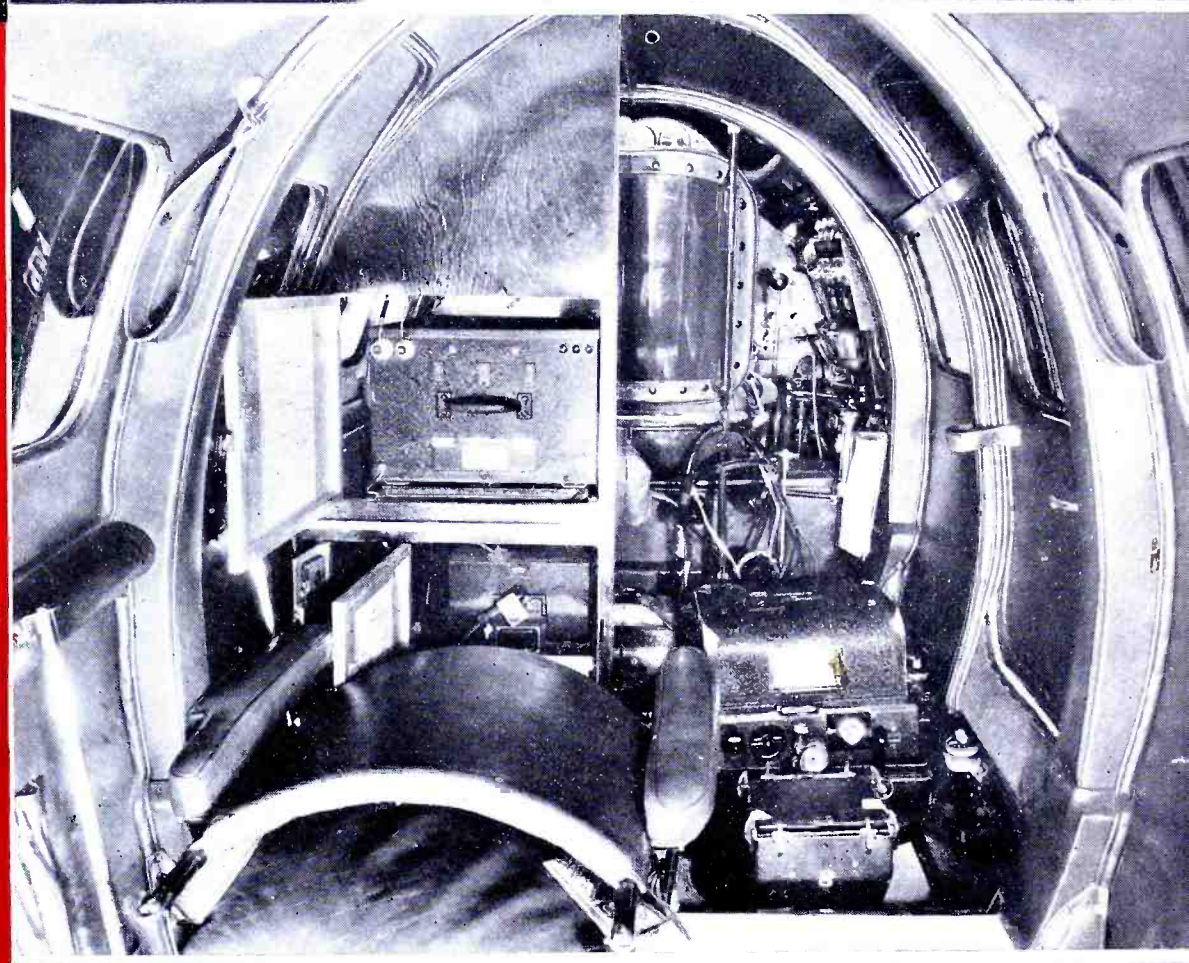
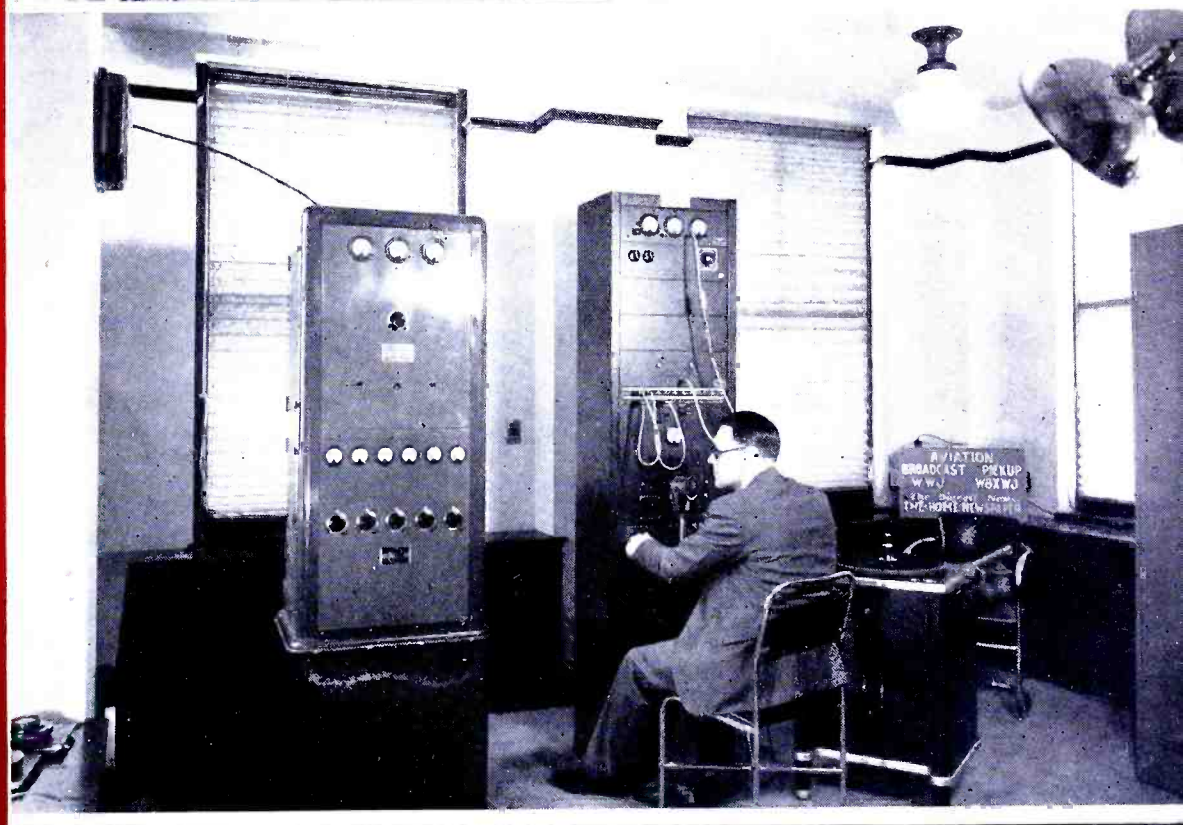
ALL-WAVE RADIO





MAY • 1936

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A necessity for the beginner—equally indispensable for the already licensed amateur. Going after your first ham "ticket"? You need the manual for its instructions on where to apply, how to go about it in the right way—and, most important of all, for the nearly 200 typical license exam questions and answers. Already got a license? The manual is still necessary—for its dope on renewal and modification procedure, the Class A exam (with questions and answers), portable procedure, etc.

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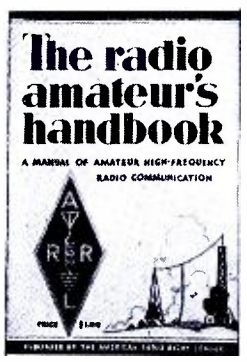

FOR THOSE FAMILIAR WITH THE HANDBOOK

Owners of past editions enthuse over the 1936 edition which is nearly twice as big. This was done in order to expand many chapters to give the subjects the treatment they deserved, and to add chapters on dope heretofore not covered. Attention has been given to the new developments in the ultra-high frequency field. We are positive in declaring it to be the most helpful piece of amateur literature that has ever been created.

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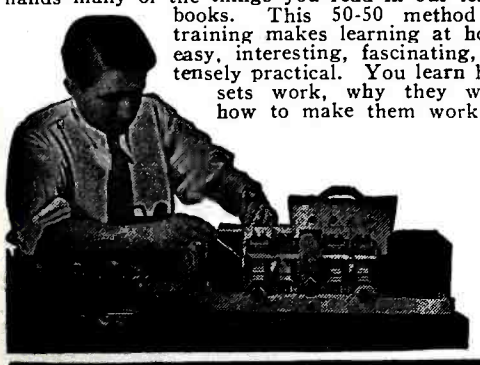

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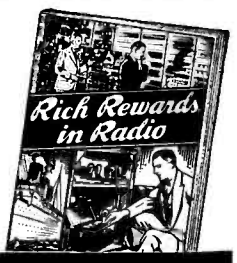

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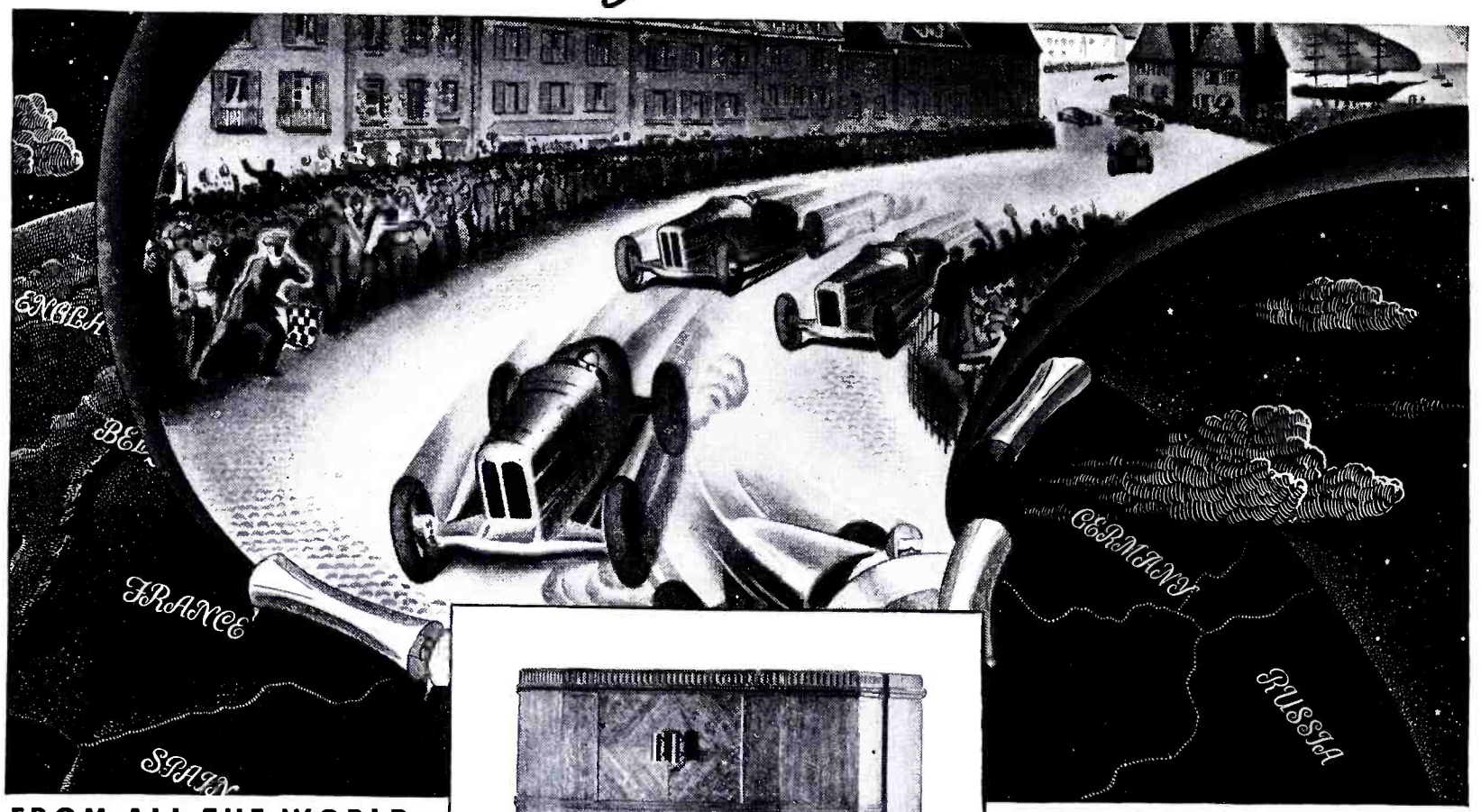

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You hear the throbbing roar of the racers long before you see them. But here they come! One—two—four—ten—twelve! Frenchmen at a madman's pace—roaring toward us down the crooked crowded streets! Skidding around corners, bumping curbs—missing the crowd by inches—brakes screaming, goggles gleaming — madman's marathon! Car out of control! Look out!—he's going to crash!—Wait—he's straightened out again. Shrieking tires—as the mad pack dodge past him with a deafening roar and rush. Mile after mile this flirting with death—thrills, spills, chills!

