do not publish their programmes in advance such verification may often be reliable, but the most that can be done by the broadcaster is to state that such and such a program was broadcast at such and such a time, leaving the listener in a position to confirm 'his own' verification of reception. In the case of the BBC transmitters, however, the Empire programmes are published in advance, not only in the columns of the overseas press, but also in a pamphlet which can be obtained by any listener direct from the BBC on payment of a small annual subscription. The fact, therefore, that a listener reports to us the items broadcast in an Empire programme does not enable us to verify definitely that he has heard this programme from one of our own transmitters. It is quite common, for instance, for listeners not necessarily taking part in one of these competitions, to write to the BBC and report reception of the Empire Station on a receiver which is not designed for the reception of transmissions on short-waves. Upon investigation we usually find that he has heard our programme relayed from a local broadcasting station in his own vicinity.

"Again, our Empire programmes are broadcast simultaneously on two or more wavelengths, and it is quite impossible for us to confirm from which actual transmitter the listener has heard our programme.

"Furthermore, the Empire transmitters are now so widely received that our programmes are heard daily by many thousands of listeners in all parts of the world. In view of this fact we feel that the so-called "verification" of reception, apart from the other reasons which we have outlined above, would involve us in a great deal of labour and expense, which might better be directed towards other channels.

"The object of our Empire transmissions is mainly to provide a service of news and entertainment to listeners in all parts of the Empire, and we feel that the lasting success of our Empire Service will depend on the matter received, rather than the method of its reception. For this reason we are not in favour of such competitions as are outlined above, although we should welcome news of a competition which would provide constructive criticism of a technical or programme nature, and would make some positive contribution to the art of short-wave broadcasting. In order to avoid any misunderstanding we should say that we receive each year many thousands of letters from listeners in all parts of the world with regard to the reception of our Empire programmes. The contents of each communication are carefully analysed, and a reply addressed according to circumstances to every correspondent. Correspondence of a constructive nature relative to programmes, or of a technical nature, will, we can assure listeners, be always welcome to the officials of this Corporation who are responsible for the operation of our Empire Broadcasting Service."

◆

"THE RIGHT IDEA"

Editor, ALL-WAVE RADIO:

Just bought a copy of ALL-WAVE RADIO. Have been reading radio magazines for the past ten years. Most of them have lacked something.

A magazine for the Fan who is primarily interested in reception, but who also is more or less interested in the technical and experimental side, is the right idea.

F. L. P.

Keep on eye on us, and report again in the near future, if you will. Tell us what you like and don't like. Thanks.—Ed.

◆

A SINCERE HOPE EXPRESSED

Editor, ALL-WAVE RADIO:

It is indeed a pleasure to be one of the Charter subscribers to a magazine which is to have a policy such as yours is to have.

I sincerely believe you are hitting the right nail on the head, inasmuch as there are many of us who have done big things in Radio in the old days still with the spirit in our systems—but realizing the grief we went through would not attempt to start all over again, at least not in a commercial way. Perhaps we have other interests now, and can dispose of our cast-off radio parts to our High School sons, who were then too young to take an interest.

Nevertheless, we who have been through it, must still have our desire to experiment, satisfied. Likewise, we must have our "Radio."

Some of us who had enough work to employ so-called radio men, would not depend upon one of them to service our own radios. Of course, we want the very latest and best, so you come in the field now to help us. The old spirit is still within us. Now, thanks to you, our intrests can be renewed . . . also, that indefinable something like a desire, can be satisfied. We can also retain our present interests without getting a lot of money tied up in junk that seldom, if ever, worked as we anticipated, and which, in order to dispose of, we went into the radio business.

In closing, may I add: there are others —lots of them—like myself. I shall gladly mention your new magazine to them.

H. J. PRICE,
WEST ALLIS, WISC.

Thank you for the trust you place in us. We shall do our level best to live up to it. We will make mistakes . . . all humans do—but we shan't make the error of letting down the reader.—Ed.

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In Writing For Veries . . .

ADDRESSES OF PRINCIPAL SHORT-WAVE STATIONS BY COUNTRY

AFRICA

Call	*Address*
CNR	Director General des Postes, Rabat, Morocco.
CR6AA	Estacao Radio Difusora, Caixa Postal 103, Lobito, Angelo, Portugese West Africa.
OPL-OPM	Radio Leopoldsville, Congo Belge, Africa.
SUV-SUX	Post Office Box 795, Cairo, Egypt.
VQ7LO	P. O. Box 777, Nairobi, Kenya Colony, Africa.
ZSS	Overseas Communications, Kodak House, Shortmarket St., P. O. Box 962, Capetown, So. Africa.
ZTJ	Radio ZTJ, P. O. Box 4559, Johannesburg, Transvaal, South Africa.

ASIA, OCEANIA AND FAR EAST

Call	*Address*
CQN	Government Broadcasting Station CQN, Postmaster General, Post Office Bldg., Macoa, (Portugese), China.
FZS	Postale Boite 238, Saigon, Indo-China.
HSP	Government Post & Telegraph, Bangkok, Siam.
Java Stations	H. Van der Veen, Engineer, Java Wireless Stations, Bandoeng, Java.
"JV" & "JZ" Stations	International Wireless Telephone Company of Japan, Osaka Bldg., Kojimachiku, Tokio, Japan.
"JY" Stations	Radio JYR, Kemikawa-Cho-Chiba, Ken, Japan.
KAY et al.	Philippine Long Distance Telephone Co., Manila, P. I.
PMY	Radio Station PMY, Nillmy Bldg., Bandoeng, Java, Netherlands Indies.
RV15	Far East Radio Station RV-15, Khabarovsk, U.S.R.R.
VK2ME	Amalgamated Wireless Ltd., Wireless House, 47 York St., Sidney, N.S.W. Australia.
VK3LR	Australian Broadcasting Commission, Broadcast House, 264 Pitt St., Sidney, Australia.
VK3ME	Amalgamated Wireless Ltd., P. O. Box 1272-L, Melbourne, Australia.
VPD	Amalgamated Wireless, Ltd., Suva, Fiji Islands.
VUC	Indian State Broadcasting Service, 1 Garstin Place, Calcutta, India.
VUY-VUB	Indian State Broadcasting Service, Irwin House, Sprott Road, Ballard Estate, Bombay, India.
XGW	Radio Administration, Sassoon House, Shanghai, China.
YBG	Radio Service, Serdangweg 2, Sumatra, Dutch East Indies.
YDA	H. Van der Veen, Engineer, Java Wireless Stations, Bandoeng, Java.
ZBW	Station ZBW, Hong Kong Broadcasting Committee, P. O. Box 200, Hong Kong, China.
ZGE	Radio ZGE, Kuala Lumpur, Malaya States.
ZHI	Radio Service Company, Broadcast House, 2 Orchard Road, Singapore, Malaya.
ZHJ	Radio Station ZHI, Radio Society of Penang, Penang, Malay Straits.
ZLT-ZLW ZLR	Supt. Post & Telegraph, GPO, Wellington, New Zealand.

CANADA

Call	*Address*
CGA-CJA, et al.	Marconi Station, Drummondville, Quebec, Canada.
CJRX-CJRO	Royal Alexander Hotel, Winnipeg, Manitoba, Canada.
VE9BJ	Capitol Theatre, St. Johns, N. B. Canada.
VE9CS	743 Davie St., Vancouver, B. C. Canada.
VE9DN	Canadian Marconi Co., Box 1690, Montreal, Quebec, Can.
CRCX	Rural Route No. 4, Bowmanville, Ontario, Canada.
VE9HX	Post Office Box 998, Halifax, N. S., Canada.

CUBA, MEXICO, CENTRAL AMERICA AND WEST INDIES

Call	*Address*
CO9GC	Laboratorio Radio-Electrico, Grau y Caminero, Apartado 137, Santiago, Cuba.
CO9JQ	Estacion Experimental de Onda Corta-CO9JG, Calle del General Gomez, No. 4, Camaguey, Cuba.
CO9WR	P. O. Box 85, Sancti-Spiritus, Santa Clara, Cuba.
COCO	Post Office Box 98, Havana Cuba.
COCD	"La Voz del Aire, S. A.", P. O. Box 2294, 25 y. g. Vedado, Havana, Cuba.
COCH	Estacion COCH, Calle B No. 2 Vedado, Havana, Cuba.
HI1A	Radiodifusora HI1A "La Voz del Yaque," Santiago de los Caballeros, R. D.
HI3C	Radiodifusora HI3C, Sr. Roberto Bernado, Prop., La Ramona, R. D.
HI4D	Radiodifusora HI4D, "La Voz de Quisqueya," Dominican Republic.
HH2T HH2S	Societe Haitienne d'Automobile, Port-au-Prince, Haiti.
HIH	Radio HIH, "Las Voz del Higuamo," San Pedro de Macoris, R. D.
HIL	Radio HIL, Apartado 623, Santo Domingo City, R. D.
HIX	Radio HIX, J. R. Saladin, Director of Radio Communication, Santo Domingo, R. D.
HI1J	Radiodifusora HI1J, Apartado 204, San Pedro de Macoris, R. D.
HIZ	Radiodifusora HIZ, Calle Duarte No. 68, Santa Domingo, R. D.
HP5B	Radio HP5B, P. O. Box 910, Panama City, Panama.
HP5J	La Voz de Panama, Apartado 867, Panama City, Panama.
TGX	Radiodifusora TGX, Director M. A. Mejicano Novales, 11 Avenue N. 45, Guatemala City, Guatemala.
TGW	Radiodifusora Nacional TGW, Republic de Guatemala.
TIPG	Radio TIPG, Perry Girton, Prop., Apartado 225, San Jose, Costa Rica, C. A.
TI8FF	Radio TI8FF, Ecos del Pacifico, Punta Arenas, Costa Rica.
TIEP	"La Voz del Tropico," Apartado 257, San Jose, Costa Rica, C. A.
TIGPH	Radiodifusora TIGPH "Alma Tica," Apartado 775, San Jose, Costa Rica.
TIRCC	Radioemisora Catolica Costaricense, Apartado 1064, San Jose, Costa Rica, C. A.
HRN	Radio HRN, La Voz de Honduras, Tegucigalpa, Honduras
VPN	Station VPN, Nassau, Bahama Island.
WTDV	H. M. McKenzie, St. Thomas, Virgin Islands.
WTDW	S. I. Winde, Christiansted, Virgin Islands.
XAM	Director General de Correos, Merida, Yucatan, Mexico.
XBJQ	Radiodifusora XBJQ, P. O. Box 2825, Mexico D. F., Mexico.
XDA-XDC	Secretaria de Communicaciones, Mexico, D. F.
XEBT	El Buen Tono, S.A., Apartado 79-44, Mexico, D. F.
XECR	Estacian XECR Secretaria de Relaciones Exteriories, Mexico, D. F.
XECW	Radio XECW, Del Caballero Santokan, Bajio 120, Mexico, D. F.
XEFT	Radio XEFT, La Voz de Vera Cruz, Av. Independencia 28, Vera Cruz, Mexico.
YNA	Tropical Radio Telegraph, Managua, Nicaragua, C. A.
YNIGG	La Voz de Los Lagos; Radiodifusora YNIGG, Managua, Nicaragua, C. A.
YNLF	Radiodifusora YNLF, c/o Ing, Moises Le Franc Calle 15 de Set No. 206, Managua, Nicaragua.
YNDA	Radiodifusora YNDA, Managua, Nicaragua.

EUROPE

Call	*Address*
2RO	5 Via Montello, Rome, Italy
CSL	Radio CSL, Emissora National, Lisbon, Portugal.