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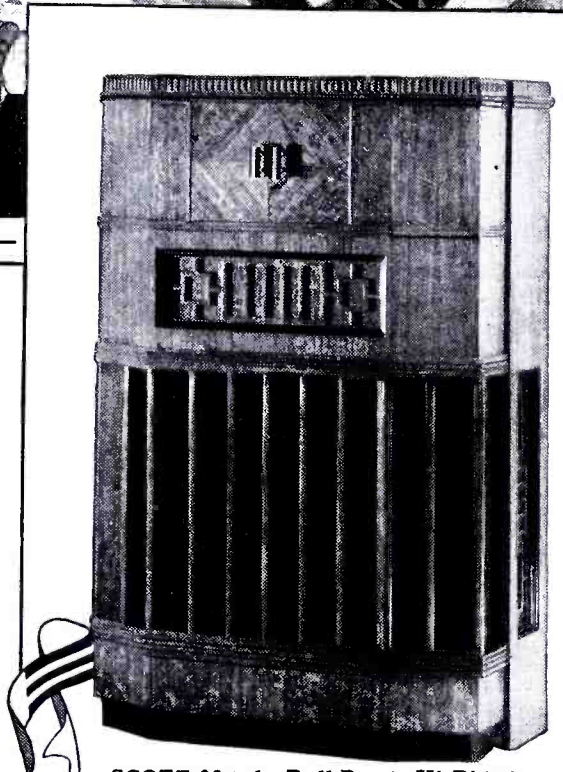

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Edited by M. L. Muhleman

CONTENTS - MAY - 1936

ALL-WAVE RADIO

VOLUME 2 • NUMBER 5

COVER

Top: The Early Bird, the Detroit News *"Radio Newspaper of the Air." Center: Interior of the Early Bird, showing the Western Electric radio transmitter and receiver at the left, and one of the three camera installations at the lower right. Bottom: W8XWJ, the* Detroit News *ultra-high-frequency station. Left to right: transmitter, speech input equipment, turntable, and in the background at right, the aircraft broadcast pick-up receiver. C. H. Wesser at controls.*
(Photos courtesy Detroit News and Western Electric Co.)

FEATURES

DEPARTMENTS

GENERAL

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THE RADIO HANDBOOK for 1936 is a book for every all-wave experimenter, and for every radio amateur. A massive volume of new information, including the best available data on metal-tube short-wave receivers, dozens of new "ham" receivers, new grid-bias controlled carrier modulated radiotelephones, new data on 5-meter transmitters, receivers and transceivers, new 2½ meter jobs, new all-band single-wire antenna system, new pre-amplifiers, test sets, etc. The book contains charts, tables, graphs and hundreds of diagrams and photographs. You will value this great book . . . and you will use it in your daily work. Get a copy now, by all means!

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EDITORIAL QUOTES

BY THE EDITOR

Super Power

THE data on the 6L6 Beam Power Amplifier appearing in this issue will be of special interest to experimenters who have been striving for true high-fidelity reproduction of broadcast programs. The 6L6 is the first receiver-class tube designed that is actually capable of handling the large power excursions required for the proper reproduction of orchestral music.

It has not been deemed practical to incorporate volume expansion in radio receivers until volume compression is introduced into broadcast transmissions. However, it has been found that volume expansion in a radio receiver is of distinct benefit even though compression may not be resorted to at the transmitter. This holds true for programs that are properly monitored. If monitoring is haphazard, the volume expander is of no earthly value.

There are a sufficient number of stations with good monitoring to make a volume expander a desired addition to a high-fidelity set. We have concluded that the time is now ripe for the presentation of such a receiver. The 6L6 tube makes such a receiver possible.

We have started on the preliminary design and expect to have the completed receiver ready for presentation in the July issue.

✦

Inexpensive Super

THE JUNE ISSUE will carry complete details on the construction of a superheterodyne receiver low in cost but high in performance. A number of original ideas have been incorporated in the design and these, more than anything else, make the high performance possible. Moreover, this receiver is comparatively easy to construct and align. There are no difficult tracking problems to contend with.

✦

Amateur Radio History

WE HAVE RECEIVED an interesting and valuable letter from F. H. Schnell, W9UZ, which contains some heretofore unpublished data regarding the early history of Amateur Radio. Mr. Schnell has been kind enough to give us permission to use the material, and we know that all hams will find it highly interesting.

We are withholding the publication of this historical data for the time being as there is the possibility of obtaining some old photographs to accompany it. But look for the dope next month.

✦

Ahee Yove Row boo aye

THE HEADING above is not Chinese, nor is it any language you are acquainted with—yet it is a language of a sort. More than likely you have heard phrases from the same language many, many times in the past, but we wouldn't blame you for not recognizing them.

Ahee Yove Row boo aye is "ALL-WAVE RADIO" in inverted speech. That is just about how it would sound if you were to hear it through one of the A.T.&T. transatlantic radiotelephone speech inverters.

Mr. Richey, Chief Technical Operator, A.T.&T. Overseas Service, whose articles on "Radio and the Atmosphere" are appearing in ALL-WAVE RADIO, can actually talk this language. It sounds something like Pig Latin. If you give Mr. Richey your name, he will re-arrange it "while you wait." When you hear it spoken in its inverted form, it is unrecognizable, but if it is repeated into a microphone in the same form, and passed through the inverter, it will come out all set back in order! Thus, if you were to say "Ahee Yove Row boo aye" into the microphone, it would emerge from the output of the inverter as "All Wave Radio."

✦

"The Ham Bands"

BEAT NOTE will welcome dope from hams regarding reception conditions and progress in the 5 & 10 bands. For that matter, any news or tips on ham radio in general will be welcome, but Beat Note is particularly anxious to correlate data on 5 and 10-meter conditions from various parts of the country.

What are you doing with how much power and what sort of radiator? Who do you receive at what time of the day on 10? Have you noted definite recurrences that would suggest the possibility of consistencies? At what times do you experience fading or at what times do your own signals pass through various conditions of fading?

We would appreciate receiving any dope you can pass along.

✦

Prospective Hams

IF YOU HAVE questions regarding amateur radio you wish to have answered, address them to Mr. G. S. Granger, care of ALL-WAVE RADIO, and they will be included in the series of informal lessons Mr. Granger is preparing for Mr. and Mrs. Rowland. The entire series is to be published in the magazine, and we want each lesson to be of as much value to our readers as we hope them to be to Mr. and Mrs. Rowland.

As a general rule, the same questions are common to a large group. Therefore, the more questions we receive, the better idea we will have of what should be included in the informal lessons.

✦

What You Should Know

THERE ARE MANY easily-understood points regarding receivers and receiver operation that have not been effectively driven home to the all-wave listener. We have had in mind for some time the preparation of an article dealing with these points, as they have a definite bearing on the results that may be expected from a receiver.

The article is now ready and will appear in the forthcoming issue. We trust that it will assist many listeners in getting more DX. No matter how well you may know your own receiver, it will be well worth your while to read this article. Watch for it.

✦

Television

NEWSPAPER MEN and radio editors were the guests of RCA at a recent demonstration of television held at the plant in Camden, New Jersey. The guests were given the opportunity of witnessing television broadcasting under conditions simulating those which would be encountered in actual service.

The demonstration was quite impressive, and would have led the "man in the street" to the assumption that there is nothing to prevent the immediate institution of a public television service. But such is not the case. There are still a number of technical problems to be solved before RCA will be ready to offer television services.

W8XWJ—Transmitter at left, speech equipment at right, turntable in foreground.

W8XWJ-

Experimental Ultra-High-Frequency Station of the Detroit News Broadcasts Regularly. See Additional Illustrations on the Front Cover.

By C. H. Wesser
OPERATOR IN CHARGE, W8XWJ

WHEN on Wednesday, January 29th, 1936, W8XWJ, the Ultra High Frequency experimental station of WWJ, *The Detroit News* Station in Detroit, Michigan, went officially in service, our station manager, Mr. W. J. Scripps, saw one of his ambitions realized. The dedicatory program, in keeping with WWJ's pioneering spirit, included such features as the dramatic re-enactment of the first two-way Amateur communication across the Atlantic; a broadcast pick-up from the *Detroit News* Airplane "Early Bird," with both Pilot Piersol and WWJ's ace sports announcer Ty Tyson describing their view of the City of Detroit from up in the air, in the evening and during a fair sized blizzard; a sketch which took the listeners back to August 1920 when WWJ, then 8MK, first went on the air with regularly scheduled programs; and musical features.

Good Day and Night Signals

The purpose of W8XWJ can perhaps best be described in these few words: "The investigation of possibilities of ultra-high frequencies for broadcasting." Already much has been learned in this connection in the few weeks the station has been on the air. For instance: W8XWJ with its 100 watts of carrier seems to cover Wayne County, in which Detroit is situated, with very good signal strength. It has been found that reception within twelve or fifteen miles is excellent with very low background noise level, and only occasional automobile ignition interference, which is, of course, quite severe on the ultra-high frequencies. There is also a very definite absence of static, including most of the ugly varieties of man-made static, and in addition, apparently no day-night effect can be observed, the signals being equally clean and strong at night as they are in the daytime.

From the very start of W8XWJ's transmissions, *The Detroit News* has cooperated with listeners by the distribution of pamphlets which completely and clearly describe how a converter or a complete receiver can be constructed, to enable listeners to receive W8XWJ. Well over 500 of these pamphlets were mailed to persons requesting them, within a few weeks time. In return, a surprisingly large number of listener's reports are being received, which aid materially in determining the service area of the station, and incidentally, in locating some bad cases of man-made interference which are promptly investigated, and wherever possible, eliminated by WWJ's interference engineer.

Heard in England

In addition to the many reports from the greater Detroit area, reports have been received from short-wave listeners in Michigan, Ohio and the west coast, as well as from several listeners in England. During certain hours, when skip allows, the station is being received in England with exceptionally good signal strength. In one case a British listener reports using a two-tube super-regenerative receiver driving a loudspeaker, on which W8XWJ can be heard as far as from 20 yards from the speaker! Because of the fact that the station has been on the air only a short time, distant reports are still few. Such reports however, would help greatly in learning more about the behavior of frequencies between 30 and 40 megacycles for long-distance communication.

Reports Verified

Let it be said here that all reports, from near and far, will be verified and acknowledged by means of a printed card showing a picture of the upper part of the Penobscot Building in which the station is located. This building was picked as the best possible spot for an ultra-high-frequency station because it is the tallest building in Detroit and Michigan, rising some 650 feet above street level, with its steel aircraft beacon tower on its top. It is atop this beacon tower that, within a few weeks, we hope to install a vertical radiator which will be fed from the transmitter on the 44th floor by a

WWJ's High Stepper

concentric transmission line. This line will be approximately 150 feet long. Cold weather has prevented the installation of this radiator, and we have been forced to operate on a very ineffective, temporary antenna, stretched between two bays of the building, and along the side of it. At present a twisted pair transmission line is used.