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CT1AA	Antonio Augusto de Aguair, 144, Lisbon, Portugal.
CT1CT	Oscar G. Lomelino, Rua Gomez Freire 79-2 D, Lisbon, Portugal.
CT1GO	Portugese Radio Club, Parede, Portugal.
SPW	Radio SPW, Polski Radio Warsaw, Warsaw, Poland.
DAF	Hauptfunkstelle Nordeich, Norden-Land, Germany.
DJA, et al.	German Short Wave Station, Broadcasting House, Berlin, Germany.
Dutch Phones	Partstaat 29, S'Gravenhage, Holland.
EAQ	P. O. Box 951, Madrid, Spain.
EA8AB	Radio Club Tenerefe, Alvarez de Lugo 1, Santa Cruz de Tenerife, Canary Islands.
EHY-EDM	Piy Margall 2, Madrid, Spain.
English Phones	Engineer-in-Chief's Office (Radio Branch) G.P.O. Armour House, London, EC1.
English Ships	Connaught House, 63, Aldwych, London W.C. 2, England.
TFJ	Icelandic State Broadcasting Service, P. O. Box 547, Reykjavik, Iceland.
French Phones	166 Rue de Montmartre, Paris, France.
G6RX	Rugby Radio Hillmorton, Warwickshire, England.
GSA-GSH, et al.	British Broadcasting Corporation, Broadcasting House, London, W.1, England.
HAS-HAT	Director Radio, Hungarian Post, Gyali St. 22, Budapest, Hungary.
HB9B	Radio Club, Box 1, Basle, Switzerland.
HBL-HBP et al.	Information Section, League of Nations, Geneva, Switzerland.
HVJ	Radio HVJ, Castine, Pio IV, Vatican City, Vatican, Italy.
IAC	Coltano Radio, Piza, Italy.
IRM-IRW IRGI2A	Italo Radio, Via Calabria N. 46/48, Rome, Italy.
LKJ1	Ministere Du Commerce, Administrator des Telegraphes, Oslo, Norway.
OER2	Radio OER2, Vienna, Austria.
ORK-ORG	Director de Communications, Bruxelles, Belgium.
OXY	Stateradiofonien Heibersgade 7, Copenhagen, Denmark.
PCJ	Philips Radio PCJ, Eindhoven, Holland
PHI	Phillips Radio PHI, Huizen, Holland.
PI1J.	Radio Station PI1J, Dr. M. Hellingman, Owner and Operator, Dordrecht, Holland.
Pontoise	Minister des Postes, 193 Rue de Grenelle, Paris, France.
RNE-REN RV59	Radio Centre, Solianka 12, Moscow, U.S.S.R.

SOUTH AMERICA

Call	*Address*
CEC	CIA Internacional de Radio, Casilla 16-D, Santiago, Chile.
CP5	Radio CP5, Casila 637, La Paz, Bolivia.
El Prado	Apartado 98, Riobamba, Ecuador.
HC2AT	Radiodifusora HC2AT, P. O. Box 872, Guayaquil, Ecuador.
	Radiodifusora HC2CW Casilla 1166, Guayaquil, Ecuador.
HC2ET	Radiodifusora del Telegrafo, Casilla 249, Guayaquil, Ecuador.
HC2CW	Radiodifusora HC2CW Casilla 1166, Guayaquil, Ecuador.
HC2JSB	Ecuador Radio Station HC2JSB, Juan S. Behr, Prop., Guayaquil, Ecuador.
HC2RL	P. O. Box 759, Guayaquil, Ecuador.
HCIB	Casilla 691, Quito, Ecuador.
HCK	Radiodifusora HCK, Quito, Ecuador.
HJA7	Radio HJA7, Cucuta, Colombia.
HJ1ABB	Apartado 715, Barranquilla, Colombia.
HJ1ABC	Radiodifusora HJ1ABC La Voz de Quibdo, Quibdo, Columbia
HJ1ABD	Estacion HJ1ABD, Cartagena, Colombia.
HJ1ABE	Apartado 31, Cartagena, Colombia.
HJ1ABG	Apartado 816, Barranquilla, Colombia.
HJ1ABJ	"La Voz de Santa Marta," Radio HJ1ABJ, Santa Marta, Colombia.
HJ1ABK	Radiodifusora HJ2ABK, Apartado 580, Barranquilli, Colombia.
HJ2ABA	"La Voz Del Paiz," Tunja, Boyaca, Colombia.
HJ2ABC	Pompilio Sanchez, Cucuta, Colombia.
HJ2ABD	Radiodifusora HJ2ABD, Bucaramanga, Colombia.
HJ3ABD	Colombia Broadcasting, Apartado 509, Bogota, Colombia.
HJ3ABF	Apartado 317, Bogota, Colombia.
HJ3ABH	"La Voz de La Victor," Apartado 565, Bogota, Colombia.
HJ3ABI	Apartado 513, Bogota, Colombia.
HJ4ABA	Emisora HJ4ABA, "Ecos de la Montana," Medellin, Colombia.
HJ4ABB	Radio Manizales, Apartado 175, Manizales, Colombia.
HJ4ABC	Radiodifusora HJ4ABC "La Voz de Pereira," Pereira-Caldas, Colombia.
HJ4ABD	Radiodifusora HJ4ABD La Voz de Citia, Medallin, Colombia.
HJ4ABE	Radiodifusora de Medellin, Medellin, Colombia.
HJ4ABJ	Radiodifusora HJ4ABJ, Ecos del Combeina, Ibague, Colombia.
HJ4ABL	"Ecos de Occidente," P. O. Box 50, Manizales, Colombia.
HJ5ABC	"La Voz de Colombia," Radiodifusora HJ5ABC, Cali, Colombia.
HJ5ABD	"La Voz del Valle," Cali, Colombia.
HJ5ABE	Radiodifusora HJ5ABE, Apartada 50, Cali, Colombia.
HJB	Marconi Telegraph Co., Apartado 1591, Bogota, Colombia.
HJN	Ministero de Correos y Telegraph, Bogota, Colombia.
HJY	All-America Cables, Inc., Bogota, Colombia.
HKE	Observatoria Nacional de San Bartolome, Bogota, Colombia.
HKV	Radiodifusora HKV, Radio Dept.—War Ministry, Government of Colombia, Bogota, Colombia.
LSN-LSL, et al.	Compania Internacional, 143 Defensa, Buenos Aires, Argentina.
LSX	Transradio Internacional, San Martin 329, Buenos Aires, Argentina.
OAX4D	Radiodifusora OAX4D, All- American Cables, Inc., (L. N. Anderson, Mgr.) Calle de San Antonio, 677; Casilla 2336, Lima, Peru.
OAX4G	Radiodifusora OAX4G, Roberto Grellaud, Avda. Abancay 915-923 Lima, Peru.
OCI-OCJ	All-America Cables, Inc., Lima, Peru.
PPU-PPQ, et al.	Caixa Postal 500 Rio de Janeiro, Brazil.
PRA8	Radio Station PRA8, Radio Club of Pernambuco; "The Voice of North," Pernambuco, Brazil.
PRF5-PSK	Comp. Radio Internacional Do Brazil, P. O. Box 709, Rio de Janeiro, Brazil.
VP3MR	Radio Station VP3MR, Georgetown, British Guiana.
YV2RC	Apartado Correos 2009, Caracas, Venezuela.
YV3RC	Radiodifusora Venezuela, YV3RC, Caracas, Venezuela.
YV4RC	Estacion S.A.R., Este 10 bis N. 71, Caracas, Venezuela.
YV5RMO	Box 214, Maracaibo, Venezuela.
YV6RV	"La Voz de Carabobo," Radio YV6RV, Valencia, Venezuela.
YV8RB	Radiodifusora YV8RB, "La Voz de Lara," Barguisimento, Venezuela.
YV10RC	Radiodifusora YV10RSC "La Voz del Tachira," San Cristobal, Venezuela.
YVQ-YVR	Servicio Radiotelegraphico, Maracay, Venezuela.
ZP10	Radio Prieto ZP10, Asuncio, Paraguay.

UNITED STATES

Call	*Address*
Dixon Stations	140 Montgomery St., San Francisco, Cal.
W1XAL	70 Brookline Ave., Boston, Mass.
W1XK	Hotel Statler, Boston, Mass.
W2XAD- W2XAF	General Electric Co., Schenectady, N. Y.
W2XE	485 Madison Ave., New York, N. Y.
W3XAU	1622 Chestnut St., Philadelphia, Pa.
W3XL- W3XAL	30 Rockefeller Plaza, New York, N. Y.
W4XB	Isle of Dreams Broadcasting Corp.; Radio W4XB, Herald Bld., Miami, Florida.
W8XAL	Crosley Radio Corp., Cincinati, Ohio.
W8XK	William Penn Hotel, Pittsburgh, Pa.
W9XAA	Navy Pier, Chicago, Ill.
W9XF- W9XBS	20 North Wacker Drive, Chicago, Ill.
WVD	Radio WVD, 517-Federal Office Bldg., Seattle, Wash.

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SHORT-WAVE STATION LIST

STAR BROADCASTERS INDICATED BY BOLD TYPE; PHONE (P); EXPERIMENTAL (E); TIME, E.S.T.

KC	Meters	Call	Location	Time
21540	**13.92**	**W8XK**	**Pittsburgh, Pa.**	**7-9 A.M.**
21500	13.95	NAA	Washington, D. C.	(E) Time signals regularly
21420	14.01	WKK	Lawrenceville, N. J.	(P) Phones LSN-PSA daytime; HJY-OCQ irregular
21160	14.19	LSL	Buenos Aires, Arg.	(P) Phones GAA mornings; DFB-DHO PSE-EHY irregular
21140	14.19	KBQ	Manila, P. I.	(P) Tests and relays P. M. irregular
21080	14.23	PSA	Rio de Janerio, Brazil	(P) Phones WKK-WLK daytime
21060	14.25	KWN	Dixon, Calif.	(P) Phones afternoon irregular
21020	14.29	LSN	Buenos Aires, Arg.	(P) Phones WKK-WLK daily; EHY, FTM irregular
20860	14.38	EHY	Madrid, Spain	(P) Phones LSM-PPU-LSY mornings
20860	14.38	EDM	Madrid, Spain	(P) Phones LSM-PPU-LSY mornings
20380	14.72	GAA	Rugby, England	(P) Phones LSL mornings; LSY-LSM-PPU irregular
20040	14.97	OPL	Leopoldsville, Belgian Congo, Africa	(P) Tests with ORG mornings and noon
20020	14.99	DHO	Nauen, Germany	(P) Phones PPU-LSM-PSA - LSL - YVR mornings
19987	15.01	CFA	Drummondville, Que.	(P) Phones: No A. M.; irregular
19980	15.02	KAX	Manila, P. I.	(P) Phones KWU evenings; DFC-JVE A. M.; early A. M.
19820	15.14	WKN	Lawrenceville, N. J.	(P) Phones GAU mornings
19720	15.21	EAQ	Madrid, Spain	(P) Relays and tests in A.M.
19680	15.24	CEC	Santiago, Chile	(P) Phones OCI-HJY afternoons
19600	15.31	LSF	Buenos Aires, Arg.	(P) Phones and tests irregularly
19530	15.36	EDR2	Madrid, Spain	(P) Phones LSM-PPU-YVR mornings
19530	15.36	EDX	Madrid, Spain	(P) Phones LSM-PPU-YVR mornings
19520	15.37	IRW	Rome, Italy	(P) Phones LSM-PPU mornings
19500	15.40	LSQ	Buenos Aires, Arg.	(P) Phones daytime irregularly
19355	15.50	FTM	St. Assise, France	(P) Phones LSM-PPU-YVR mornings
19345	15.52	PMA	Bandoeng, Java	(P) Phones PCK-PDK early mornings
19260	15.58	PPU	Rio de Janerio, Brazil	(P) Phones DFB-EHY-FTM mornings
19235	15.60	DFA	Nauen, Germany	(P) Phones HSP-KAX early mornings
19220	15.61	WKF	Lawrenceville, N. J.	(P) Phones GAS-GAU mornings
19200	15.62	ORG	Brussells, Belgium	(P) Phones OPL mornings
19140	15.68	LSM	Buenos Aires, Arg.	(P) Phones DFB-FTM-GAA-GAB mornings
18970	15.81	GAQ	Rugby, England	(P) Phones ZSS mornings
18960	15.82	WQD	Rocky Point, N. Y.	(E) Tests LSY irregularly
18950	15.83	HBF	Geneva, Switzerland	(E) Phones So. America mornings
18910	15.86	JVA	Nazaki, Japan	(P) Phones and tests irregular
18890	15.88	ZSS	Klipkewvel, So. Africa	(P) Phones GAQ-GAU mornings
18860	15.91	WKM	Rocky Point, N. Y.	(E) Tests and relays irregularly (P) Phones PCV mornings early
18830	15.93	PLE	Bandoeng, Java	(P) KWU evenings; music at times
18740	16.01	PCP	Kootwijk, Holland	(P) Relays and phones mornings irregular
18680	16.06	OCI	Lima, Peru	(P) Phones CEC-HJY days; WKK-WOP noon
18620	16.11	GAU	Rugby, England	(P) Phones VWY-ZSS early A.M.; Lawrenceville, daytime
18480	16.23	HBH	Geneva, Switzerland	(E) Relays to N. Y. mornings irreg.
18440	16.25	HJY	Bogota, Colombia	(P) Phones CEC-OCI noon; music at times
18405	16.30	PCK	Kootwijk, Holland	(P) Phones PLE-PMC early A.M.
18350	16.35	FZS	Saigon, Indo-China	(P) Phones FTK early mornings
18340	16.36	WLA	Lawrenceville, N. J.	(P) Phones GAS mornings
18310	16.38	GAS	Rugby, England	(P) Phones WLA-WMN mornings
18295	16.39	YVR	Maracay, Venezuela	(P) Phones DFB-EHY-FTM mornings
18270	**16.42**	**ETA**	**Addis Ababa, Ethiopia**	**Daily 7 A.M. - 3 P.M. Wednesdays 5 P.M.**
18250	16.43	FTO	St. Assise, France	(P) Phones LSM-LSY mornings
18200	16.48	GAW	Rugby, England	(P) Relays and phones N. Y. irreg.
18190	16.49	JVB	Nazaki, Japan	(P) Phones Java early mornings
18180	16.51	CGA	Drummondville, Que.	(P) Phones GBB mornings
18135	16.54	PMC	Bandoeng, Java	(P) Phones PCK-PCV early mornings
18115	16.56	LSY3	Buenos Aires, Arg.	(E) Phones DFB-FTM-GAA-PPU A. M.; evening broadcasts occasionally
18040	16.63	GAB	Rugby, England	(P) Phones LSM noon
17980	16.69	KQZ	Bolinas, Calif.	(E) Tests and relays to LSY irreg.
17940	16.72	WQB	Rocky Point, N. Y.	(E) Tests with LSY mornings
17920	16.74	WQF	Rocky Point, N. Y.	(P) Phones Ethiopia irregular
17900	16.76	WLL	Rocky Point, N. Y.	(E) Relays to Geneva and Germany mornings
17850	16.81	LSN	Buenos Aires, Arg.	(P) Phones S. A. stations irreg.
17830	16.82	PCV	Kootwijk, Holland	(P) Phones PLE early mornings
17790	**16.86**	**GSG**	**Daventry, England**	**6-8:45 A.M. 9:00 A.M.-12:00 noon**
17780	**16.87**	**W3XAL**	**Bound Brook, N. J.**	**9 A.M., 5 P.M. daily**
17760	**16.89**	**DJE**	**Zeesen, Germany**	**8:30-11:30 A.M.**
17750	16.91	IAC	Piza, Italy	(P) Phones and Tests to ships A.M.
17740	16.91	HSP	Bankok, Siam	(P) Phones DFA-DGH-KAY early mornings
17710	16.94	CJA-3	Drummondville, Que.	(P) Phones Australia and Far East early A. M.
17699	16.95	IAC	Piza, Italy	(P) Phones and tests to ships A.M.
17545	17.10	VWY	Poona, India	(P) Phones GAU-GBC-GBU mornings
17520	17.12	DFB	Nauen, Germany	(P) Phones PPU-YVR-KAY mornings
17480	17.16	VWY	Poona, India	(P) Phones GAU-GBC-GBU daytime
17260	17.37	DAF	Nordenland, Germany	(P) Phones ships mornings
17120	17.52	WOO	Ocean Gate, N. J.	(P) Phones ships daytime
17120	17.52	WOY	Lawrenceville, N. J.	(P) Phones England irreg.
17080	17.56	GBC	Rugby, England	(P) Phones ships daytime
16305	.18.39	PCL	Kootwijk, Holland	(P) Special relays and phones irreg.
16300	18.44	WLK	Lawrenceville, N. J.	(P) Phones England irreg.
16240	18.47	KTO	Manila, P. I.	(P) Phones JVE-KWU evenings
16214	18.50	FZR	Saigon, Indo-China	(P) Phones FTA-FKT early A.M.
16050	18.69	JVC	Nazaki, Japan	(P) Phones Hong Kong early A. M.; Phones JVF-KTO, PLE early A.M.
16030	18.71	KKP	Kankuku, Hawaii	(P) KWU afternoons and evenings
15930	18.83	FYC	Pontoise, France	(P) Phones 9:00 A.M. and irreg.
15880	18.89	FTK	St. Assise, France	(P) FZR-FZS-LSM-PPU-YVR mornings
15860	18.90	JVD	Nazaki, Japan	(P) Phones Shanghai early A.M.
15860	18.90	CEC	Santiago, Chile	(P) Phones OCJ mornings
15810	19.02	LSL	Buenos Aires, Arg.	(P) Phones GAA mornings; PSE-PSF afternoons
15760	19.04	JYT	Kemikawa-Cho, Japan	(E) Tests KKW-KWE-KWU evenings
15740	19.06	JIA	Chureki, Japan	(P) Phones Nazaki early A.M.
15700	19.11	WJS	Hicksville, L. I., N. Y.	(P) Phones Ethiopia irregular
15670	19.15	WAE	Brentwood, N. Y.	(E) Tests afternoons
15660	19.16	JVE	Nazaki, Japan	(P) Phones PLE early A. M.; KTO evenings.
15625	19.20	OCJ	Lima, Peru	(P) Phones CEC daytime
15620	19.21	JVF	Nazaki, Japan	(P) Phones KWO-KWU after 4 P.M.
15595	19.24	DFR	Nauen, Germany	(E) Tests and relays mornings irreg.
15430	19.44	KWE	Bolinas, Calif.	(P) Tests JYK-JYT-PLE evenings
15415	19.46	KWO	Dixon, Calif.	(P) Phones JVF evenings
15410	**19.47**	**Prado**	**Riobamba, Ecuador**	**5:00-7:00 P.M. Sunday**
15370	**19.52**	**HAS3**	**Budapest, Hungary**	**Sunday 8-9 A.M.**

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KC	Meters	Call	Location	Time
15355	19.54	KWU	Dixon, Calif.	(P) Phones Japan, Manila and Java evenings
15330	19.56	W2XAD	Schenectady, N. Y.	2-3 P.M. Weekdays-Sunday 10:30 A.M.-4 P.M.
15280	19.63	DJQ	Zeesen, Germany	12:30-2:15 A.M.
15270	19.64	W2XE	Wayne, N. J.	11 A.M.-6 P.M.
15260	19.66	GSI	Daventry, England	12:15 P.M.-4:30 P.M.
15252	19.67	RIM	Tashkent, U.S.S.R.	(P) Phones RKI early mornings
15243	19.68		Pontoise, France	7-11 A.M.
15220	19.71	PCJ	Eindhoven, Holland	Sunday 7:30-10:00 A.M. Tues. 3-6 A.M. Wed. 7-11 A.M.
15220	19.71	W8XK	Pittsburgh, Pa.	9 A.M.-7 P.M.
15200	19.74	DJB	Zeesen, Germany	3:45-7:15 A.M. 8:00-11:30 A.M.
15140	19.82	GSF	Daventry, England	6-8:45 A.M. 9 A.M.-12 noon
15121	19.84	HVJ	Vatican City, Vatican	10:30-10:45 A.M.
15055	19.92	WNC	Hialeah, Fla.	(P) Phones daytime
15040	19.95	RKI	Moscow, U.S.S.R.	(P) Phones RIM early A.M.
15040	19.95	HIR	Santo Domingo, R. D.	(P) Phones WNC daytime
14980	20.03	KAY	Manila, P. I.	(P) Phones DFC-DFD-GCJ early A.M.; KWU evenings
14940	20.06	HJB	Bogota, Colombia	(P) Phones WNC-PPU YVQ days
14920	20.11	KQH	Kahuku, Hawaii	(P) Tests irregularly
14845	20.19	OCJ2	Lima, Peru	(P) Phones HJY and others daytime
14800	20.27	WQV	Rocky Point, N. Y.	(E) Tests Europe irreg.
14732	20.51	IQA	Rome, Italy	(P) Phones Japan and Egypt; sends music at times
14710	20.39	IRG	Massawa, Eritrea, Africa	(P) Phones and tests with JVH 5:00 to 7:00 A. M., and sends music
14690	20.42	PSS	Rio de Janerio, Brazil	(P) Phones LSL-WLK-WOK daytime
14653	20.47	GBL	Rugby, England	(P) Phones Nazaki, early A.M.
14620	20.52	EHY	Madrid, Spain	(P) Phones LSM mornings irreg.
14620	20.52	EDM	Madrid, Spain	(P) Phones PPU-PSA-PSE mornings
14600	20.55	JVH	Nazaki, Japan	(E) Phones DFB-GTJ-PCJ-TYB early mornings and B.C. music
14590	20.56	WMN	Lawrenceville, N. J.	(P) Phones England daytime
14550	20.60	HBJ	Geneva, Switzerland	(E) Relays to Riverhead daytime
14530	20.65	LSN	Buenos Aires, Arg.	(P) Phones PSF-WLK-WOK irreg.
14485	20.71	TIR	Cartago, Costa Rica	(P) Phones WNC daytime
14485	20.71	TIU	Cartago, Costa Rica	(P) Phones WNC daytime
14485	20.71	YNA	Managua, Nicaragua	Phones WNC daytime
14485	20.71	HPF	Panama City, Panama	(P) Phones Daytime
14485	20.71	HRM	Tela, Hondura	(P) Phones WNC daytime
14485	20.71	TGF	Guatemala City, Guatemala	(P) Phones WNC daytime
14470	20.73	WMF	Lawrenceville, N. J.	(P) Phones England daytime
14440	20.78	GBW	Rugby, England	(P) Phones Lawrenceville daytime
14410	20.80	DIP	Zeesen, Germany	(E) Experimental; 12-4:30 P. M.
14236	21.07	HB9B	Basle, Switzerland	Monday, Thursday, Friday 4-6 P.M.
14200	21.20	W10XFB	The Schooner "Morrissey"	(E) Irregular
14100	21.25	HJ5ABE	Medillin, Colombia	11:00 A.M.-12 noon daily ex. Sun. 6:00-10:30 P.M.
13900	21.58	WQP	Rocky Point, N. Y.	(E) Test daytime
13820	21.70	SUZ	Cairo, Egypt	(P) Phones DFC-DGU-GBB daytime
13745	21.83	CGA-2	Drummondville, Que.	(P) Phones Europe irregular
13738	21.82	RIS	Tiflis, U.S.S.R.	(P) Tests with Moscow irregular
13690	21.91	KKZ	Bolinas, Calif.	(F) Tests Japan and Java early A.M.; days Honolulu
13667	21.98	HJY	Bogota, Colombia	(P) Phones CEC afternoons
13635	22.00	S.P.W.	Warsaw, Poland	11:30 A.M.-12:15 P.M.
13610	22.04	JYK	Kemikawa-Cho, Japan	(E) Tests irregular A.M.
13585	22.08	GBB	Rugby, England	(P) Phones CGA3-SUV-SUZ daytime
13545	22.15	PFG	Kootwijk, Holland	(P) Tests mornings irregular
13415	22.36	GCJ	Rugby, England	(P) Tests with JVH afternoons
13390	22.40	WMA	Lawrenceville, N. J.	(P) Phones GAS-GBS-GBU-GBW daily
13380	22.42	IDU	Asmara, Eritrea, Africa	(P) Phones Italy; early A. M. and sends music
13345	22.48	YVQ	Maracay, Venezuela	(P) Phones WNC-HJB days
13340	22.49	KBJ	Manila, P. I.	(P) Phones nights and early A.M.
13285	22.58	CGA3	Drummondville, Que.	(P) Phones England days
13180	22.76	DGG	Nauen, Germany	(P) Relays to Riverhead days