For the many readers who are technically inclined, a detailed description of the equipment at W8XWJ may not be amiss. All equipment is manufactured by RCA and includes a Type 100-F High-Fidelity Transmitter, speech input equipment turntable for reproduction of 33 1/3 and 78 rpm recordings, oscillograph, and monitoring equipment.

The Transmitter

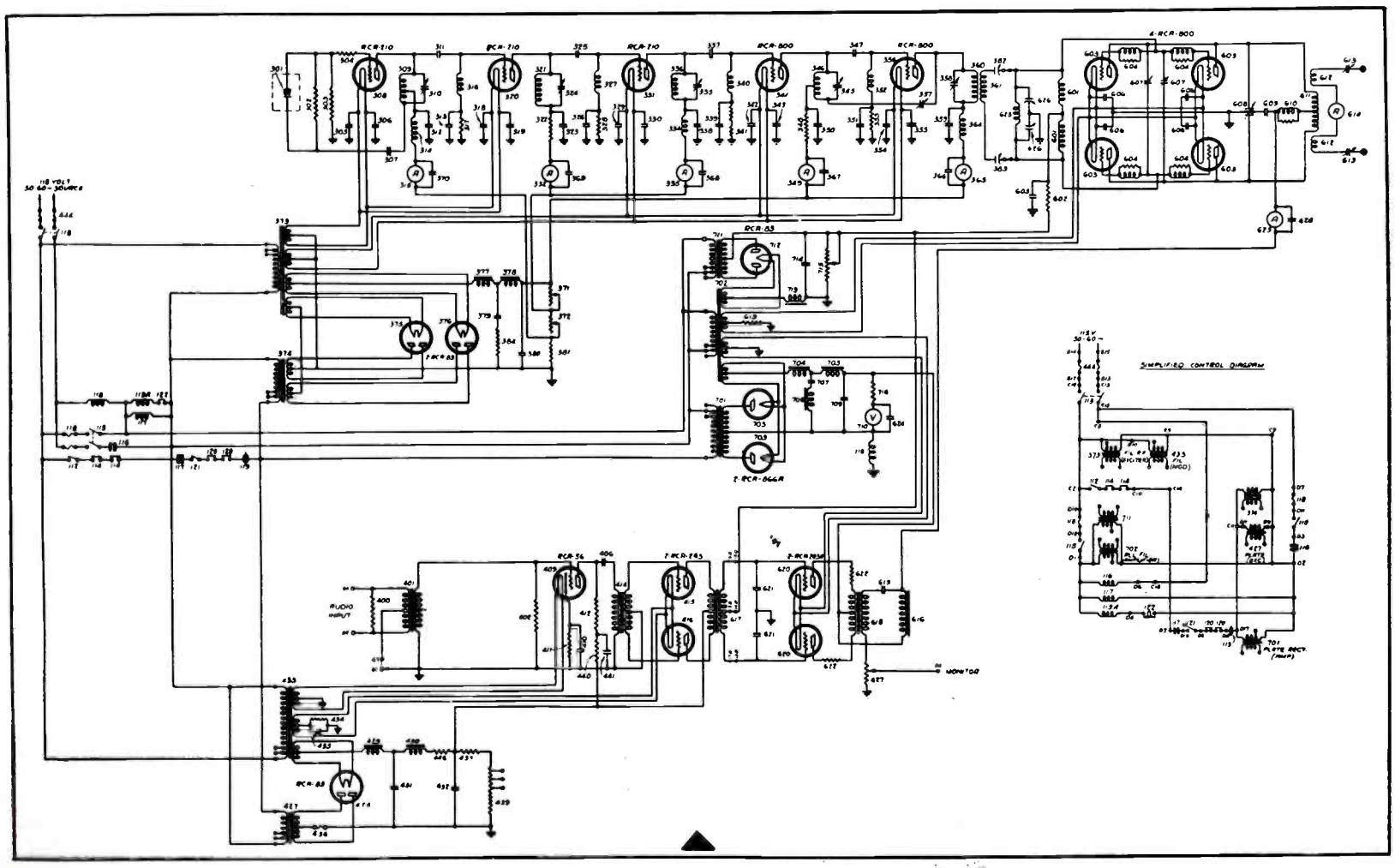
A V-cut quartz crystal, ground to 3950 kilocycles, is used in the grid circuit of a type 10 oscillator tube. This stage is followed by two doubler stages using type 10 tubes also, followed by a doubler stage using a 800 tube. Capacity coupling is used between all these stages. The plate circuit of the 800 doubler is tuned to 31,600 kilocycles. This stage is followed by a neutralized 800 in the buffer stage, which in turn is link coupled to the final (modulated) amplifier stage. The final stage employs four 800 tubes in parallel push-pull, and operates on the carrier frequency of 31,600 kilocycles.

The audio frequency line-up is as follows: one type 56 driving two 2A3 tubes in push-pull Class A, which in turn drive the 203-A Class B stage which modulates the final r-f amplifier. Four power supplies furnish the necessary filament and plate power for all stages, as well as bias for the Class C stage. A time-delay relay prevents the application of voltage on any of the plates for at least thirty seconds after the filaments have come on, and of course, meters are provided in all plate circuits to aid in tuning the transmitter properly. In all, ten meters are provided and these meters are mounted on the front panel of the transmitter, as are the six plate circuit tuning condensers. Provision is made to feed from the final amplifier into any type of transmission line. A series tuning condenser is provided in each of the transmission line's leads. The frequency range of the transmitter is from 30 to 41 megacycles. All circuits will readily cover this entire range by merely varying the tuning capacities in the various circuits, with the one exception of the final amplifier plate tank circuit. For frequencies above 36 megacycles the inductance in this circuit must be replaced by one a bit smaller.

Speech Input Equipment

Included in the speech input equipment are: one microphone pre-amplifier; a four-channel mixer; monitor amplifier; equalizer and variable line pad; meter panel with line and plate volt meters and plate current meters; a microphone and monitoring amplifier switch panel; and jack strips on which all individual units are terminated. Normally one of the mixer channels is used for local announce mike; another for the program loop coming from WWJ's local studios or NBC, and a third channel for turntable. This set-up enables the operator to mix these three sources of program at will. The fourth channel is available for another local mike, the output of a keyed audio oscillator for code practice on the air, or the output of a broadcast pick-up receiver located in the station. The announce mike is of the inductor type. Its low output level requires the use of the

[*Continued on page 250*]



Complete schematic diagram of the 100-F transmitter.

RADIO AND THE

By J. L. Richey

CHIEF TECHNICAL OPERATOR,
OVERSEAS SERVICE, A.T.&T.

THE manner in which radio waves are bent back to the earth by the ionosphere is one of the most interesting of physical phenomena. We shall probably gain a better picture of how it possibly happens, by reviewing some optical phenomena.

Refraction and Dispersion of Waves

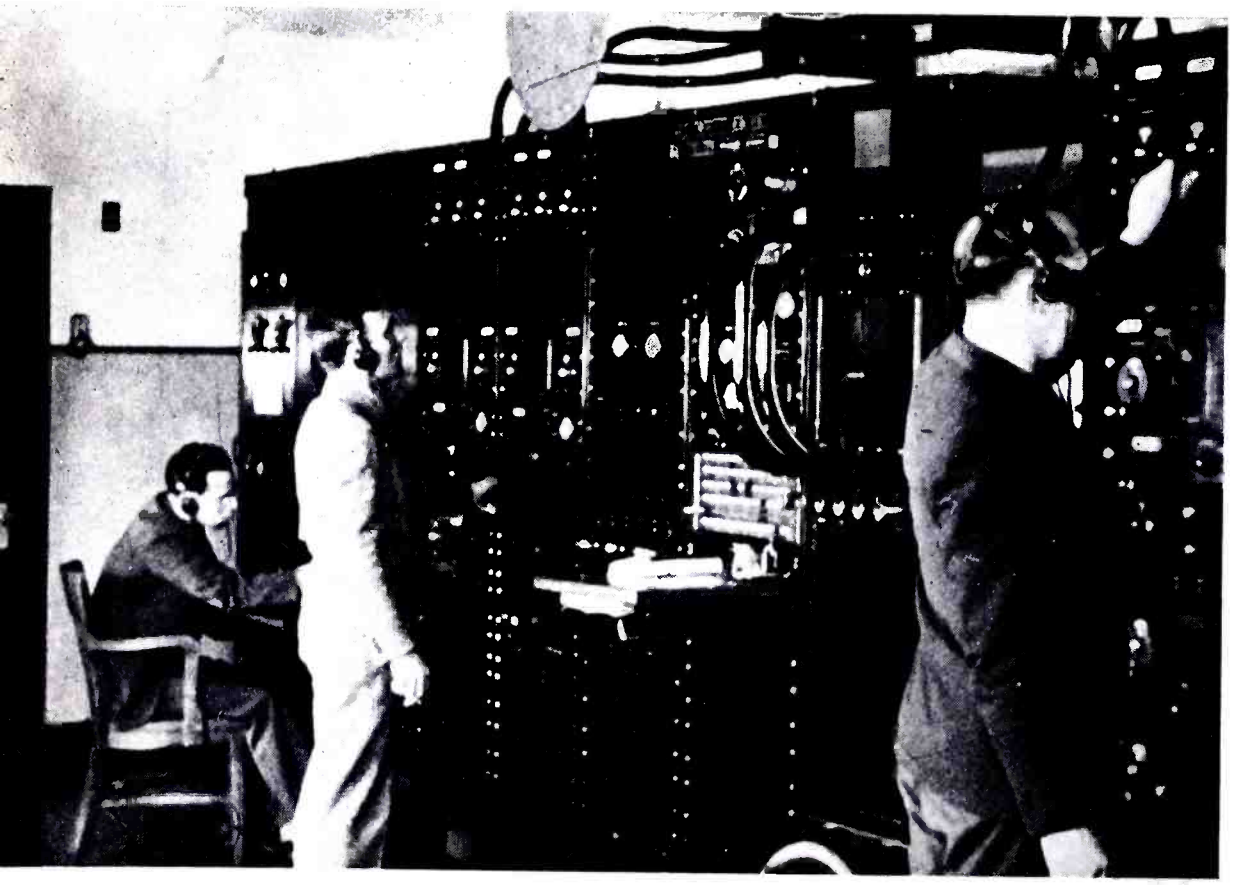
The bending of light waves is probably most familiar to us in the following examples": An oar seems broken where it enters the water, the bottom of a pond seems closer than we know it actually is, the sun has a redder color as it sets, and sometimes looks as if it were flattened. These peculiarities are created by differences in the velocity of the light waves in the two media through which they pass. Light travels at a speed of 186,330 miles per second in vacuo. In air it will be less than this, and in water the velocity will be still less. Through different types of glass the velocity of light will also be less than that obtained in vacuo. This bending phenomenon is called *refraction,* and the ratio of the velocity of the waves through the medium under consideration to that obtained in vacuo is known as the *index of refraction.*

It has also been found that in the air and glass, the velocity of blue light is less than that of red light, the difference being much greater through glass. It follows, therefore, that the index of refraction is greater for blue light than for red light. If a beam of both blue and red light goes through a glass prism, the colors will be bent different amounts, and will be separated. This separation is called *dispersion* and may be measured by the distance of separation.

Whenever sunlight or white light is sent through a glass prism, the emergent light will be found to be a band of colors. Sunlight and white light are composed of all colors, and in going through the glass, each color is bent a different amount, causing the observed separation. This is the sort of phenomenon we witness when we see a rainbow, in which condition the raindrops act like minute prisms.

Whenever light passes at an angle from one medium into another where its speed is higher, the emergent beam is bent from a line drawn perpendicular to the surfaces of the two media. A portion of it is reflected—the angle of reflection being the same as the angle of incidence. The amount of bending of the emergent light depends upon the angle of incidence and the index of refraction; it becomes increasingly larger as the angle of incidence is increased. Fig. 1 shows this phenomenon when transmitting light from a source in the water to the air above it. A beam starting at "I" and going straight up would not be bent at all, a portion of the light being reflected, and the remainder proceeding straight through. The beam to "A" is bent from the straight line I-1, and again a portion being reflected. At "B" the amount of bending is greater, and the reflection a little more. The angle the line I-n makes with the perpendicular is called the *critical angle,* because the emergent beam is zero, all of the light being reflected back into the water. Any light beam whose angle of incidence is greater than the critical angle will be completely reflected back into the water, such as I-O-D in Fig. 1.

Receiving equipment at Forked River, N. J.—a "still" from the motion picture "Seagoing Telephones."



Reflection and Refraction

When radio waves enter the ionosphere, the velocity at any particular wavelength is greater than in the medium below it. A portion of the energy is reflected and the emergent remainder is bent. The degree of bending depends upon the rate of change of ionic density. Since the ionic density generally increases with height, the speed will also increase with height and consequently increases the bending, making the trajectory curved. The index of refraction can be considered to be constantly changing. The phenomenon of dispersion is experienced in the iono-

ATMOSPHERE

PART 2:

How Radio Waves Are Reflected and Refracted—Short- and Long-Distance Waves—"Skip Distance"

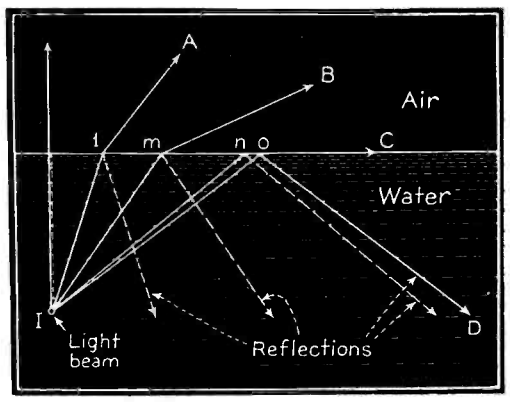


Fig. 1. Behavior of light in water and air —a generalized analogy of the behavior of radio waves.

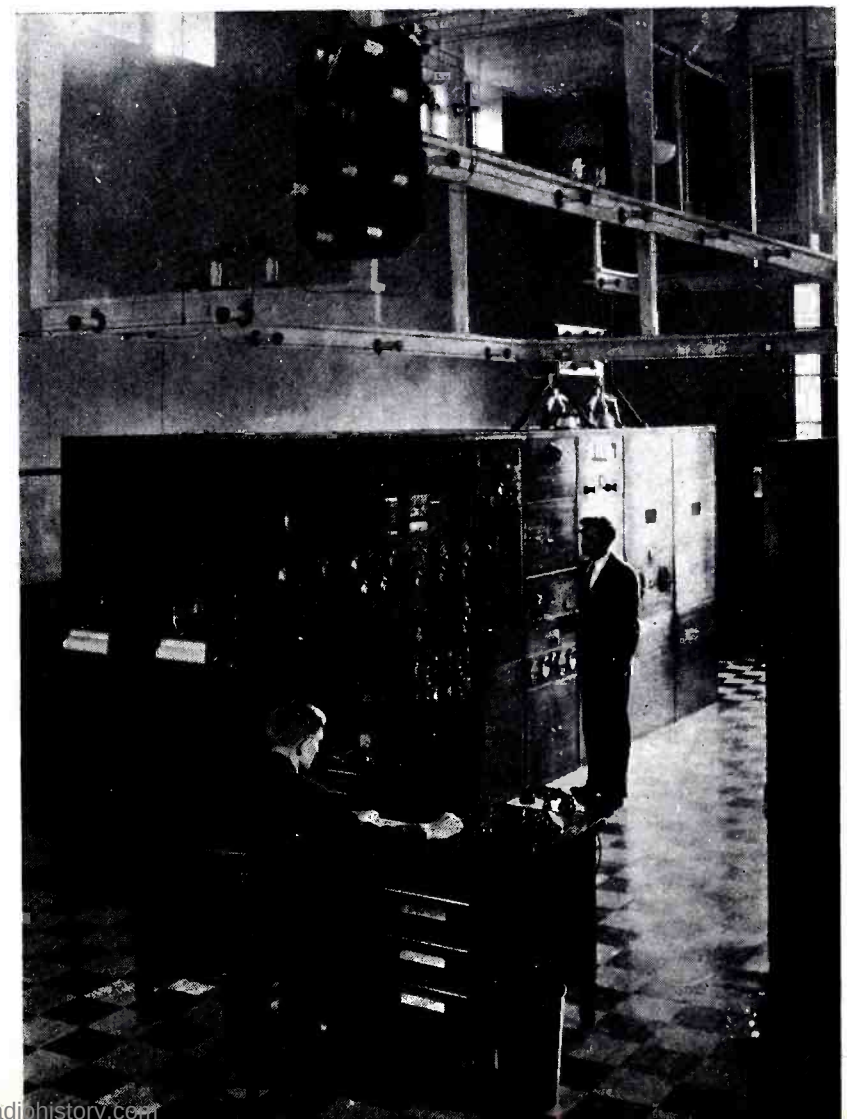
sphere, and is of the same character as that observed with light through glass. In the radio consideration the long wavelengths are bent to a much greater degree than are the short wavelengths, as shown in Fig. 2. It is expected, therefore, that the critical angle will be attained on the long waves at a lower elevation than the short waves, and will be reflected from a lower portion of the ionosphere, as indicated in the figure. From this it follows that the short waves will penetrate further into the ionosphere and return to the earth at a much greater distance from their source than the long waves.

As the wavelength is made shorter, the index of refraction at any given level of the ionosphere approaches unity, which means that the bending will become less and less. Finally the wavelength becomes so short that the bending will be so small that the waves cannot return to the earth at all, which finally results in their penetration through the ionosphere into interstellar space, as depicted in Fig. 3. On account of the small refraction obtained on wavelengths below approximately ten meters, it has been found that they are not practical for consistent long distance use. Quasi-optical phenomena are observed on these shorter wavelengths, and their trajectories become straighter as their length is shortened.

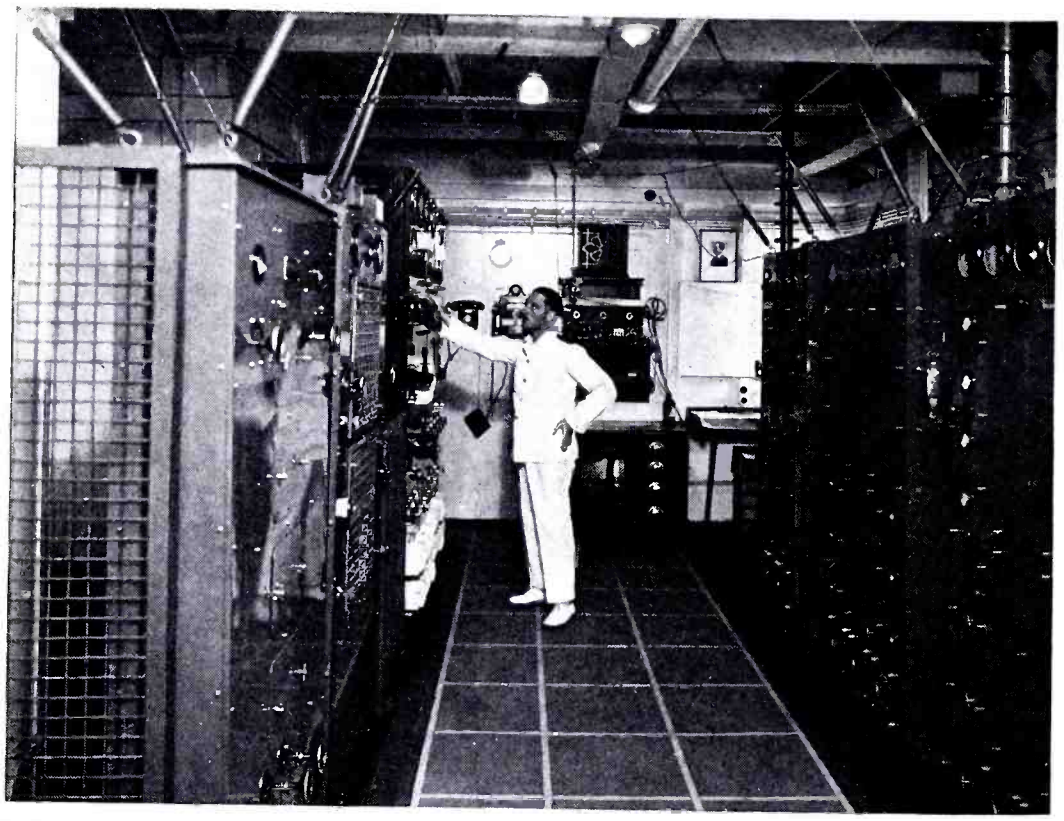
If we should at any time be able to communicate with other planets, we shall probably find wavelengths shorter than ten meters most useful, because of the ease with which they can escape through the ionosphere. Romantic as interplanetary communication may appear, if it ever comes to pass, we shall have to be content with slow service. Radio waves travel at about the speed of light, or approximately 186,000 miles a second. Consequently, in order to communicate with the planet Mars when it is nearest the earth (a distance of 34,600,000 miles), it would take about three minutes for a signal to travel in each direction. With the other planets the time would be correspondingly longer because of the greater distances involved. For example, to Jupiter when it is closest, a message would take over thirty minutes to go each way. A heavenly body at the distance of the closest star would receive a signal in a little over four years. To communicate with, say the star Arcturus —whose light was used to operate electrical devices which opened the World's Fair in Chicago in 1933—it would take a message forty years to go each way. So, communication beyond our own world will have very serious commercial limitations on account of time.

Polarization of Radio Waves

The waves that leave the transmitting antenna are usually plane polarized. If the antenna radiates mainly from vertical conductors, the wave is vertically plane polarized; and if it radiates mainly from horizontal conductors, the wave is horizontally plane polarized. An analogy will probably make the propagation picture of the waves a little clearer. If one were to take hold of a long piece of rope with the other end fastened to a pole, and stretch it loosely so that it clears all obstacles, and then raising the arm that is holding the rope straight up and down, transverse vertical oscillations will proceed down the rope. (Disregard the reflections from the other end of the rope.) These oscillations are analogous to a vertically plane polarized wave. If the arm were moved from



One of the transmitters at the A. T. & T. Lawrenceville Radio Station. On the left are temperature recording devices for crystal ovens. In the foreground, control turret.



Radio telephone transmitting equipment aboard the S. S. Empress of Britain, used for service with shore telephone stations.

side to side horizontally, the waves generated would be analogous to a horizontally plane polarized wave. If the arm were moved in a circle, in a clockwise direction, the wave proceeding down the rope would be analogous to a clockwise circularly polarized wave. If the arm were rotated in a counter-clockwise direction, the wave would be analogous to a counter-clockwise circularly polarized wave. An elliptically polarized wave would be one, where the figure traced by the arm is an ellipse instead of a circle, etc.

A plane polarized wave can be considered as two circularly polarized waves present at the same time, one rotating clockwise and the other counter-clockwise. If the two components reinforce each other in the vertical plane and neutralize in the horizontal plane, the resultant wave is vertically plane polarized. If they reinforce each other in the horizontal plane and neutralize each other in the vertical plane, the resultant wave is horizontally plane polarized.

The earth's magnetic field may be in such direction, that in the ionosphere it causes one of the circularly polarized radio wave components to execute a larger circle and the other component a smaller circle. This results in a change in the speed of the two components and causes one wave to lag more and more behind the other and change their phase relation—that is, the position where they neutralize and reinforce each other. This phenomenon is called rotary dispersion, wherein a vertically plane polarized wave gradually changes to a horizontally polarized wave, and vice versa. The degree of rotation depends upon the difference in the speeds and the distances involved. Sometimes the condition of the ionosphere may be such that the two components traveling at different speeds will be reflected from different levels, resulting in their splitting into two separate circularly polarized waves, known as the ordinary and extraordinary ray respectively. Variations in the length of the path of each component results in a complex resultant at the receiving antenna. If the receiving antenna is a vertical wire, the two components may combine at times to produce a resultant horizontally plane polarized wave, and the signal would fade out. Variations in the ionization of the ionosphere at different levels can cause and does cause effects of this kind.