KC	Meters	Call	Location	Time
13075	22.95	VPD	Suva, Fiji Islands	Mon. to Sat. 12:30-1:30 A.M.
13000	23.08	FYC	Paris, France	(P) Phones CNR mornings
12985	23.11	DFC	Nauen, Germany	(P) Phones KAY-SUV-SUZ early A. M.
12865	23.32	IAC	Piza, Italy	(P) Phones ships irregular
12840	23.36	WOO	Ocean Gate, N. J.	(P) Phones ships days
12830	23.37	HJC	Barranquilla, Colombia	(P) Phones HJB-HPF-WNC days
12830	23.38	HJA-3	Barranquilla, Colombia	(P) Phones HJB-HPF-WNC days
12825	23.38	CNR	Rabat, Morocco	Sunday 7:30-9:00 A.M.
12825	23.38	CNR	Rabat, Morocco	(P) Phones FYB-TYB-FTA irreg.
12800	23.44	IAC	Píza, Italy	(P) Phones ships and tests Tripoli, irreg.
12780	23.47	GBC	Rugby, England	(P) Phones VWY early A.M.
12396	24.20	CT1GO	Parede, Portugal	Sun. 11:30 A.M.-1 P.M.; 7:15-8:30 P.M. Tues. to Fri. 7:15-8:30 P.M.
12394	24.21	DAF	Nordenland, Germany	(P) Phones ships irreg. mornings
12300	24.39	PLM	Bandoeng, Java	(P) Phones 2ME near 6:30 A.M.
12295	24.40	ZLU	Willmigton, N. Z.	(P) Phones ZLJ early A.M.
12290	24.41	GBU	Rugby, England	(P) Phones Lawrenceville days
12280	24.43	KUV	Manila, P. I.	(P) Phones early A.M.
12250	24.49	TYB	Paris, France	(P) Phones JVH-XGR and ships irreg.
12235	24.52	TFJ	Reykjavik, Iceland	(P) Phones England days
12235	24.52	TFJ	Reykjavik, Iceland	English broadcast each Sunday, 8:40-9: A.M.
12220	24.55	FLJ	Paris, France	(P) Phones ships irreg.
12215	24.56	TYA	Paris, France	(P) Algeria, days—"Inverted Speech"
12060	24.88	PDV	Kootwijk, Holland	(P) PLE - PLV - PMC early mornings
12035	24.93	HBO	Geneva, Switzerland	(E) Relays programs & phones irreg.
12020	24.95	VIY	Rockbank, Australia	(P) Tests CJA6 early A.M. and evenings
12100	24.79	CJA6	Drummondville, Que.	(P) Tests VIY early A.M. and evenings
12000	25.00	RNE	Moscow, U.S.S.R	Sunday 6-7 A.M. 10-11 A.M. 4-6 P.M. Monday 4-6 P.M. Wednesday 6-7 A.M. 4-6 P.M. Friday 4-6 P.M.
11991	25.02	FZS	Saigon. Indo-China	(P) Phones FTA-FTK early A.M.
11955	25.01	ETA	Addis Ababa, Ethiopia	Irregular
11950	25.11	KKQ	Bolinas Calif.	(P) Relays programs to Hawaii eve.
11940	25.13	FTA	St. Assise, France	(P) Phones FZS-FZR early A.M.
11935	25.14	YNA	Managua Nicaragua	(P) Cent. and S. A. stations, days
11885	25.23		Pontoise, France	11:15 A.M.-2:15 P.M. 3-6 P.M.
11870	25.26	W8XK	Pittsburgh, Pa.	5-9 P.M.
11860	25.29	GSE	Daventry, England	9 A.M.-12 noon
11830	25.36	W2XE	Wayne, N. J.	6-8 P.M.
11811	25.40	2RO	Rome, Italy	8:15-9 A.M. 9:15-10:15 A.M. 12 noon-1 P.M.-1:45-5 P.M.
11800	25.42	CO9WR	Sancti-Spiritus, Cuba	4-6 P.M. 9-11 P.M.
11790	25.43	W1XAL	Boston, Mass.	Tues. and Thurs. 6-9 P.M. Sunday 5-7 P.M.
11770	2549	DJD	Zeesen, Germany	12 noon-4:30 P.M.
11750	25.53	GSD	Daventry, England	3 A.M.-5:20 A.M. 12:15-4:30 P.M. 10-11.05 P.M.
11730	25.57	PHI	Huizen, Holland	Sat. & Sun. 7:30-10 A.M. Mon. Thurs. Fri. 7:30-9:30 A.M.
11720	25.60	CJRX	Winnipeg, Manitoba	Week days 8:00 P.M.-12 midnight; Sunday 3-10 P.M.
11713	25.62		Pontoise, France	7-10 P.M.-11 P.M.-1 A.M.
11710	25.63	HJ4ABA	Medillin, Colombia	11:30 A.M.-1 P.M. 6:30-10:30 P.M.
11680	25.68	KIO	Kaukuku, Hawaii	(P) Phones Far-East early A.M.
11670	25.71	PPQ	Rio de Janerio, Brazil	(P) Phones WCG-WET-LSX evenings
11660	25.73	JVL	Nazaki, Japan	(P) Phones Taiwan evenings
11570	25.93	HH2T	Port-au-Prince, Haiti	(P) Evenings; irregular
11538	26.00	XGR	Shanghai, China	(P) Tests irregularly
11500	26.09	XAM	Merida, Mexico	(P) Phones XDF-XDM-XDR irreg.
11495	26.10	VIZ3	Rockbank, Australia	(P) Tests CJA4 early A.M.
11413	26.28	CJA4	Drummondville, Que.	(P) Phones VIZ3 early A.M.
11385	26.35	HBO	Geneva, Switzerland	(E) Phones and relays irregular
11275	26.61	XAM	Merida, Mexico	(P) Phones XDR-XDM irregular
11000	27.27	ZLT	Wellington, N, Z.	(P) Phones VLZ early mornings
11000	27.27	PLP	Bandoeng, Java	(P) Phones early A.M.; broadcasts 6:30-10 A.M.
11000	27.26	XBJQ	Mexico D. F., Mexico	8:15 P.M.-10:30 P.M.
10975	27.35	OCI	Lima, Peru	(P) Phones CEC-HJY days
10975	27.35	OCP	Lima, Peru	(P) Phones HKB early evenings

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KC	Meters	Call	Location	Time
10910	27.50	KTR	Manila, P. I.	(P) Phones DFC early A.M. irreg.
10850	27.63	DFL	Nauen, Germany	(P) Relays programs afternoons irreg.
10840	27.68	KWV	Dixon, Calif.	(P) Phones Japan, Manila, Hawaii, mornings
10790	27.80	YNA	Managua, Nicaragua	(P) Phones So. America days, irreg.
10770	27.86	GBP	Rugby, England	(P) JYS and XGR irreg.; Phones VLK early A.M. and eve.
10740	27.93	JVM	Nazaki, Japan	4-7:30 A.M. irregular 12-1 A.M. Daily Mon & Thurs. 4-5 P.M.
10675	28.10	WNB	Lawrenceville, N. J.	(P) Phones ZFB daytime
10670	28.12	CEC	Santiago, Chile	(P) Phones HJY-OCI daytime
10670	28.12	CEC	Santiago, Chile	Daily 8-9 P.M.
10660	28.14	JVN	Nazaki, Japan	(P) Phones JIB early A.M.: Relays JOAK irreg.
10660	28.14	JVN	Nazaki, Japan	4-7:30 A.M. irregular
10630	28.22	WED	Rocky Point, N. Y.	(E) Relays program service irregularly
10620	28.25	EHX	Madrid, Spain	(P) Phones CEC and EHZ afternoons
10610	28.28	WEA	Rocky Point, N. Y.	(E) Tests Europe irreg.
10550	28.44	WOK	Lawrenceville, N. J.	(P) Phones LSN-PSF-PSH-PSK evenings
10535	28.48	JIB	Tawian, Japan	(P) Phones JVL-JVN early mornings
10520	28.52	VK2ME	Sydney, Australia	(P) Phones GBP-HVJ early A.M.
10520	28.52	VLK	Sydney, Australia	(P) Phones GBP-HVJ early A.M.
10520	28.52	CFA-4	Drummondville, Que.	(P) Phones: No A. M. days
10440	28.74	DGH	Nauen, Germany	(P) Phones HSG-HSJ-HSP early A.M.
10430	28.80	YBG	Medan, Sumatra	(P) Phones PLV-PLP early A.M.
10420	28.79	XGR	Shanghai, China	(P) Tests GBP-KAY early A.M.
10420	28.79	PDK	Kootwijk, Holland	(P) Phones PLV A.M. and special programs irreg.
10410	28.82	KES	Bolinas, Calif.	(P) Phones S. A. and Far East irreg.
10400	28.85	KEZ	Bolinas, Calif.	(P) Phones Hawaii and Far East irreg.
10390	28.87	KER	Bolinas, Calif.	(P) Phones Far East; early evening
10380	28.90	WCG	Rocky Point, N. Y.	(E) Special program service irreg.
10375	28.92	JVO	Nazaki, Japan	(P) Manchuria and Dairen early A.M.
10370	28.93	EHZ	Madrid, Spain	(P) Phones EHX daytime
10350	28.98	LSX	Buenos Aires, Arg.	Near 10 P.M. irregular. 6-7:15 P.M. daily
10335	29.03	ZFD	Hamilton, Bermuda	(P) Phones afternoons
10330	29.04	ORK	Brussels, Belgium	2:30-4:00 P.M.
10310	29.10	PPM	Rio de Janeiro, Brazil	(P) Tests New York and Buenos Aires evenings.
10300	29.13	LSQ	Buenos Aires, Arg.	(P) Phones GCA-HJY-PSH afternoons
10300	29.13	LSL	Buenos Aires, Arg.	(P) Phones GCA-HJY-PSH afternoons
10290	29.15	DIQ	Zeesen, Germany	(E) Phone and pgm. service irreg.
10290	29.15	DIQ	Zeesen, Germany	Used irregularly.
10290	29.15	HPC	Panama City, Panama	(P) Phones C. A. and S. Am. daytime
10260	29.24	PMN	Bandoeng, Java	(P) Tests VLJ early A. M.; broadcasts 6:30-10 A. M.
10250	29.27	LSK3	Buenos Aires, Arg.	(P) "Inverted Speech" afternoons
10220	29.35	PSH	Rio de Janerio, Brazil	(P) Phones LSL-WOK evenings; special pgm. service irreg.
10170	29.50	RIO	Bakou, U.S.S.R.	(P) Phones RIR-RNE early A.M.
10169	29.50	HSG	Bankok, Siam	(P) Phones DGH early A.M. irreg.
10140	29.59	OPM	Leopoldsville, Belg-Congo	(P) Phones ORK afternoons
10080	29.76	RIR	Tiflis, U.S.S.R.	(P) Phones RIO-RNE early A.M.
10070	29.79	EHY	Madrid, Spain	(P) Phones YVR afternoons
10055	29.84	ZFB	Hamilton, Bermuda	(P) Phones WNB daytime
10055	29.84	SUV	Cairo, Egypt	(P) Phones DFC-DGU-GCA and GCB daytime
10040	29.88	HJA3	Barranquilla, Colombia	(P) Tests early evenings irreg.
9990	30.01	KAZ	Manila, P. I.	(P) Phones JVQ-KWX-PLV early A.M.
9966	30.08	IRS	Rome, Italy	(P) Tests irregularly
9950	30.13	GBU	Rugby, England	(P) Phones WNA evenings
9930	30.21	HKB	Bogota, Colombia	(P) Phones CEC-OCP PSH-PSK afternoons
9930	30.21	HJY	Bogota, Colombia	(P) Phones LSQ afternoons
9890	30.33	LSN3	Buenos Aires, Arg.	(P) Phones WOK-WLK; broadcasts evenings irregular
9870	30.40	WON	Lawrenceville, N. J.	Phones and tests; Eng-irregularly
9870	30.40	JYS	Kenukawa-Cho, Japan	4-7 A.M. irregular
9860	30.43	EAQ	Madrid, Spain	Saturday 12-2 P.M. Daily 5:15 to 9:30 P.M.
9840	30.47	JYS	Kenukawa-Cho, Japan	(E) Tests irregular
9830	30.50	IRM	Rome, Italy	(P) Phones JVP-JZT-LSX-WEL mornings
9810	30.58	DFE	Nauen, Germany	(P) Relays and tests afternoons irreg.
9800	30.59	GCW	Rugby, England	(P) Phones Lawrenceville eve. and nights
9800	30.59	LSI	Buenos Aires, Arg.	(P) Relays very irreg.
9760	30.74	VLJ	Sydney, Australia	(P) Phones PLV-ZLT early A.M.
9760	30.74	VLZ	Sydney, Australia	(P) Phones PLV-ZLT early A.M.
9750	30.77	WOF	Lawrenceville, N. J.	(P) Phones GCU irreg.
9710	30.88	GCA	Rugby, England	(P) Phones LSL afternoons
9700	30.93	LQA	Buenos Aires, Arg.	(P) Tests and relays early evening
9635	31.13	2RO	Rome, Italy	Mon. Wed. Fri. 6-9:00 P.M.
9630	31.15	CFA5	Drummondville, Que.	(P) Phones: No A. M. days
9620	31.17	DGU	Nauen, Germany	(P) Phones SUV A.M. Tests and relays irreg.
9620	31.17	FZR	Saigon, Indo-China	(P) Phones Paris early A.M.
9600	31.25	CT1AA	Lisbon, Portugal	Tues. Thurs. Sat. 4:30-7 P.M.
9595	31.27	HBL	Geneva, Switzerland	Saturday 5:30-6:15 P.M. First Monday each month 4-6 P.M.
9590	31.28	W3XAU	Philadelphia, Pa.	12-8 P.M.
9590	31.28	VK2ME	Sydney, Australia	Sundays { 1 A.M.-3 A.M. 5:00-9.00 A.M. 9:00-11:00 A.M.
9590	31.28	HP5J	Panama City, Panama	11:30 A.M.-1 P.M. 7:30-10 P.M.
9580	31.31	GSC	Daventry, England	4:00-5:45 P.M. 6:00-8:20 P.M. 10-11:05 P.M.
9580	31.31	VK3LR	Melbourne, Australia	Mon. Tues. Wed. Thurs. 3:15-7:30 A.M. Fri. 10:30 P.M.-2 A.M. Sat. 5-7:30 A.M.
9570	31.34	LKJ1	Jeloy, Norway	5-8 A.M. 10 A.M.-6 P.M.
9570	31.33	WIXK	Boston, Mass.	Week days 7 A.M.-12 midnight Sunday 9 A.M.-12 midnight
9565	31.36	VUY VUB	Bombay, India	11:30 A.M.-12:30 P.M. Wed. & Sat. Sunday 7:30-8:30 A.M.
9560	31.38	DJA	Zeesen, Germany	12:30-2:15 A.M. 8-11:30 A.M. 5:05-9:15 P.M.
9545	31.43	CEC	Santiago, Chile	8-9 P.M. Daily
9540	31.45	DJN	Zeesen, Germany	12:30-2:15 A.M. 3:45-7:15 A.M. 5:05-10:45 P.M.
9530	31.48	W2XAF	Schenectady, N. Y.	Mon. to Fri. 4 P.M.-12 A.M. Sat. 1 P.M.-12 A. M. Sun. 4:15 P.M.-12 A.M.
9510	31.55	GSB	Daventry, England	3-5:20 A.M. 9 A.M.-12 noon 12:15-4:30 P.M. 4:45-5:45 P.M. 6-8:20 P.M.
9510	31.55	VK3ME	Melbourne, Australia	Wed. to Sat. Inc. 5-7 A.M.
9501	31.56	PRF5	Rio De Janeiro, Brazil	4:45-5:45 P.M. daily 9-10:45 P.M. irreg.
9480	31.65	PLW	Bandoeng, Java	(P) Phones Australia early A.M.
94.80	31.65	KET	Bolinas, Calif.	(P) Phones WEL evenings & nights
9470	31.68	WET	Rocky Point, N. Y.	(E) Tests LSX-PPM-ZFD evenings
9460	31.71	ICK	Tripoli, Africa	(P) Phones Italy mornings.
9430	31.80	YVR	Maracay, Venezuela	(P) Tests mornings
9428	31.81	COCH	Havana, Cuba	10 A.M.-12 noon. 4:00-6:30 P.M. 8:00-10:00 P.M.
9415	31.86	PLV	Bandoeng, Java	(P) Phones PCV-PCK-PDK-VLZ-KWX and KWV early mornings
9400	31.92	XDR	Mexico City, Mexico	(P) Phones XAM irreg. days
9330	32.15	CGA4	Drummondville, Que.	(P) Phones GCB-GDB-GBB afternoons
9280	32.33	GCB	Rugby, England	(P) Phones Canada afternoons
9180	32.68	ZSR	Kliphewvel, S. Africa	((P) Phones Rugby afternoons seasonally
9170	32.72	WNA	Lawrenceville, N. J.	(P) Phones GBS-GCU-GCS afternoons
9147	32.79	YVR	Maracay, Venezuela	(P) Phones EHY afternoons
9120	32.88	HAT4	Budapest, Hungary	6:00-7:00 P.M. Sundays
9110	32.93	KUW	Manila, P. I.	(P) Tests and phones early A.M.
9091	33.00	CGA-5	Drummondville, Que.	(P) Phones Europe days
9020	33.26	GCS	Rugby, England	(P) Phones Lawrenceville afternoons
9010	33.30	KEJ	Bolinas, Calif.	(P) Relays programs to Hawaii eve.