Absorption and Scattering

In any gas the molecules and electrons are always in motion. It is only at absolute zero (-273°C) that all motion is stopped. The higher the temperature the greater is the motion of these particles. In a gas which has been ionized, the electrons are also in motion. All of the electrons are not vibrating at the same frequency; there is, however, a mean frequency at which most of them vibrate, this being dependent upon the density of the electrons, and the temperature of the region. In their movements the electrons will be constantly colliding with molecules that are in their path. For a given density of gas, it may be seen that for a certain temperature there will be an average distance which an electron travels between collisions. This distance is called the *free mean path,* and it changes with density; i. e., as the density of the gas decreases the free mean path becomes longer.

The free electrons in the ionosphere are put into motion by the electric component of the passing radio wave. In this manner energy is absorbed and then reradiated. This motion is in addition to that caused by the temperature of the gaseous region. If the electrons should collide with molecules or ions before they had radiated all of the energy absorbed, the remainder may be spent in collision, and hence lost. If the electrons in colliding with the molecules or ions are merely deflected from their path with little or no loss in energy (elastic collisions), the ensuing radiation will be diffused. This latter phenomenon is called *scattering.* All of these effects result in less energy being available to the distant receiver and is the cause of attenuation, over and above that caused by the spreading out (inverse distance) effect. The collisions will be most frequent in the region where there are a large number of electrons to absorb energy, and a great many molecules present to collide with. In the denser regions the electrons will not have a chance to absorb much energy before colliding with gas molecules; therefore, the maximum absorption will be at a fairly high elevation.

Effect of Earth's Magnetic Field

The presence of the earth's magnetic field serves to constrain the path of the electrons and hence change the attenua-

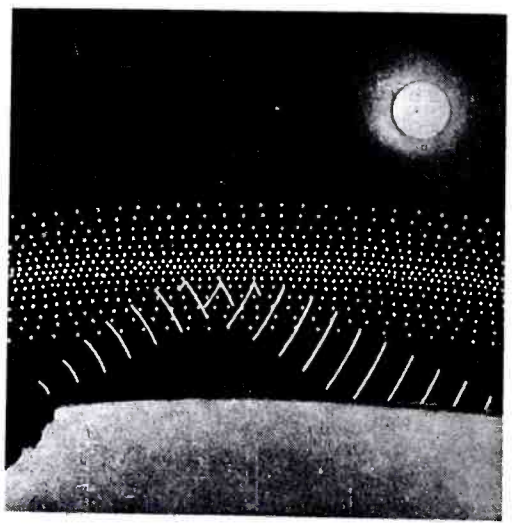


Fig. 5. Illustrating "skip distance." Note that the waves hurdle a large area.

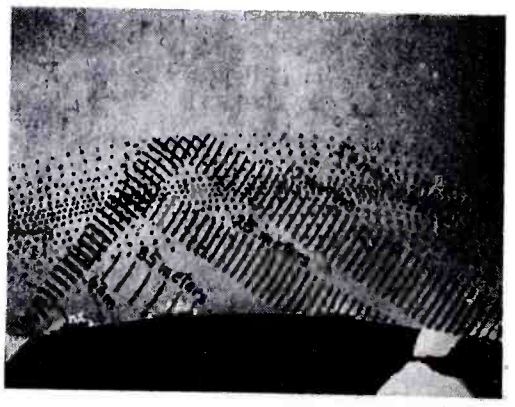


Fig. 2. Long wavelengths are bent to a much greater degree than are the short wavelengths, and the long waves are reflected from a lower portion of the ionosphere.

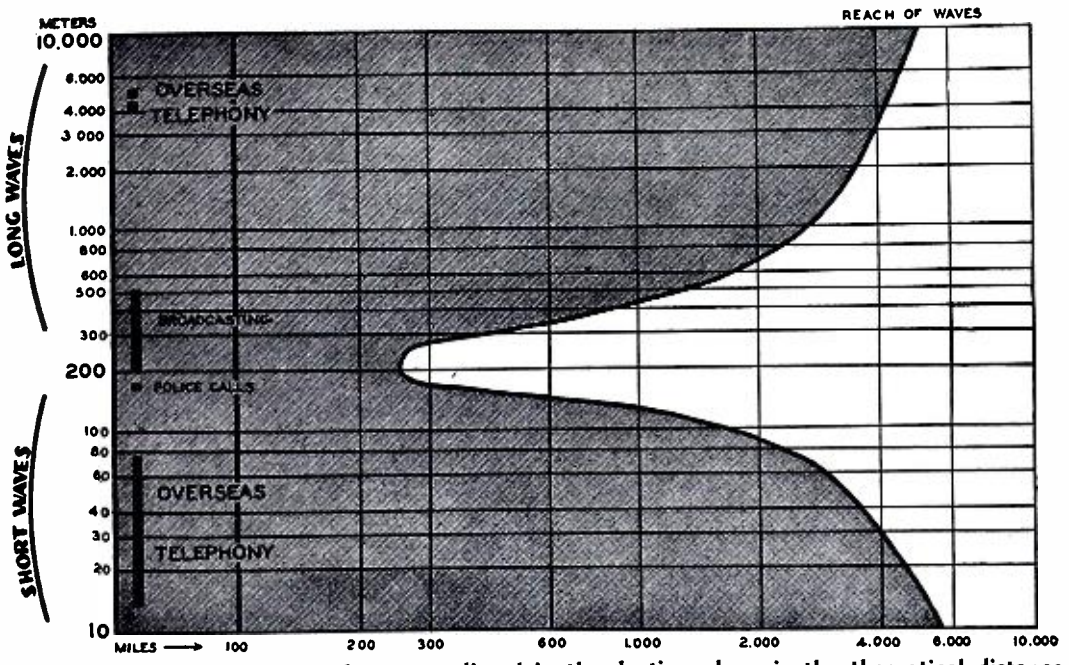


Fig. 4. With a given amount of power radiated in the daytime, here is the theoretical distance which would be attained by typical wavelengths. (Lengths below ten meters are not commercially good for terrestrial long distances.)

tion; so instead of executing an up and down motion, the magnetic field will cause the path to become curved. If the direction the wave travels is the same as the direction of the earth's magnetic field the paths of the electrons will be nearly closed loops. The constraining effect will be greatest on the long waves. A theory suggested to explain the high absorption on wavelengths near 200 meters, considers that the earth's magnetism and the mass of the electron are of such magnitude that it causes the electrons to execute an ever-increasing spiral path, in resonance with the wave; hence energy continues to be absorbed in quantum steps until the electron is stopped by collision. At this critical frequency or wavelength the attenuation is the highest. It increases gradually from the long waves up to this point, and beyond it as the wavelength is made shorter the attenuation is reduced. This resonant point near 200 meters is usually looked upon as the boundary line between the long and short waves. Waves whose lengths are greater than 200 meters are generally considered long waves, and those shorter than this figure are considered short waves. See Fig. 4.

Skip Distance

An interesting characteristic generally observed on wavelengths less than 50 meters, is the so-called skip distance phenomenon (See Fig. 5). This skip distance is the distance from the transmitter to the point where the refracted waves (sky waves) come down from the ionosphere and meet the earth. Between this latter point, and the point where the ground wave of the transmitting antenna dies out, much weaker, if any, signals are picked up. The received signal in this region is usually due to scattering. In general, the skip distance is caused by two effects: First, the ionization is not sufficient nor the wavelength long enough to cause the necessary refraction that will keep the waves overlapping (that is the ground wave and the sky waves); and secondly, the ionic gradient and atmospheric density and temperature combines to produce high absorption of the waves leaving the transmitting antenna in the horizontal plane (the ground wave). The skip distance is greater at night, on account of the reflection taking place in the higher region of the ionosphere, therefore making a longer hop. The night-time skip region will be of greater dimensions in winter than in summer, because of the corresponding greater length of night and greater virtual height of the reflecting layer[10].

BIBLIOGRAPHY FOR PARTS I AND II

1. C. W. Rice—Short-Wave Radio Transmission and Its Practical Uses; July and August 1927. *QST*.
2. C. W. Rice and W. G. Baker—Refraction of Short Radio Waves; February 1926. *Proceedings* of A. I.E.E.
3. C. F. Talman—The Story of Our Weather; Volume I of Popular Science Library, Published by P. F. Collier and Son Co., New York, N. Y.
4. R. W. King—What Do We Know About Radio Waves in Transit? June 1927. *Radio Broadcast*.
5. R. A. Heising—Experiments and Observations Concerning the Ionized Regions of the Atmosphere; January 1928. *Proc.* I.R.E.
6. K. K. Darrow—Cosmic Rays—What Physicists Have Learned About Them; April 1933. *Proceedings* of the A.I.E.E.
7. A. M. Skellett—The Ionizing Effect of Meteors; December 1932 and February 1935. *Proceedings* I.R.E.
8. J. P. Schafer and W. M. Goodall—Characteristics of the Ionosphere; June 3, 1933 *"Nature."* Observations of Ionosphere During Meteor Shower. December 1932 *Proc.* I.R.E. Diurnal and Seasonal Variations of Ionosphere for 1933-1934; June 1935 *Proc.* I.R.E.
9. Kirby, Berkner and Stuart—Studies of the Ionosphere; April 1934. *Proceedings I.R.E.*
10. C. R. Burrows—The Propagation of Short Radio Waves Over the North Atlantic. September 1931. *Proceedings* of Institute of Radio Engineers.
11. Sheldon, Kent, Paton and Miller—Physics for Colleges; book published by D. Van Nostrand Company, Inc., 8 Warren Street, New York City.
12. F. R. Moulton—Astronomy; book published by The Macmillan Publishing Co., 60 Fifth Avenue, New York, N. Y.
13. Ladner and Stoner—Short Wave Wireless Communication; John Wiley & Sons, Inc., 400 Fourth Ave., New York, N. Y.

(To be continued)

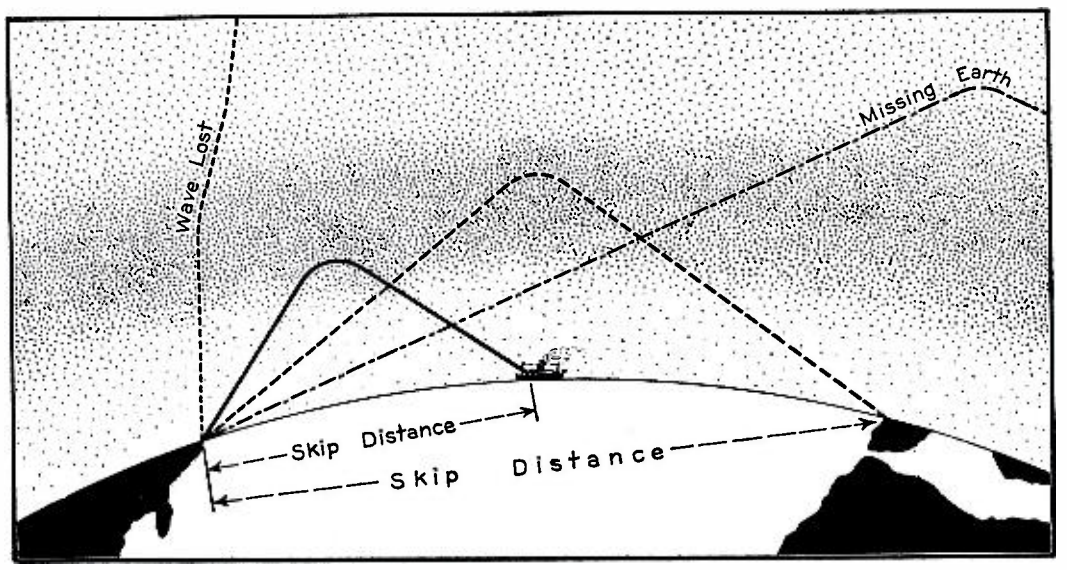


Fig. 3. The paths of various short waves. The "skip distance" of the two which reach their commercial destination are indicated.