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KC	Meters	Call	Location	Time
8975	33.42	CJA5	Drummondville, Que.	(P) Phones Australia nights and early A. M.
8975	33.43	VWY	Poona, Ind.	(P) Phones GBC-GBU mornings
8950	33.52	WEL	Rocky Point, N. Y.	(E) Tests with Europe irreg.
8950	33.52	W2XBJ	Rocky Point, N. Y.	(E) Tests irregularly
8930	33.59	WEC	Rocky Point, N. Y.	(P) Phones Ethiopia irregular
8900	33.71	ZLS	Wellington, N. Z.	(P) Phones VLZ early mornings
8830	33.98	LSD	Buenos Aires, Arg.	(P) Relays to N. Y early evenings
8790	34.13	HKV	Bogota, Colombia	(E) Tests early evenings and nights
8790	34.13	TIR	Cartago, Costa Rica	(P) Phones Central America daytime
8790	34.13	HKV	Bogota, Colombia	6:00-11:00 P.M. irregular
8775	34.19	PNI	Makasser, D. E. I.	(P) Phones PLV early mornings
8760	34.35	GCQ	Rugby, England	(P) Phones ZSR afternoons
8750	34.29	ZBW	Hong Kong, China	Sun. Tues. Wed. Fri. Sat. 5:30-8:30 A.M. Mon. Thurs. 5:30-7:30 A.M. 8-9 P.M.
8740	34.35	WXV	Fairbanks, Alaska	(P) Phones WXH nights
8730	34.36	GCI	Rugby, England	(P) Phones VWY afternoons
8680	34.56	GBC	Rugby, England	(P) Phones ships and New York daily
8665	34.62	CO9JQ	Camagney, Cuba	11:30 A.M.-12:30 P.M. 8:00-9:00 P.M.
8650	34.68	WVD	Seattle, Wash.	(P) Tests irregularly
8590	34.92	YNDA	Managua, Nicaragua	8-10 P.M. Daily
8560	35.05	WOO	Ocean Gate, N. J.	(P) Phones ships daytime
8470	35.39	DAF	Nordenland, Germany	(P) Phones ships irregularly
8400	35.71	HC2AT	Guayaquil, Ecuador	8:00-11:00 P.M. ex. Sunday
8400	35.71	HC2CW	Guayaquil, Ecuador	8-11 P.M. ex. Sunday
8380	35.80	IAC	Piza, Italy	(P) Phones ships irregularly
8214	36.50	HCJB	Quito, Ecuador	12:30-2:15 P.M. 7:15-11:15 P.M. daily ex. Monday
8185	36.65	PSK	Rio de Janerio, Brazil	(P) Phones LSL-WOK evenings and special programs
8140	36.86	LSC	Buenos Aires, Arg.	(P) Tests evenings and nights irreg.
8120	36.95	KTP	Manila, P. I.	(P) Phones KWX-KWV-PLV-JVQ mornings
8110	37.00	ZP10	Ascunsion, Paraquay	8:00-10:00 P.M.
8035	37.33	CNR	Rabat, Morocco	Sunday 2:00-5:00 P.M.
7970	37.64	XGL	Shanghai, China	(P) Tests early mornings
7968	37.65	HSJ	Bankok, Siam	(P) Tests and phones early A.M.
7960	37.69	VLZ	Sydney, Australia	(P) Phones ZLT early A.M.
7920	37.88	GCP	Rugby, England	(P) Phones VLK irreg.
7900	37.97	LSL	Buenos Aires, Arg.	(P) Phones PSK-PSH evenings
7890	38.02	CJA-2	Drummondville, Que.	(P) Phones Australia nights
7880	38.05	JYR	Kemikawa-Cho, Japan	(E) Tests and relays irregularly
7860	38.17	SUX	Cairo, Egypt	(P) Phones GCB afternoons
7855	38.19	LQP	Buenos Aires, Arg.	(P) Tests evening irreg.
7797	38.47	HBP	Geneva, Switzerland	5:30-6:15 P.M. Saturdays First Monday each month 6-7 P.M.
7790	38.49	YNA	Managua, Nicaragua	(P) Phones Cent. & So. America daytime
7790	38.49	HC2JSB	Guayaquil, Ecuador	9:15 A.M.-2:15 P.M. 7:15-11:15 P.M.
7780	38.56	PSZ	Rio de Janerio, Brazil	(P) Tests LSX early evenings
7765	38.63	PDM	Kootwijk, Holland	(P) Special relays to Dutch Indies
7715	38.89	KEE	Bolinas, Calif.	(P) Relays programs to Hawaii seasonally
7669	39.11	TGF	Guatemala City, Guatemala	(P) Phones TIU-HPF daytime
7626	39.31	RIM	Tashkent, U.S.S.R.	(P) Phones RKI early mornings
7620	39.37	ETA	Addis Ababa, Ethiopia	Irregular
7610	39.42	KWX	Dixon, Calif.	(P) Phones KKH nights; KAZ-KTP-PLV-JVT-JVM mornings
7590	39.53	TIRFF	Punta Arenas, Costa Rica	9-10 P.M. ex. Sunday
7565	39.66	KWY	Dixon, Calif.	(P) Phones Shanghai, early mornings
7520	39.89	KKH	Kanhuku, Hawaii	(P) Tests KEE evenings; Phones KWX-KWV nights
7518	39.90	RKI	Moscow, U.S.S.R.	(P) Phones RIM early mornings
7510	39.95	JVP	Nazaki, Japan	Tests Point Reyes early A. M.; broadcasts Monday and Thursdays, 4-5 P. M.
7500	40.00	CFA-6	Drummondville, Que.	(P) Phones: no A. M. days
7470	40.16	JVQ	Nazaki, Japan	(P) Relays and phones early A.M.; broadcasts Monday and Thursday, 4-5 P.M.
7470	40.16	HJP	Bogota, Colombia	(P) Phones HJA3-YVQ early evenings
7445	40.30	HBQ	Geneva, Switzerland	(E) Relays Special B.C evenings irreg.
7430	40.38	ZLR	Wellington, N. Z.	(P) Phones VLJ early mornings
7400	40.54	WEM	Rocky Point, N. Y.	(E) Special relays evenings.
7400	40.50	HJ3ABD	Bogota, Colombia	12 noon-2 P.M. 8:00-11:00 P.M.
7385	40.62	OEK	Wein, Austria	(P) Tests early evenings very irreg.
7380	40.65	XECR	Mexico City, Mexico	Sundays 6-7 P.M. Occasionally later
7370	40.71	KEQ	Kankuku, Hawaii	(P) Relays programs evenings
7282	41.20	HJ1ABD	Cartagena, Colombia	11:15 A.M.-1:15 P.M. Sunday. Weekdays 7:15-9:15 P.M.
7210	41.60	EA8AB	Santa Cruz, Canary Is.	5-7:30 P.M. irregular
7177	41.80	CR6AA	Labito, Angela, Africa	2:30-4:30 P.M. Wed. & Sat.
7118	42.13	HB9B	Basle, Switzerland	Mon., Thurs., Fri. 4-6 P.M.
7100	42.25	HKE	Bogota, Colombia	Monday 6-7 P.M. Tues. and Friday 8-9 P.M.
7080	42.37	PIIJ	Dordrecht, Holland	Saturday 10:10-11:10 A.M.
7080	42.37	VP3MR	Georgetown, Br. Guiana	Sun 7:45-10:15 A.M. Mon 3:45-4:45 P.M. 6:45-7:45 P.M. Wed. Thurs. Sat. 5-7:45 P.M.
7074	42.48	HJ1ABK	Barranquilla, Columbia	3-6 P.M. Sunday
6990	42.92	JVS	Nazaki, Japan	(P) Phones China mornings early
6935	43.25	WEB	Rocky Point, N. Y.	(E) Relays programs evenings
6905	43.45	GDS	Rugby, England	(P) Phones WOA-WNA-WCN evenings
6900	43.48	HI3C	LaRomana, R. D.	Daily 12-2 P.M. 5-9 P.M. Sat. 12 Midnight-2 A.M.
6895	43.51	HCETC	Quito, Ecuador	8:15-10:30 P.M. ex Sunday
6880	43.60	CGA-7	Drummondville, Que.	(P) Phones Europe days
6860	43.73	KEL	Bolinas, Calif.	(P) Tests KAZ-PLV early A.M.
6840	43.86	KEN	Bolinas, Calif.	(P) Used irregularly
6830	43.92	CFA	Drummondville, Que.	(P) Phones: No A. M. nights
6796	44.15	HIH	San Pedro de Macoris, R.D.	Sunday 3-4 A.M. 12:30-3 P.M. 4-5 P.M. Week days 12:15-2 P.M. 7-8:30 P.M.
6760	44.38	CJA-6	Drummondville, Que.	(P) Phones Australia early A. M.
6755	44.41	WOA	Lawrenceville, N. J.	(P) Phones GDW-GDS-GCS evenings
6750	44.44	JVT	Nazaki, Japan	(P) Phones JOAK irregular; Phones Point Reyes at times
6750	44.44	JVT	Nazaki, Japan	2:00-8:00 A.M. irregular
6740	44.51	WEJ	Rocky Point, N. Y.	(E) Commercial program service evenings
6733	44.53	WDA	Rocky Point, N. Y.	(E) Tests evenings irreg.
6725	44.60	WQO	Rocky Point, N. Y.	(E) Tests evenings irreg
6720	44.96	YVQ	Maracay, Venezuela	8:00-9:00 P.M. Saturdays
6701	44.71	TIEP	San Jose, Costa Rica	7:00-10:00 P.M. daily
6690	44.84	CGA-6	Drummondville, Que.	(P) Phones Europe irregularly
6680	44.91	DGK	Nauen, Germany	(P) Relays to Riverhead evenings irreg.
6720	44.96	YVQ	Maracay, Venezuela	(P) Phones and relays N. Y. evenings
6650	45.11	IAC	Piza, Italy	(P) Phones ships irregularly
6635	45.00	HC2RL	Guayaquil, Ecuador	5:45-7:45 P.M. Sunday, 9:15-11:15 P.M. Tuesday
6620	45.31	Prado	Riobamba, Ecuador	Thursday 9:00-11:15 P.M.
6610	45.38	REN	Moscow, U.S.S.R.	1:00-5:00 P.M. irregular
6590	45.50	HI4D	Santo Domingo, R.D.	12:15-2:00 P.M. 5:00-8:00 P.M. except Sunday
6550	45.81	TIRCC	San Jose, Costa Rica	Daily 11 A.M.-2 P.M. 6-7 P.M. Thursday 7-10 or 11 P.M. Sunday 11 A. M.-1 P.M. 8-10 P.M.
6520	46.01	YV6RV	Valencia, Venezuela	11:30 A.M.-12:30 P.M. 5:30-10:00 P.M. except Sunday
6503	46.10	HIL	Santo Domingo, R.D.	Mon. to Sat. inc. 12:15-1:45 P.M. Sat. 7:45-9:45 P.M.
6490	46.30	HJ5ABD	Cali, Colombia	7:00-10:00 P.M. ex. Sunday
6460	46.44	HJ1ABB	Ibague, Colombia	7-10 P.M. ex. Sunday
6447	46.51	HJ1ABB	Barranquilla, Colombia	11:45 A.M.-1:00 P.M. 5:30-10:00 P.M. ex. Sunday
6425	46.69	VE9AS	Fredericton, N.B.	Occasional broadcasts — not regular
6425	46.69	W9XBS	Chicago, Ill.	Not regular. Usually Tuesday and Thursday 1:00-5:00 P.M.
6420	46.70	W3XL	Bound Brook, N. J.	No regular schedule maintained
6415	46.77	HJA3	Barranquilla, Colombia	(P) Phones HJA2 evenings
6400	46.88	YN1GG	Managua, Nicaragua	Daily 1:00-2:30 P.M. 7:00-10:00 P.M.
6385	46.99	TIPG	San Jose, Costa Rica	8:30-11:00 P.M.
6375	47.10	YV4RC	Caracas, Venezuela	4:30-10:30 P.M.
6350	47.39	JZG	Nazaki, Japan	5:00-7:00 A.M. irregular
6315	47.50	HIZ	Santo Domingo, R.D.	Daily 11:30 A.M.-1:30 P. M. 5:30 P.M.-8:00 P.M.
6235	48.10	OCM	Lima, Peru	(P) Phones afternoons

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IMPROVED S. W. SET

(Continued from page 110)

The ganged tuning condenser, C-I, C-2, is mounted on an aluminum panel, as shown. This measures 4″ high by 3″ wide and is bent from a piece 4½″ by 3″ leaving a ½″ by 3″ mounting area at the bottom. The mounting hole for the condenser is centrally located at a height of 3¼″, which, of course, is determined by the height of the dial. This panel should be rigidly mounted if backlash effects are to be eliminated. In this design three screws were employed and backlash effects were barely noticeable at the highest frequencies. Consequently, it is recommended that at least *five* screws be employed, and if possible bracing angles as well. Obviously the aluminum should not be lighter than 14 gauge.

The Wiring

The location and mounting of the remaining parts are entirely as indicated and require no further comment. In wiring the receiver, the resistors and fixed condensers are mounted directly by their pigtails. When wiring the dry electrolytic condenser, C-II, it is necessary to observe the polarity. The proper procedure is to connect the positive terminal to the cathode.

In order to minimize hum, the grid condenser and leak, C-7, R-3, are mounted inside of the detector tube shield. For this reason they should be of small size and the sides and top of the cap lined with light cardboard to prevent unintentional grounds. Also in the interests of a low hum level it will be found advisable to ground one of the heater lines, preferably at the detector tube.

Operation

To put the receiver in operation, insert the tubes and one set of coils and make the various external connections to the power supply, antenna, and phones. If a doublet type of antenna is available, connect it as indicated in the schematic diagram; if one is not available forget about it and connect the lead-in to one of the antenna posts and ground the other by connecting it to the ground binding post.

As stated before, the condenser C-3 should be all-in or nearly so and the regeneration control advanced until the detector tube goes into oscillation as evidenced by a gentle hiss.

When employing the two smallest sets of coils the dial should be alive with signals and no difficulty should be experienced in finding a broadcast carrier. When receiving modulated signals, the regeneration control should, of course, be backed down slightly until the circuit is just on the verge of oscillation.

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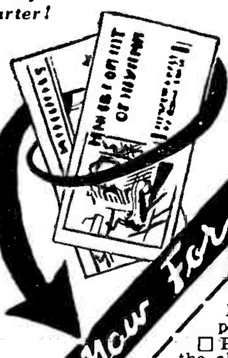