"BARB"

TWO EMBRYO

ALL-WAVE RADIO IS

Why Not

PROLOGUE

Mr. and Mrs. Ernest Rowland, of 384 William Street, East Orange, New Jersey, are two "youngsters" who have been so taken with amateur radio that they have decided to "plug" for all they are worth so that they may get on the air with their own amateur transmitter.

Neither "Ernest" nor "Barbara" had the slightest idea as to how they should go about becoming amateurs, nor did they know if their chances of obtaining radio amateur licenses were at all favorable. They asked Mr. Granger, whom they have known for some time.

What Granger told them was simply this: "If you are sincere in this, and if both of you are willing to devote a bit of time each day to a study of the code and the fundamentals of amateur radio, there is no reason why you shouldn't pass your examinations for Class B licenses."

When Granger commenced outlining preliminaries, it was Ernest who remarked that there must be thousands of other short-wave listeners who desire to become radio amateurs, but have been scared off by a lack of knowledge as to how to proceed.

Since Granger had agreed to "see them through" to the bitter end, it was immediately planned to publish each month the correspondence between instructor and students, with the idea in mind that short-wave listeners who wish to become radio amateurs will have the opportunity of "following through" with Ernest and Barbara.

Be that as it may, we are sure our readers will find it immensely interesting to follow the progress made by these two enthusiasts. The entire staff of ALL-WAVE RADIO *has taken a fatherly interest in "Ernest" and "Barb," and wish them lots of luck.*—THE EDITOR.

LESSON 1

Dear Ernest and Barb:

You certainly make an odd pair of students. Ernest, you seem to have all the confidence necessary, but Barb seems fearful of that which is ahead of her.

But I can understand that; a man has a mechanical turn of mind, whereas a woman has not. Nevertheless, a woman is quite often more receptive of mind than a man is, and for that reason I believe the two of you are going to run nose-to-nose in this.

But it would help immeasurably if Barb could work up a bit more confidence. I wish you would go to the Library and get her a copy of Anne Morrow Lindbergh's book, "North to the Orient." and force her—which will be easy in this case—to read the first few chapters in which Mrs. Lindbergh speaks of her apprehensions concerning the possibilities of her ever learning anything about radio. Barb is sharing the identical apprehensions, and it may be that she will feel better after reading of the progress Mrs. Lindbergh made; much, I believe, to her surprise.

All things are deep and difficult until one understands them; afterwards one smiles at their simplicity. You will find this to be so with the Continental Code you are about to study, and you will find it so with the fundamentals of radio, beyond which you need not go unless you care to. It will all be very simple—afterwards. In the meantime, never mind the little fears . . . just study, and the "afterwards" will arrive more rapidly than you would expect.

I am attempting to make things as easy for you as possible. I phoned Bob Hertzberg, of Wholesale Radio Service, Inc., and he was so interested in your joint venture that he very kindly donated a key (which you can use with your transmitter later on) a buzzer and a pair of headphones for the two of you to get started with. More than likely you have received these by this time and I think it would be a good idea to get them hooked up right away so that both you and Barb can get the "feel" of a key before you actually get into code practice.

Buzzer Hookup

Here is a sketch (Fig. 1) that shows how to wire up the key, the buzzer and the two No. 6 dry cells. Mount the key and the buzzer on a board, or better yet, mount them on an old table if you happen to have one around. After you have the outfit working, adjust the little screw on the vibrator contact for a good, steady tone. If you can't steady the tone, you might add another No. 6 dry cell in series with the two shown in the sketch.

After you have the buzzer working properly, connect up the headphones for Barb. The connections are shown in dotted lines in the sketch.

Since the two of you are going to work together on this, it would be a good idea if you were to send to Barb a while, then switch the pair of headphones and have her send to you for a while.

The first thing the two of you will have to do is to learn how to send prop-

RADIO HAMS

SEEING THEM THROUGH

Join In?

"ERNEST"

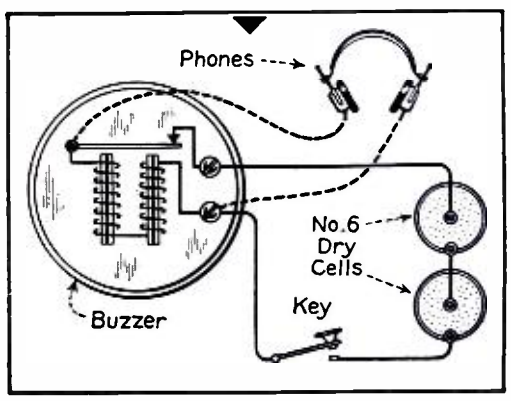


Fig. 1. Connections for a typical code-practice setup.

erly. If you cannot form the characters in the right way, Barb certainly won't be able to make out what the letters are. And vice versa, Barb! But, sending slowly, as both of you will do for a while, is not a difficult feat, providing you keep in mind that the dots and dashes which make up the letters *will make up other letters if the spacing is incorrect.* I shall get around to that shortly.

Candler to Help

First of all, I want to tell you that Mr. Walter H. Candler, of the Candler System Co., Asheville, North Carolina, who has been so successful in training people in the radio code, has shown the same keen interest in the two of you as have numerous other people with whom I have talked. Possibly it is because it is unusual to run into husband and wife both intent on becoming hams. In any event, Mr. Chandler has offered to enroll the two of you in his complete course in Scientific Code Instruction, free of charge, which is a break for you! This includes all the necessary training in code and radio fundamentals for you and Barb to obtain your amateur licenses. Mr. Candler is a past master in code training and there isn't much I could tell you that he won't tell you later on. But, until you receive the first lesson from him, I would like to cover a few of the major points regarding the code.

Fundamentals of Code

I have worked up the complete Continental Code on the attached sheet (Fig. 2). This includes everything but the special punctuation marks which you may never use. Anyhow, I don't want you to get all tied up into a knot over them at this stage of the game, as they are relatively unimportant.

Now, please note that all letters, numbers and punctuation marks are made up of combinations of dots and dashes *without spacing.* In the Morse code, where dots predominate, certain letters are composed of dots that are spaced. This is not so in the Radio Code.

Now if you two will run down the alphabet you will observe that some letters are composed wholly of dots, others wholly of dashes, and others composed of a combination of the two. Thus, *e, i, s, h* are composed of one, two, three and four dots respectively, while *t, m* and *o* are composed of one, two and three dashes respectively. Then there are letters like *a* which are composed of some dot-and-dash combination, and other letters which are just the reverse. Thus, *a* is dot-dash, while *n* is just the reverse, or dash-dot. Going further, there are letters, such as *f,* that are made up of larger combinations which, if separated in one way or another, will make up two other letters. Thus, *f* is dot-dot-dash-dot, but if it were to be broken up, it could be *in,* for instance, for *in* is dot-dot dash-dot.

You will see from this that the matter of spacing is highly important if the person at the other end is to know what you are talking about. I have drawn a little sketch of the characters making up the letter *c.* (Fig. 3). This is an extra-special letter since it is a part of that very famous "CQ" used by radio operators and almost done to death by many amateurs. And you would be surprised how often an amateur sends something other than CQ without even realizing it.

Observe from my sketch that the letter *c* is dash-dot-dash-dot. If it is keyed as it normally sounds it will be dah-dit-dah-dit. But, if the operator is careless and either spaces these four characters or gives them the incorrect rhythm, they will be either dah-dit, dah-dit, which is *nn,* or dah-dit-dah, dit, which is *ke.*

Rhythm of Code

I am bringing this up now because you are going to do the sending for Barb and she is going to do the sending for you. It is important, therefore, that both of you appreciate that the dots and dashes making up the letters of the alphabet will form a very definite rhythm that cannot possibly be mistaken for any other rhythm in the code, if keyed properly. I'm not good at remembering the titles of songs, but you will know both the title and the melody of "Carry Me Back to Old Virginny," If, instead of humming it, you will give it the old "da-de-da-da-" method of fill-in one uses when he doesn't remember the words, you will find that it will be something very close to this: dah-dah, dit-dah, dit-dah-dah, dah-dah, which is *mawm* in radio code. The same thing won't work out very well with "The Music Goes Down an' 'Round," but the "Carry Me Back to Old Virginny" is a good example

of the rhythmic content of the radio code.

You will appreciate, then, that both of you should learn to key or send with rhythm and that eventually you must learn to copy by the rhythmic sound of each letter. The letter *c,* for instance, cannot be clipped so that it sounds like two fast *n*'s. The dah-dit-dah-dit must be blended together so that it has continuity. It must be treated in exactly the same way you would treat an *h,* which is dit-dit-dit-dit. If it is broken thus: dit-dit, dit-dit, it is a double *i;* if it is sent dit, dit-dit-dit, it is *es;* if it is sent dit-dit-dit, dit, it is obviously *se,* and not by the wildest stretch of the imagination an *h.*

Holding the Key

It is hard to send if you don't hold the key properly. The key should be far enough back so that you can rest your arm on the table. The first two fingers of the right hand (unless one happens to be a southpaw!) should be placed on top of the key knob and the thumb along the left edge of the knob. The key should not be tapped; sending should be accomplished by flexing the wrist which will increase the pressure of the fingers on the key knob. If too much pressure is required to make the key close for the dots and dashes, then the spring tension on the key should be adjusted until you find the key easy to operate.

Now, one last point about keying . . . don't try to send the letters fast. The time interval of a dot is about what anyone would expect it to be—short enough to be a dot and long enough to be recognizable. A dash should equal three dots in time interval. The spacing between each character making up a letter should be equal to one dot. If the spacing is greater than this, you will have split one letter into two. This spacing need not worry you too much at first providing you send but one letter at a time, which is a good idea anyhow.

Learning to Copy

In learning to copy, take the easy letters first, such as *t, m,* and *o,* which are all composed of dashes, and *e, i, s,* and *h,* which are all composed of dots.

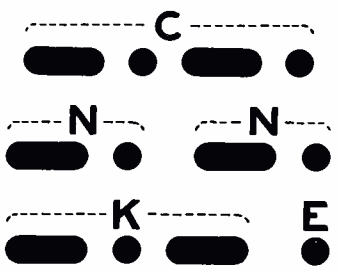


Fig. 3. The letter "c" will turn out to be "nn" or "ke" if the characters are not spaced properly, as shown.

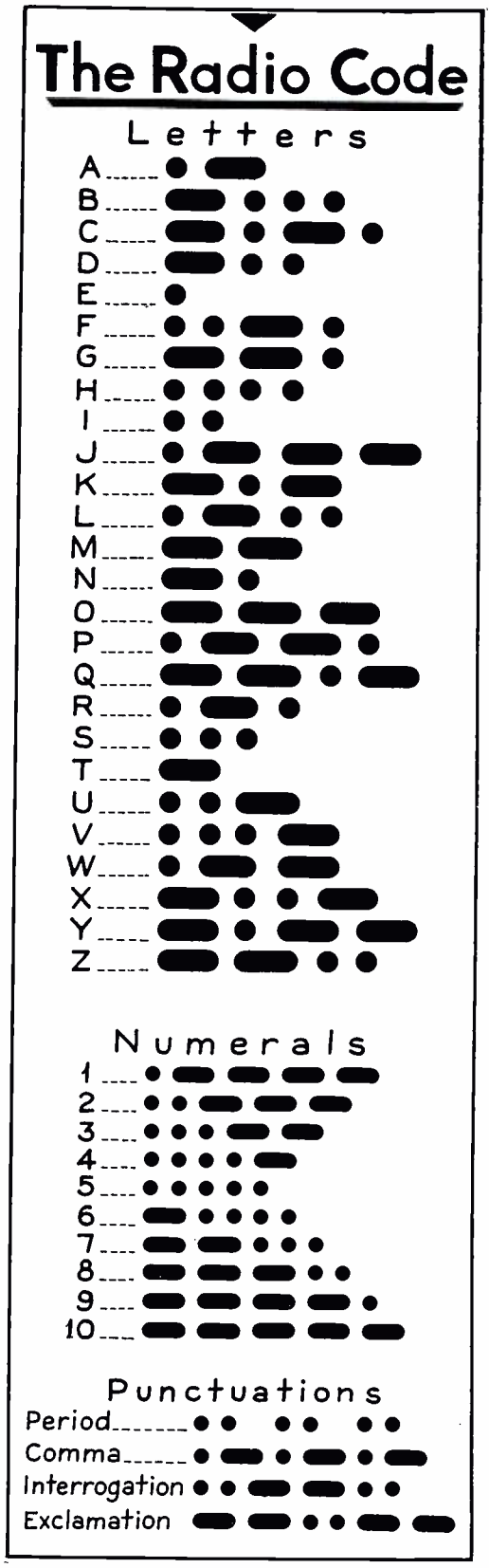


Fig. 2.. The Continental Code, as used in radio communication.