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KC	*Meters*	*Call*	*Location*	*Time*
6235	43.00	OAX4G	Lima, Peru	7-10 P.M. Daily
6198	48.40	CT1GO	Parede, Portugal	Sunday 11:30-1:00 P.M. 7:15-8:30 P.M. Tues. to Fri. inc. 7:15-8:30 P.M.
6185	48.50	HI1A	Santiago de Caballeros, R.D.	11:45 A.M.-1:45 P.M. 7:45-9:45 P.M. ex Sunday
6170	48.62	HJ3ABF	Bogota, Colombia	6:00-11:00 P.M. ex. Sunday
6165	48.66	YV3RC	Caracas, Venezuela	10:30 A.M.-1:30 P.M. 4:30-10:00 P.M. except Sunday
6150	48.78	HJ5ABC	Cali, Colombia	Daily 11:00 AM.-12 noon; 7:00 P.M.-10:00 P.M. Sunday 12-2 P.M.
6150	48.78	HJ2ABA	Tunja, Colombia	1:00-2:00 P.M. & 7:00-10:00 P.M.
6150	48.78	CJRO	Winnipeg, Manitoba	Weekdays 7:30 P.M.-12 noon. Sundays 3:00-10:00 P.M.
6150	48.78	CO9GC	Santiago, Cuba	12:00 A.M. Sat.-2:00 A.M. Sunday. Friday 7:30 A.M.-11 P.M.
6150	48.78	CSL	Lisbon, Portugal	7:30-8:30 A.M. 2:30-7:00 P.M.
6140	48.86	W8XK	Pittsburgh, Pa.	9:00 P.M.-1:00 AM. daily
6130	48.92	ZGE	Kuala Lampur, S.S.	Sun. Tues. Fri. 6:40-8:40 A.M.
6130	48.92	COCD	Havana, Cuba	Sunday 11 A.M.-2:00 P. M. 7:00-10 P.M. Weekdays 11:30 A.M. to 11 P.M.
6130	48.92	LKJ1	Jeloy, Norway	10:00 A.M.-6:00 P.M. daily
6120	49.02	XEFT	Vera Cruz, Mexico	Mon. to Fri. 11 A.M.-4 P.M. 7:30 P.M.-12 Midnight. Sat. 11 A.M.-4 P. M. 6:30 P.M.-12 Midnight. Sun. 11 A.M.-4 P.M. 9 P.M.-Midnight
6120	49.02	W2XE	Wayne, N. J.	7:00-10:00 P.M. daily
6120	49.02	YDA	Bandoeng, Java	5:30-11:00 P.M. 5:45-6:45 P.M. 10:30 P.M.-1 A.M.
6115	49.06	HJ1ABE	Cartagena, Colombia	Daily 11 A.M.-12:30 P.M. 4-5 P.M. Monday 7-9:30 P.M. 10:30-11:30 P.M. Tues. to Fri. 7-9:30 P.M. Sat. 6-8 P.M. Sunday 9 A.M.-2 P.M.
6110	49.10	HJ4ABB	Manizales, Colombia	11:00 A.M.-1:00 P.M. 5:00-8:00 P.M.
6110	49.10	VUC	Calcutta, India	Mon. 8-9 A.M. Wed. 10:30-11:30 A.M.
6110	49.10	VE9HX	Halifax, Nova Scotia	11:30 A.M.-2:00 P.M. 6:00 P.M.-1 A.M.
6110	49.10	GSL	Daventry, England	12:15-4:30 P.M. 6-8:20 P.M. 10-11:05 P.M.
6100	49.18	W9XF	Chicago, Illinois	Daily 12:00 M-1:00 A.M. Tues. Thurs. Fri. Sun. 8:00-9:00 P.M.
6100	49.18	W3XAL	Bound Brook, N. J.	Mon. Wed. Sat. 4:00 P.M.-12:00 A.M.
6095	49.22	CRCX	Bowmansville, Ont.	Sun. 12 noon-12 A.M. Mon. to Sat. 6 P.M.-12 A.M.
6090	49.26	VE9BJ	St. John, N.B.	5:00-11:00 P.M.
6090	49.26	ZTJ	Johannesburg, S. Africa	11:45 P.M.-12:30 A.M. 3:30-7:00 A.M. 9 A.M.-4:45 P.M.
6080	49.34	W9XAA	Chicago, Ill.	Daily 11 A.M.-9 P.M.
6080	49.34	ZHJ	Penang, S.S.	6:40-8:40 A.M.
6080	49.34	HJ4ABC	Pereira, Colombia	9:30-11 A.M. 7-9 P.M. ex. Sun.
6080	49.34	CP5	LaPaz, Bolivia	8:00-9:00 P.M. daily
6070	49.42	VE9CS	Vancouver, B.C.	6:00-7:00 P.M. Sunday. 1:45 P.M.-1:00 A.M.
6070	49.42	HH2S	Port-Au-Prince, Haiti	Evenings—irregular
6070	49.42	OER2	Vienna, Austria	9:00 A.M.-5:00 P.M. Saturdays until 6:00 P.M.
6070	49.42	HJN	Bogota, Colombia	8:00-10:45 P.M.
6065	49.45	HJ4ABL	Manizales, Colombia	11:00 A.M-12 noon Sat. to 5:30. 7:30 P.M.-10:30 P.M.
6060	49.50	W8XAL	Cincinnati, Ohio	Sun. 7 A.M.-8 P.M. 11 P.M.-1:30 A.M. Week days 6:30 A.M.-8 P.M. 11 P.M.-2:00 A.M.
6060	49.50	HJ4ABD	Medillin, Colombia	6-11 P.M. ex. Sun.
6060	49.50	W3XAU	Philadelphia, Pa.	8-11 P.M.
6060	49.50	VQ7LO	Nairobi, Kenya Colony, Africa	5:45-6:15 A.M. 11 A.M.-2 P.M.
6060	49.50	OXY	Skamleback, Denmark	1-6:30 P.M. Sunday 11 A.M.-6:30 P.M.
6050	49.59	GSA	Daventry, England	4-5:45 P.M. 6-8:20 P.M.
6043	49.65	HJ1ABG	Barranquilla, Colombia	12 noon-1 P.M. 6-10 P.M.
6040	49.67	PRA8	Pernambuco, Brazil	9:30-11:30 A.M. 2:30-8:30 P.M.
6040	49.67	W4XB	Miami, Florida	Weekdays 12-2 P.M. 5:30 P.M.-12 A.M. Sunday 11:30 A.M.-3 P. M. 5 P.M.-12 A.M.
6040	49.67	W1XAL	Boston, Mass.	Tuesday & Thurs. 6-9:00 P.M. Sundays 5-7:00 P.M.
6030	49.75	HP5B	Panama City, Panama	12 noon-1 P.M. 8-10:30 P.M.
6020	49.83	DJC	Zeesen, Germany	12 noon-4:30 P.M. 5:00-10:45 P.M.
6020	49.83	CQN	Macoa, China	Monday & Friday 3-5:00 A.M.
6020	49.83	XEUW	Vera Cruz, Mexico	10 P.M.-1 A.M. Daily
6012	49.85	HJ3ABH	Bogota, Colombia	11:30 A.M.-2 P.M. 6-11 P.M. Sunday 4-9 P.M.
6011	49.89	HJ1ABC	Quibdo, Colombia	9-11 P.M. ex. Sunday
6010	49.92	ZHI	Singapore, S.S.	Mon. Wed. Thurs. 5:40-8:10 A.M. Sat. 10:40 P.M.-1:10 A.M.
6010	49.92	COCO	Havana, Cuba	Week Days 10:30 A.M.-1:30 P.M. 4 P.M.-7 P. M. Sunday 10:30 A.M.-1:30 P.M. 4-10 P.M.
6006	49.95	HJ1ABJ	Santa Marta, Colombia	11 A.M.-1 P.M. 7-9 P.M.
6005	49.96	VE9DR	Montreal, Que.	Used very irregular
6005	49.96	VE9DN	Montreal, Que.	Used very irregular
6000	50.00	XEBT	Mexico City, Mexico	10 A.M.-12 midnight and later at times
5980	50.17	XEBJ	Mexico City, Mex.	Tues. 10-11 P.M.
5980	50.17	HJ2ABD	Bucaramanga, Colombia	7-10 P.M. ex. Sunday
5980	50.17	HIX	Santo Domingo, R.D.	Mon. to Sat. 11:10 A.M.-12:40 P.M. 4:40-5:40 P.M. Tues. & Fri. also 8:10-10:10 P.M. Sunday 7:40-9:40 A.M.
5980	50.17	XECW	Mexico City, Mexico	4-4:45 P.M. 10-12 M.
5969	50.26	HVJ	Vatican City, Vatican	2-2:15 P.M. Sunday 5-5:30 A.M.
5960	50.30	YNLF	Managua, Nicaragua	6-11 P.M.
5940	50.65	TG2X	Guatemala City, Guatemala	9-11 P.M.
5930	50.60	HJ4ABE	Medillin, Colombia	11 A.M.-12 noon. 6-10:30 P.M.
5900	50.85	HJ2ABC	Cucuta, Colombia	11 A.M.-12 noon. 6:30-9 P.M.
5900	50.85	HCK	Quito, Ecuador	8:00-11:30 P.M.
5880	51.02	YV8RB	Barquisimeto, Venezuela	6-11 P.M.
5875	51.11	HRN	Tegucigalpa, Honduras	6:30-8 P.M. 8:30-10 P.M.
5865	51.15	HI1J	San Pedro de Macoris RD	Daily 12:30-2 P.M. 6:30-9:00 P.M.
5853	51.20	WOB	Lawrenceville, N. J.	(P) Phones ZFA P.M.
5850	51.28	YV5RMO	Maracaibo, Venezuela	11:30 A.M.-1 P.M. 5:30 to 10 P.M.
5845	51.30	KRO	Kaukuku, Hawaii	(P) Tests early mornings
5825	51.50	HJA2	Bogota, Colombia	(P) Phones HJA3 afternoons irreg.
5820	51.50	TIGPH	San Jose, Costa Rica	7-10 P.M.
5800	51.72	KZGF	Manila, P. I.	(P) Tests mornings irregularly
5800	51.72	YV2RC	Caracas, Venezuela	10:30 A.M.-1:30 P.M. 4-10 P.M. Daily
5790	51.81	JVU	Nazaki, Japan	(P) Phones JZC early mornings
5780	51.90	OAX4D	Lima, Peru	9-11:30 P.M. Wed. Sat.
5750	52.17	XAM	Merida, Mexico	(P) Phones XDR-XDF early evenings
5730	52.36	JVV	Nazaki, Japan	(P) Phones JZC early A. M.
5720	52.45	YV1ORCS	Santo Cristobal, Venezuela	8:00-11:00 P.M.
5712	52.54	CFU	Rossland, Canada	(P) Phones CFO and CFN evenings
5670	52.91	DAN	Nordenland, Germany	(P) Phones ships irreg.
5445	55.10	CJA7	Drummondville, Que.	(P) Phones Australia early A. M.
5435	55.20	LSH	Buenos Aires, Arg.	(P) Relays LR4 and tests evenings
5400	55.56	HJA7	Cucuta, Colombia	Phones irregularly; broadcasts music in evening at times
5400	55.56	HJA7	Cucuta, Colombia	Monday 4-8 P.M.
5395	55.61	CFA7	Drummondville, Que.	(P) Phones: No Am.; irregular
5265	57.00	KEC	Bolinas, Calif.	(P) Phones Honolulu irregularly
5170	58.50	PMY	Bandoeng, Java	(E) Phones and relays programs early mornings
5110	58.71	KEG	Bolinas, Calif.	(P) Phones irregularly evenings
5080	59.08	WCN	Lawrenceville, N. J.	(P) Phones GDW evenings seasonally
5025	59.76	ZFA	Hamilton, Bermuda	(P) Phones WOB evenings
4975	60.30	GBC	Rugby, England	(P) Phones ships afternoon and nights
4905	61.16	CGA8	Drummondville, Que.	(P) Phones GDB-GCB afternoons
4820	62.20	GDW	Rugby, England	(P) Phones WCN-WOA evenings
4752	63.13	WOY	Lawrenceville, N. J.	(P) Tests very irregular
4752	63.13	WOO	Ocean Gate, N. J.	(P) Phones ships irreg.
4752	63.13	WOG	Lawrenceville, N. J.	(P) Phones Rugby irregular
4600	65.22	HC2ET	Guayaquil, Ecuador	9:15-10:45 P.M. Wed. and Sat.
4555	65.95	WDN	Rocky Point, N. Y.	(P) Tests Rome and Berlin evenings
4510	66.52	ZFS	Nassau, Bahamas	(P) Phones WND daily; Tests GYD-ZSV irregular
4465	67.19	CFA2	Drummondville, uQe.	(P) Phones: No Am.; irregular days
4348	69.00	CGA9	Drummondville, Que.	(P) Phones ships and Rugby evenings
4320	69.40	GDB	Rugby, England	(P) Phones CGA8 and tests evenings
4295	69.90	WTDV	St. Thomas, Virgin Is.	(E) Weather reports 2-3 P.M.
4295	69.90	WTDW	St. Croix, Virgin Is.	(E) Weather reports 2-3 P.M.
4295	69.90	WTDX	St. John, Virgin Is.	(E) Weather reports 2-3 P.M.
4272	70.20	WOO	Ocean Gate, N. J.	(P) Phones ships afternoons and eve.
4272	70.20	WOY	Lawrenceville, N. J.	(P) Tests evenings
4250	70.65	RV15	Khabarovsk, U.S.S.R.	1:30-9:00 A.M.
3770	79.60	HB9B	Basle, Switzerland	Mon. Thurs. Fri. 4-6 P.M.
3310	90.63	CJA8	Drummondville, Que.	(P) Phones Australia, A.M.
3027	99.10	CFA8	Drummondville, Que.	(P) Phones: No Am.

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THE STRATOSPHERE FLIGHT

(Continued from page 104)

Company. These signals were transferred to the full-talk circuit and fed to the balloon through the three transmitters mentioned above. The replies from Captain Stevens in the balloon were picked up at the NBC broadcast receiving station in Chicago and then transferred by wire to New York City, where they were again automatically relayed to the trans-Atlantic telephone system for transmission to London! This very intricate tie-up of circuits worked perfectly throughout the entire interchange of conversation.

This is an example of the great improvement in pick-up technique in recent years. An event such as this would have required many days preparation only a few years ago, whereas today it was handled as a mere routine matter with only an hour's advance notice.

Signal Intensity

The signal from the balloon had an intensity of 84 microvolts at the Riverhead receiving station of R.C.A. Communications at the take-off. As the day progressed, this intensity was reduced to 14, but at no time did it drop below perfect communication value. The signals during the entire event were recorded at Riverhead.

Notable Triumph

The stratosphere broadcasts were a notable triumph for American radio engineering and graphically illustrated the great progress which has been made in the art during only the past few years.

◆

ROSES AND RAZZBERRIES

(Continued from page 117)

women-folk were preparing food for their men; everywhere through that whole nation the people had been electrified into action—all in the space of a few hours.

And LQE just sent LQE.

We thought that possibly should we camp out by our set, some day in the not too-distant future LQE might send a message. We thought that then radio might catch up with the drums.

◆

DID YOU READ "Radio Heroes" in the first issue of this sheet? All about Rogers and Cole and the rest of the gang? Well, let us tell you, they're old ladies with knitting compared to the radio boys of yesteryear.

In the old days, when the tub smacked up on a reef, do you think we sent out an S O S? Hell, no—we weren't softies—we went down with the ship!

CHANNEL ECHOES

(Continued from page 121)

latter part of Transmission Four and the beginning of Transmission Five—in other words from around 3:00 P.M. to about 8:00 P.M. One of Daventry's 31-meter band stations is usually employed in these transmissions, and seems to be the more reliable (two stations transmit simultaneously) out our way.

These dramatic presentations are admirably conceived and directed. They range high in artistic merit, and the accompanying sound is a revelation in realism. Much of the sound is actually recorded, i.e., the sound of a train is really that of a train—not a combination of drum effects, bells and whistles concocted in the studio.

It is suggested that the interested reader send $1.25—or whatever five shillings happens to be worth at the time—to the British Broadcasting Corporation, Broadcasting House, London, W. I., England, for their weekly program service.

◆

RADIO NEWSPAPER

(Continued from page 105)

ground noise caused by engines and airstream. The Early Bird was built from the ground up for broadcasting. And background is virtually eliminated without special sound-proofing."

Plane Equipment

The complete broadcast station aboard the Early Bird is supplementary Western Electric equipment of WWJ, The Detroit *News* radio station. The ground pick-up was made with a new Philco receiver, which brought in remarkably strong and clear reception.

In his flight, Piersol flashed the ship past the stands at a speed of 220 miles an hour. The same excellent radio reception was continued during this speed dash . . . his voice coming in clearly above the engine noise. He then circled high above the airport and followed the maneuvres required for photographing the field from the air. Spectators witnessed the plane in flight exactly as it covers news events and serves both readers and advertisers of The *News* with a speed and accuracy which is unique among newspapers of the world.

◆

WATCH YOUR STEP

Don't be surprised if some day soon you tune in Mexico, Cuba, Canada, or Puerto Rico only to find you have an American program. The National Broadcasting System has asked permission of the FCC to record such programs and sell them to the countries named.

Lafayette

PROFESSIONAL "9"

Communication Receiver

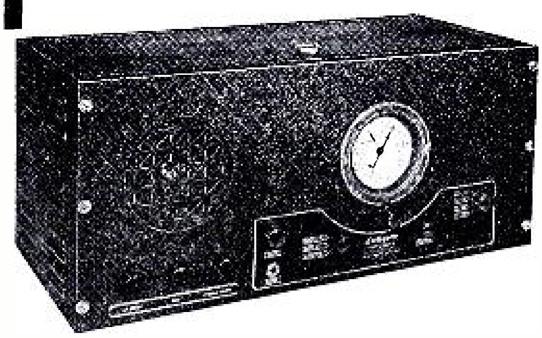
Now every amateur can afford an up-to-the-minute receiver that incorporates every modern feature which contributes to better performance.

The low price of this remarkable receiver is due solely to the fact that the amateur is required to build part of the job himself thus saving labor cost. Yet, despite the fact that Lafayette engineers have designed a precision instrument, it is nevertheless very simple to assemble. This is because the coil switching assembly comes from the factory already wired and tracked.

Five separate wave bands are provided including the 10 meter band. Thus, not only are amateur broadcasts available but also all other short wave broadcasting bands and the American broadcast band.

The Lafayette Professional "9" tube amateur superheterodyne kit comprises all parts including speaker but less tubes and cabinet. For use on 50-60 cycles, 110-125 volts. Complete instructions and diagrams are furnished. Our low price $37.75

For kit of 9 matched tubes, add $4.54; for metal cabinet as illustrated, add $7.50. If wanted completely wired add $7.50.