Then work on the simple combinations such as *a, n, u, g,* etc. Try at the very beginning to differentiate between letters by their rhythm or sound, for the sooner you are able to do this, the sooner you will be able to pick up a bit of speed. A speed of even 5 words a minute is out of the question if one has to think first what a certain character combination is. It is necessary to learn to recognize a letter by its sound in exactly the same manner that you recognize and understand a spoken word by its sound only.

After you have done a fair job of learning the letters, turn to the numbers. You will find that the characters representing these are made up of larger combinations of dots and dashes. Unlike the letters, however, the sequence is unbroken. Thus, the numeral 1 is *dit*-dah-dah-dah-dah and the numeral 2 *dit-dit*-dah-dah-dah, so that the numerals from 1 to 5 are readily distinguished by the number of dots. Beginning with the numeral 6 the combination is reversed. Thus, 6 is *dah-dit-dit-dit,* 7 is *dah-dah-dit-dit-dit,* and so on, through to 0 which is five dashes, just the reverse of the numeral 5, which is five dots.

Just as long as the characters making up a numeral are keyed properly so that there is no break in continuity, there is no chance of confusing a numeral for a group of letters. There is but one exception to this, and that is the number 6 which can very readily be taken for *th.* A good operator, of course, can make the dash hang on to the four dots so well that there would be no chance of a mistake. A good operator can send *6th* so well that you would never question it. It would sound like this: dahditditditdit, dah ditditditdit. Simple enough after you have gained proficiency in keying.

Punctuation Marks

Now take a look at the punctuation marks. At first glance it looks as though they might be confused with groups of letters, but this is not the case. A period is triple *i,* thus, dit-dit dit-dit dit-dit, but there is no word in the English language containing three *i*'s in succession, so there can be no possible chance of a mistake. A comma, you will observe is essentially a triple *a.* This might be confused with the Government's AAA, but certainly nothing else in the English language. The interrogation mark is *imi* run together, and the exclamation point is *mim* run together, both so distinctive in sound as never to be confused with anything else. As a matter of fact, the question mark has what one might term a very high degree of readibility. In sound, it stands out like a sore thumb.

Discouraging at First

Well, that's about all on code, for the present at least. Mr. Candler will give you far better instruction than I possibly could. I want to add, though, that both of you will be very much discouraged for a while. I have yet to meet a person who didn't feel in the beginning that developing speed was simply out of the question for him. I went through the same sort of experience myself many years ago. I knew every letter and number by heart. You could ask me for anything in code and I could give you the answer in less than the shake of a lamb's tail. But I couldn't repeat them rapidly by their sound.

The queer thing about it is that the

[*Continued on page 251*]

The New 6L6
BEAM POWER TUBE

A Pair In Push-Pull Can Pump 60 Watts

WE have received word from RCA Radiotron of two new metal tubes; one, the 6L6, which is a "Beam Power Amplifier" having high power output, and the other, the 5W4, which is a full-wave high-vacuum rectifier of the filament type, designed for use where d-c requirements are moderate.

The Beam Power Amplifier

The 6L6 is a power-amplifier tube for use in the output stage of radio receivers designed to have ample reserve power-handling ability. In this application, it is ideal for use with volume-expansion systems. The tube is also particularly well suited to the output stages of medium-power public-address amplifiers, and for use as modulators in amateur fone transmittters.

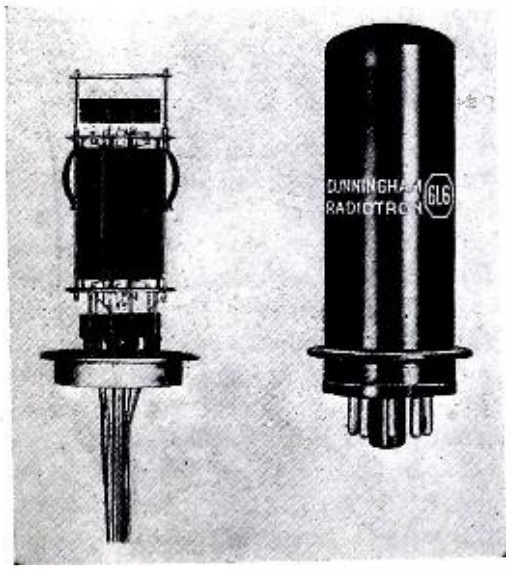
The 6L6 provides high power output with high power sensitivity and high efficiency. The power output at all levels has low third and negligible higher-order harmonic distortion.

These distinctive features have been made possible by the application of fundamentally new design principles involving the use of *directed* electron beams. The beams of high electron density are produced by constraining the electrons with potential fields set up by the tube electrodes arranged to give the desired effects.

Primary features resulting from this arrangement are that the screen does not absorb appreciable power and that efficient suppression action is supplied by space-charge effects produced between the screen and the plate. Secondary features are; high power-handling ability, high efficiency and high power sensitivity. Furthermore, large power output is obtainable without any grid current flowing in the input circuit.

In the design of the 6L6, the second-harmonic distortion is intentionally high in order to minimize third and higher-order harmonics. Experience has shown that second harmonics are far less objectionable in the audio-frequency output than harmonics of higher order. Besides, second harmonics can easily be eliminated by the use of push-pull circuits which have become more or less standard, while in single-tube resistance-coupled circuits, the second harmonic content can be made small by generating out-of-phase second harmonics in the pre-amplifier.

Because of the high power-sensitivity of the 6L6, it is practical to use circuits which avoid the troublesome effects of loudspeaker resonance and variable impedance. In such circuits, the 6L6 not only maintains its high efficiency, but also provides power sensitivity and stability equal to or better than that of a triode.



The 6L6 Beam Amplifier Tube, showing the mount assembly ready for the metal shell, and the finished tube.

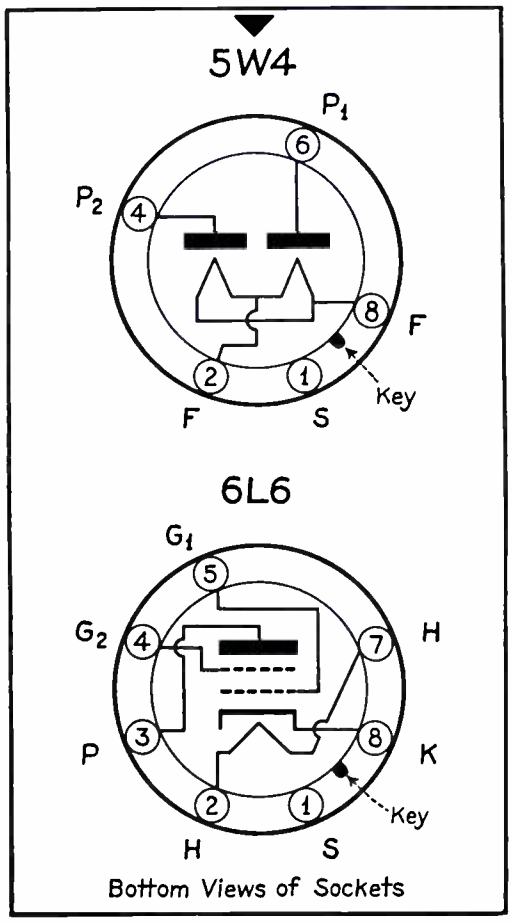
Characteristics of 6L6

This tube has a 6.3-volt heater which draws 0.9 ampere. The normal plate and screen voltage is 250, while average grid voltage is -14. Plate current is 72 m.a. and screen current 5 m.a. Amplification factor is 135, plate resistance 22,500 ohms and mutual conductance 6000 micromhos.

When operated as a single tube Class A amplifier at 250 volts plate and screen, the output is 6.5 watts. Raising the plate voltage to 375 and the grid voltage to -17.5 (fixed bias), the output is 11.5 watts. Two of the tubes operated Class A push-pull, and with similar element voltages, the power output is 13.8 watts with self bias and 14.5 watts with fixed bias. When used in a Class AB circuit, with a plate voltage of 400 and screen voltage from 250 to 300, outputs from 20 to 34 watts may be obtained. When operated Class AB under conditions where grid current flows during some part of the input cycle, outputs between 40 and 60 watts may be obtained!

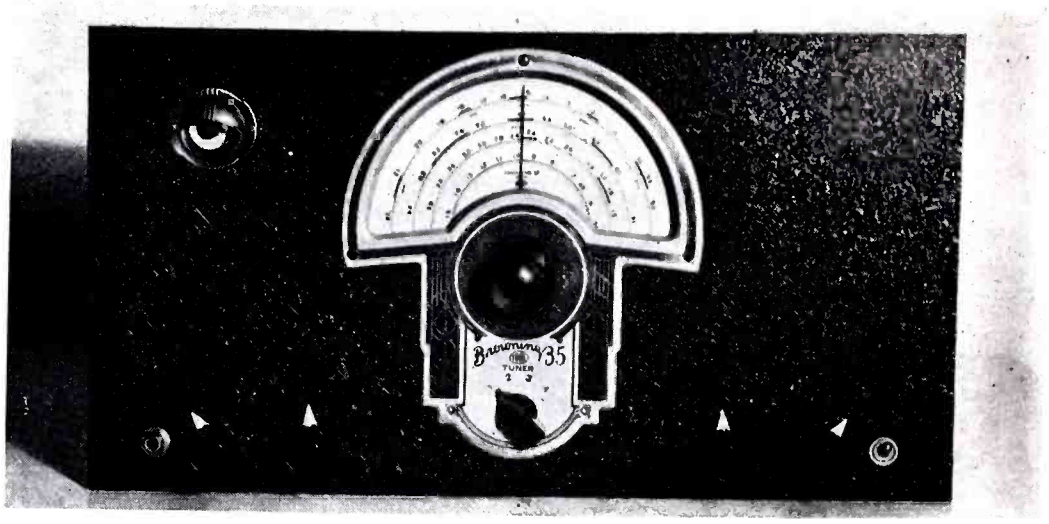
The 5W4 Rectifier

The 5W4 high-vacuum full-wave rectifier draws 1.5 amperes at 5 volts a.c. The a-c plate voltage per plate (rms) is 350 max., and the d-c output current is 110 m.a. max.



Socket and tube-base connections for the 5W4 and 6L6 tubes.

The AWR-13 ALL-WAVE QUIET SUPER



Front view of the AWR-13 Quiet Super. Note electron-ray tuning indicator in upper left corner of panel.