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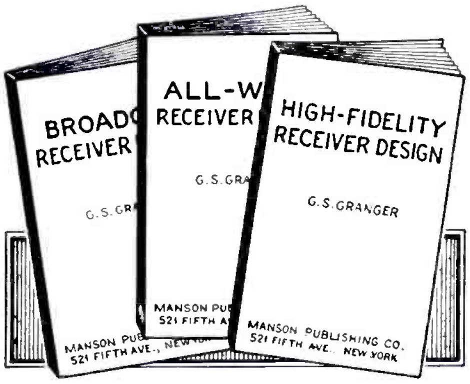

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"THE TOWER"

(Continued from page 115)

by the roar of two 700-horsepower motors, circles the field until it is heading into the wind. Suddenly, two lances of light break from the nose of the plane and reach for the landing lane, which is outlined in red lights. The plane appears to be descending a slide composed of light beams. It settles to the ground, the lights go out, and another trip of 700 or 1000 miles has been made. Happy landing! *William R. Hynes*

◆

BROADCAST—SHORT-WAVE

(Continued from page 113)

more noise in the short-wave bands than in the broadcast band because the electrical waves created by dial telephones, vacuum cleaners, auto ignition systems, etc., have frequencies the same as short-wave stations. Fortunately, much of this sort of noise can be reduced to very low values by the use of the proper type of antenna system.

There is one more contributing factor to the apparent discrepancy in the functioning of an all-wave receiver in the broadcast band and in the short-wave bands. This is amplification.

Amplification

More gain or amplification is obtained from a vacuum tube at long wavelengths than at short wavelengths. In a superheterodyne receiver, the main or intermediate-frequency amplifier functions at a fixed wavelength quite a good deal above the wavelengths comprising the broadcast band. However, pre-amplification of the signal, as well as frequency conversion, must take place before the signal may be fed into the main or intermediate-frequency amplifier. It is in the pre-amplifier and the frequency-conversion circuit where the gain is lost. These circuits *must* be tuned to the wavelength of the signal to be received and as a result as we tune further and further down the scale of wavelengths the amplification in these circuits becomes less and less.

This shortcoming has nothing to do with poor receiver design, though it is true that some manufacturers get more gain from their receivers at the shorter wavelengths than do other manufacturers. Strictly speaking, the shortcoming is due to a natural condition over which we have no control. To sum it up briefly, and in non-technical parlance, the shorter the wavelength (which is the same as saying the higher the frequency) the greater the "leaks" or losses in the pre-amplifier and frequency-conversion circuits. Low-frequency signals will stay pretty well where they are, but high-frequency signals will skip right across the elements of a vacuum tube and find their way to ground through adjacent circuits. They also lead through coils and condensers, across insulation and into the chassis instead of following the normal circuits provided for amplification. The leakage is not so severe that none of the signal is amplified, but it is sufficient to reduce the amount of amplification that could be obtained were the signal of a lower freuency or higher wavelength. Such leakage is so pronounced at wavelengths in the vicinity of 5 and 7.5 meters, that special tubes and circuits must be used to obtain any amplification to speak of.

Conclusion

For all of these difficulties, remarkable results can be obtained on the shorter wavelengths. This is due in part to the excellent design of modern receivers and tubes and to the freak conditions that are almost a rule in the short-wave bands.

◆

AMATEUR STATION W2HFS

(Continued from page 124)

There are separate power-supply units for the Class C final stage, the Class B modulator, the crystal oscillator, doubler and buffer, for the speech amplifier and for the receiver—five units altogether.

The primary circuits are opened and closed by relay action, the relays proper being controlled by a push button on the operating table. Action is sufficiently rapid to permit working break-in, eliminating the interference caused by duplex operation.

The station is operated on 20 meters most of the time, with occasional excursions to 10 and 75 meters. Through the use of a mixer, the re-broadcasting of amateur station signals is made possible. Signals originating in the 5, 10 or 75-meter bands can be relayed into the 20-meter band, or signals originating in the 5, 10, or 20-meter bands can be relayed into the 75-meter band.

Hank has worked four continents on 'phone, and in the summer of this year, in party with C060M in Cuba, and G5NI in England, formed the group known as "The Ocean Hoppers." Hank maintained regular schedules with G5NI, G5ML, G5BJ, G6XQ and G6DL, and this group was in a large measure responsible for instituting contacts between these and other English stations and U. S. stations considerable distances inland. On one occasion a five-country QSO was lined up between stations in the United States, Canada, Cuba, Norway and England.

"The Ear Benders"

The activities of station W2HFS are by no means confined to trans-Atlantic and trans-Pacific contacts. During the active periods of the 20-meter band, Hank keeps in touch with his many amateur friends throughout the United States, Canada, the West Indies and Central America. In the evenings, after the band goes dead, he is occupied with the local group of amateurs in Westchester County known as "The Ear Benders." Composing this "party-line" group are W2AJD, W2AN, W2BBI, W2BFB, W2BTV, W2CFU, W2CMJ, W2FAR, W2HFS, W2ICU (who has a QSL card picturing himself peeking out from behind his transmitter panel . . . W2 I-see-you!), W2OA (another old timer) and W1AYX who, though not in Westchester County, gets in because he's a regular fellow.

The other morning when I dropped in to see Hank, he was working on a Code of Ethics for The Ear Benders. The Code will no doubt be filed away —which was Hank's idea to begin with —and The Ear Benders will continue with their fun—which will be a good thing.

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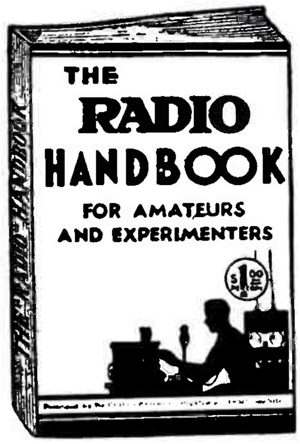

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Gross Radio, Inc., New York, N. Y., says:—
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Received the Super Skyrider today and find it really a masterpiece.

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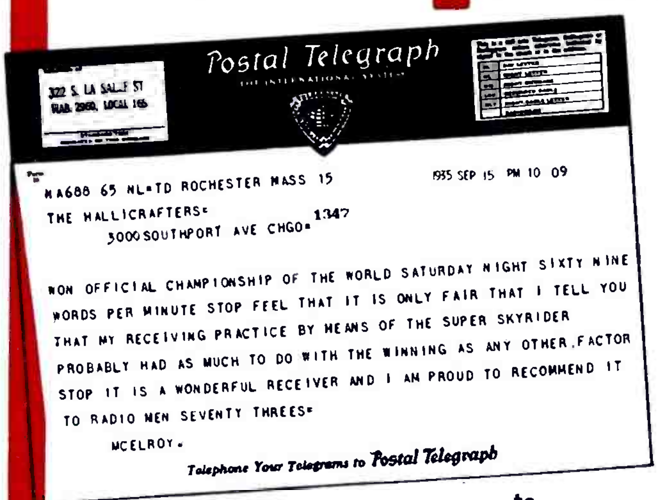

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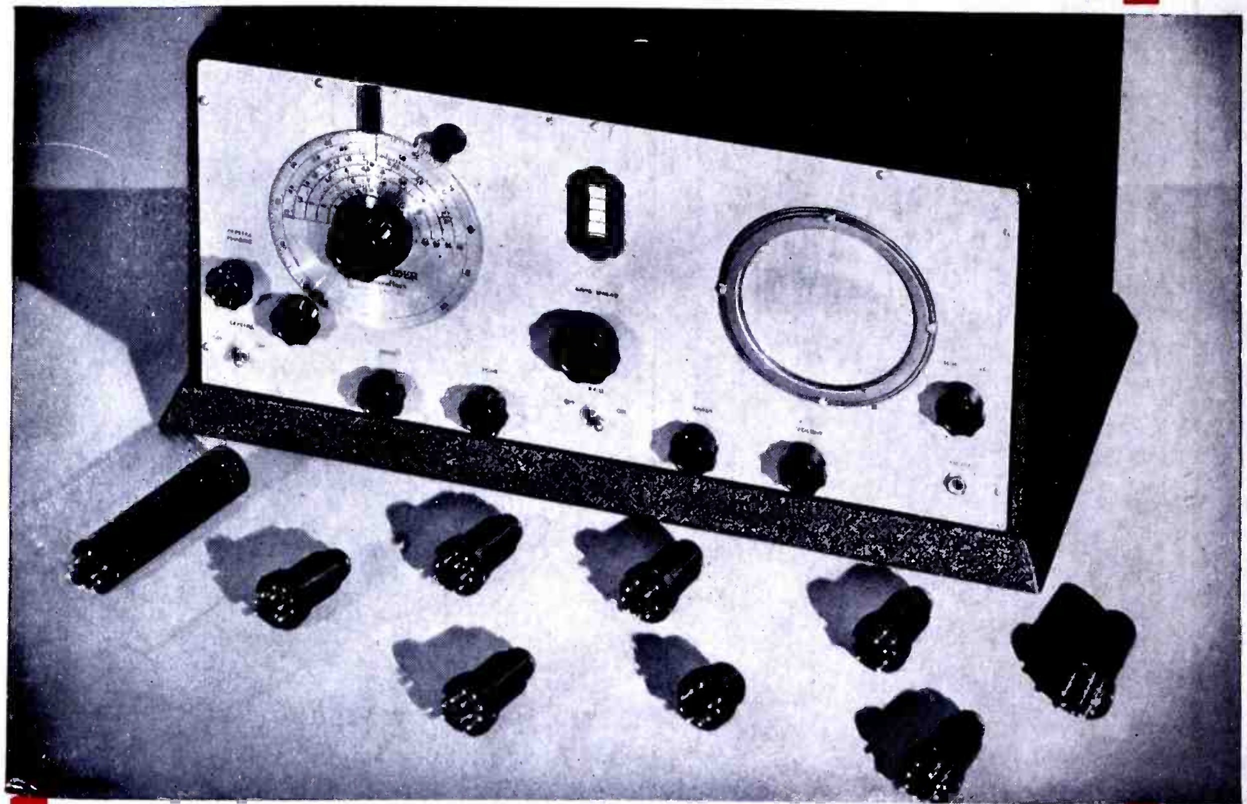
THE HALLICRAFTERS= 1347
3000 SOUTHPORT AVE CHGO=

WON OFFICIAL CHAMPIONSHIP OF THE WORLD SATURDAY NIGHT SIXTY NINE WORDS PER MINUTE STOP FEEL THAT IT IS ONLY FAIR THAT I TELL YOU THAT MY RECEIVING PRACTICE BY MEANS OF THE SUPER SKYRIDER PROBABLY HAD AS MUCH TO DO WITH THE WINNING AS ANY OTHER FACTOR STOP IT IS A WONDERFUL RECEIVER AND I AM PROUD TO RECOMMEND IT TO RADIO MEN SEVENTY THREES=

MCELROY=

Telephone Your Telegrams to Postal Telegraph

to Hallicrafters



We knew the 1936 Super Skyrider was good, but the avalanche of enthusiastic approval has swept us off our feet. From all parts of the country, from dealers who handle all kinds of receivers and from hams who have used them, we've heard a chorus of unqualified praise and congratulations.

No wonder they're enthusiastic. The Super Skyrider has everything. It's sensitive beyond all practical requirements with its Iron Core I. F. system. The new Metal Tubes eliminate all tube shield noises and increase gain. It's convenient with its modern band changing system—no plug-in coils. A controlled Crystal Filter Circuit gives true one-signal selectivity. These are but a few of the exclusive Hallicrafters features that have taken the short-wave crowd by storm. You have to see the Super Skyrider to appreciate them all.

In spite of all its advantages and superlative Hallicrafters engineering, the Super Skyrider is extremely moderate in price. You needn't go broke for two years to get this fine short-wave receiver. See it today.

- ★ 9 Metal Tubes—Dovetail perfectly with our efforts to improve signal to noise ratio—eliminate noisy tube shields—reduced interelectrode capacities and shorter leads afford greater gain.
- ★ More efficient Crystal Filter Circuit, controlled by variable knob on front of set gives one signal selectivity—without reducing sensitivity.
- ★ Iron Core I. F. system—greatly increased sensitivity and a signal to noise ratio unattainable with an air core system.
- ★ Duo-Micro-Vernier Band Spread — provides improved logging accuracy—provides electrical band spreading and micro-vernier tuning in an exclusive and distinctive dial.
- ★ Beat Oscillator with continuous range.
- ★ Modern Band Changing System—any desired bands in the short-wave spectrum with the turn of an exact positive switch—no cumbersome plug-in coils.
- ★ Compact — all completely enclosed in one convenient and efficient cabinet 19¼" x 10".

See your dealer today or write for immediate information

the hallicrafters

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