WITH BUILT-IN NOISE SILENCER. 550 TO 22,000 KC CONTINUOUS RANGE

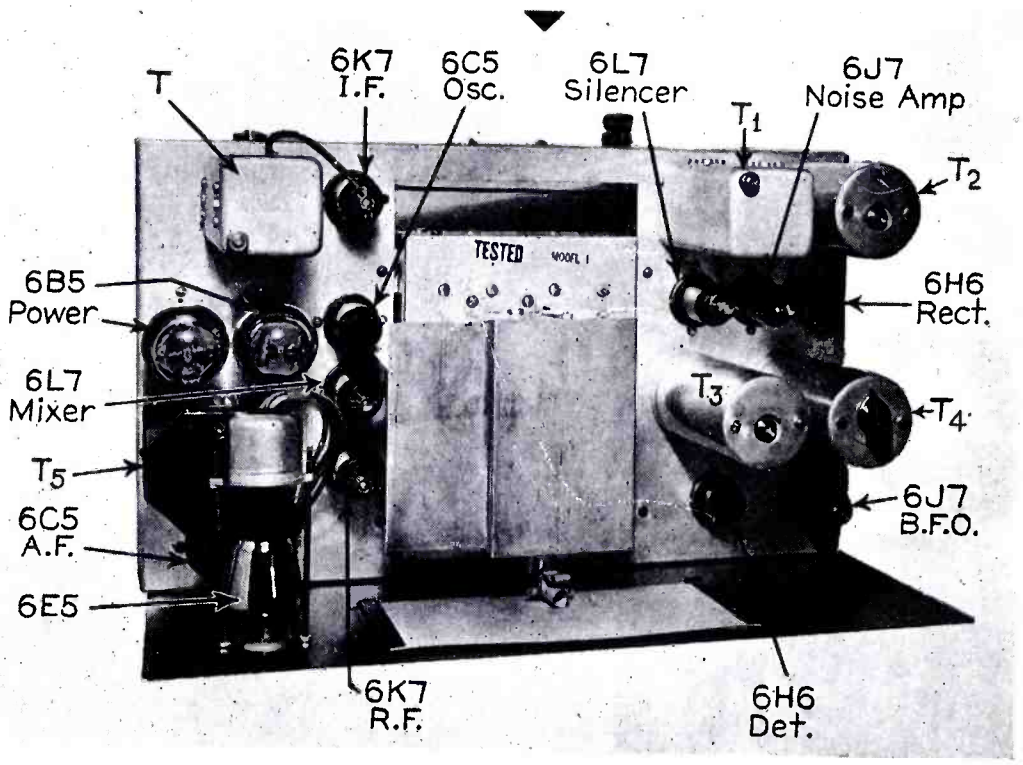
By Willard Bohlen and Chester Watzel

AN all-wave receiver is no longer an experimental piece of apparatus, hidden away in an attic or cellar workshop, but rather a musical instrument which can be matched to the finest of living-room furniture when desired.

Important Considerations

In order to obtain these results several important considerations must be taken into account and adequately taken care of. First is that of the outward appearance of the receiver. It should be housed in a neat-appearing cabinet with an attractive panel. It should also be possible to mount the receiver chassis and speaker in a console when it is desired to disguise it as a piece of furniture in order to keep domestic peace. Second is that of tuning: A calibrated dial, single-knob control and band switching are absolute necessities. Imagine if you can a dozen or two of coils reposing in the bottom of a console cabinet, to be plugged in every time a different member of the family wants a different type of reception. The third consideration is the minimization of fading and noise on foreign broadcast reception. Last, but not least, a surplus number of high-quality audio watts must be available to actuate the speaker, which must in turn be both large enough and good enough to give the best possible conversion of audio watts to high-fidelity sound energy.

When the receiver under discussion is to be a home-built job, a further consideration of easy construction must be kept in mind. While this receiver cannot, of course, be as simple as a little t.r.f. job, it can be made just as easy of construction, merely taking an appropriately longer time to finish. So don't let the large number of parts in this receiver scare you. We would rather build a super any day than a t.r.f. set, it's actually easier to get working properly once you get the hang of it.



Chassis view of the AWR-13, showing location of tubes and transformers. The chassis of the Tobe Tuner is in the center.

Special Tuning Unit

In designing this receiver the first two considerations, namely, appearance and tuning, must be taken together. This is because of the scarcity on the present market of different types of tuner units. A home-built tuner arrangement with calibrated dial and band switching is beyond the capabilities of all but a very few individual constructors. A commercially built tuner must of necessity be used and the one in this receiver is the Tobe All-Wave Tuner, this being the only complete tuner unit available. The incorporation of the Tobe Tuner into the design makes imperative the use of the standard Tobe panel, escutcheon plate and cabinet. These items fortunately

give the completed receiver an attractive and neat appearance.

The second consideration, that of minimized fading and noise, is a function of the circuit design of both the r.f. and the i.f. sections of the receiver. The r.f. section comprises the r-f amplifier stage, first detector and first, or high-frequency oscillator. The tuner again fortunately provides for an r-f amplifier stage. Without this stage the inherent noise level of the first detector-oscillator combination will be greater than the signal output of the first detector when a weak signal is being received, resulting in a very poor signal-to-noise ratio. The quietest i-f amplifier that can be built can do nothing to improve this ratio. The solution is to use an r-f amplifier stage to bring up the weak-signal output of the first detector to a point greater than the noise output. What is wanted, in other words, is as great an r.f. gain as possible and a correspondingly low i.f. gain. This point should be kept in mind at all times, both in the design and operation of not only this particular receiver, but of any superhet.

Metal Tubes Used

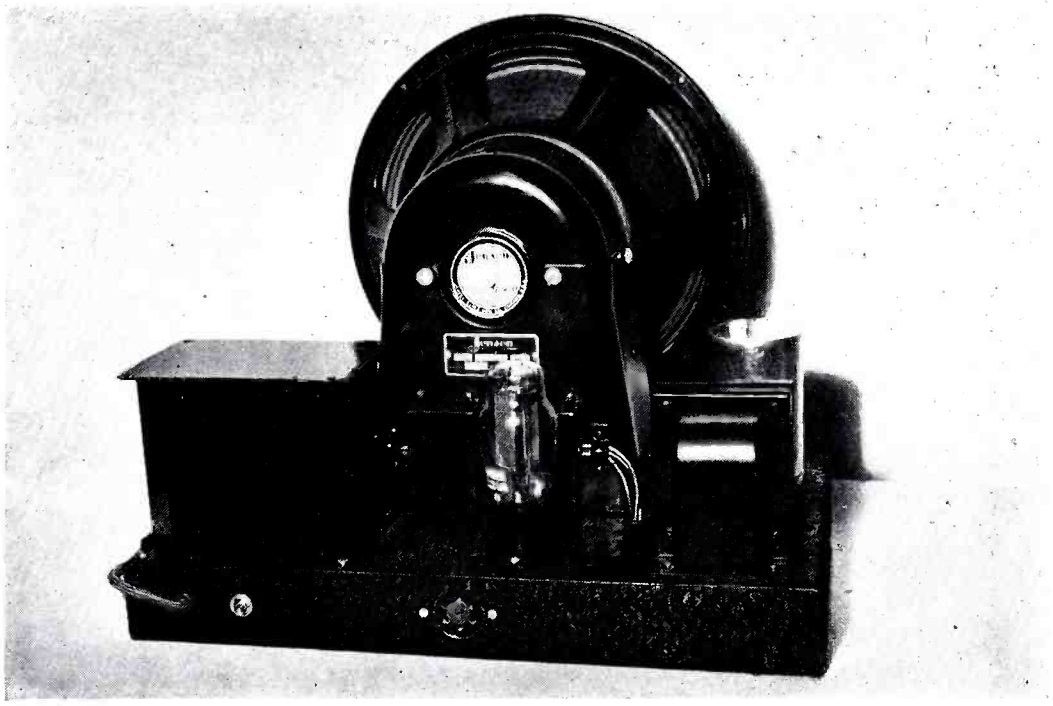
In order to keep the r.f. gain as high as possible metal tubes are used for the three high-frequency stages. Metal tubes present two great advantages for the high-frequency section of a superhet. First is the increased gain made possible by improvement in design over glass tubes, one of these being better shielding. Second is the use of the 6L7 type tube for the first detector or mixer. The 6L7 is probably the best mixer now available, being designed expressly for that purpose. Its use assures a high conversion gain from the first detector-oscillator combination.

The i-f amplifier makes its contribution to noise reduction in two ways: It provides enough adjacent-channel selectivity to exclude all undesired signals and whatever noise is present outside of the desired channel. In addition it includes in its circuit the noise peak suppression circuit, more commonly known as the noise silencer, in order to reduce in intensity such man-made noises as automobile ignition interference.

The selectivity problem is taken care of in this receiver by using a pair of variable selectivity i-f transformers, with the coupling of one continuously adjustable from the front panel. The degree of selectivity thus obtained ranges from that sufficient for fair single-signal effect in c-w reception at the one extreme to that sufficiently broad for high-fidelity at the other.

Noise Silencer

The noise silencer is the standard circuit which has been fully explained in previous issues of ALL-WAVE RADIO. It

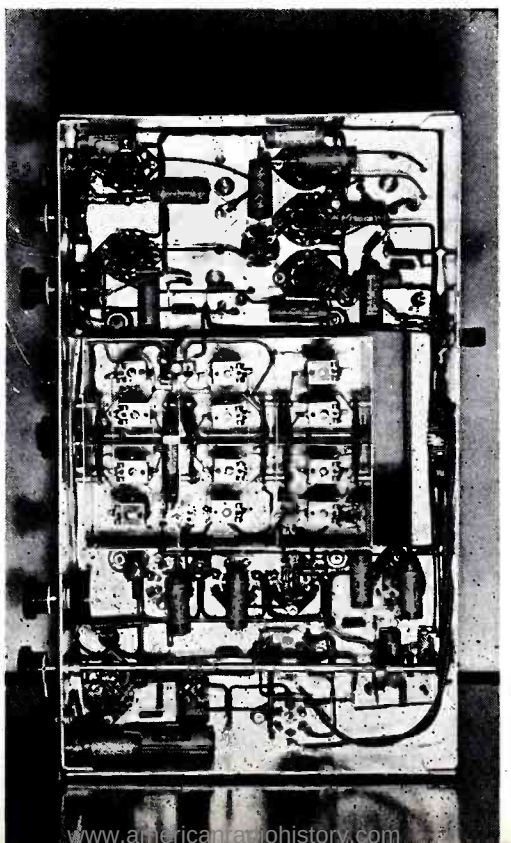


The power supply and speaker chassis for the AWR-13. The speaker is a Jensen.

will be noticed that a relatively large cathode bias resistor of 2000 ohms is used on the 6L7 control stage which is used as the second i-f stage. This reduces the gain of this stage and reduces materially the gain necessary in the noise amplifier stage, this change contributing greatly to the stability of the entire i-f circuit. In fact, the entire receiver from antenna to speaker is so stable that it is impossible to make any circuit oscillate even with the i-f transformer overcoupled for high-fidelity reception.

The second detector uses the justly popular 6H6 diode tube. This tube, in addition to handling large inputs without distortion, makes possible the production of the proper automatic volume control voltage for minimizing fading in the simplest manner. The beat oscillator when turned on produces a heterodyne whistle on all stations, which renders the location of weak fone or broadcast sta-

Under-chassis view of the AWR-13, showing layout of parts.



tions easy. It is loosely coupled from its cathode circuit to the center tap of the second detector diode transformer. With this loose coupling the heterodyne whistle will not be obnoxiously loud when hunting for weak stations. So that the beat oscillator will not overload the avc circuit and reduce the sensitivity while turned on, the beat oscillator and avc switches are combined into one toggle switch. Switching on the beat oscillator automatically turns off the avc circuit and vice-versa.

The Audio Circuit

The audio circuit is as simple as it is good. A single 6C5 triode feeds through a high-quality audio transformer to a pair of push-pull 6B5 power amplifier tubes. These 6B5 tubes are of recent design and present several unique properties not possessed by any other power tube. The 6B5 is actually two tubes in one envelope. The first section is a small triode, the second section being a high output power triode. The tube is very roughly equivalent to a 56 and a 2A5 in one envelope, or a 37 and a 6A3. A further advantage of the 6B5 is that the two sections are directly coupled internally in the manner of the familiar Loftin-White direct-coupled amplifiers so popular a few years ago. A further advantage of this arrangement is that the first section automatically provides bias for the second power section, thus obviating the necessity of a cathode bias resistor and accompanying large capacity by-pass condenser. The tube requires no grid driving power, the single 6C5 being adequate to push a pair of them.

Tests in various commercial laboratories show that the 6B5 is the best of the power tubes available, equalling in frequency response range any of the strictly Class A power tubes. It has in

addition a higher power gain than any Class A power tube, requiring less audio gain in the entire audio amplifier, which in turn makes for the complete stability of the audio system which is so necessary in a high-fidelity receiver. The pair of 6B5's as used in this receiver produce an undistorted output of over 10 watts.

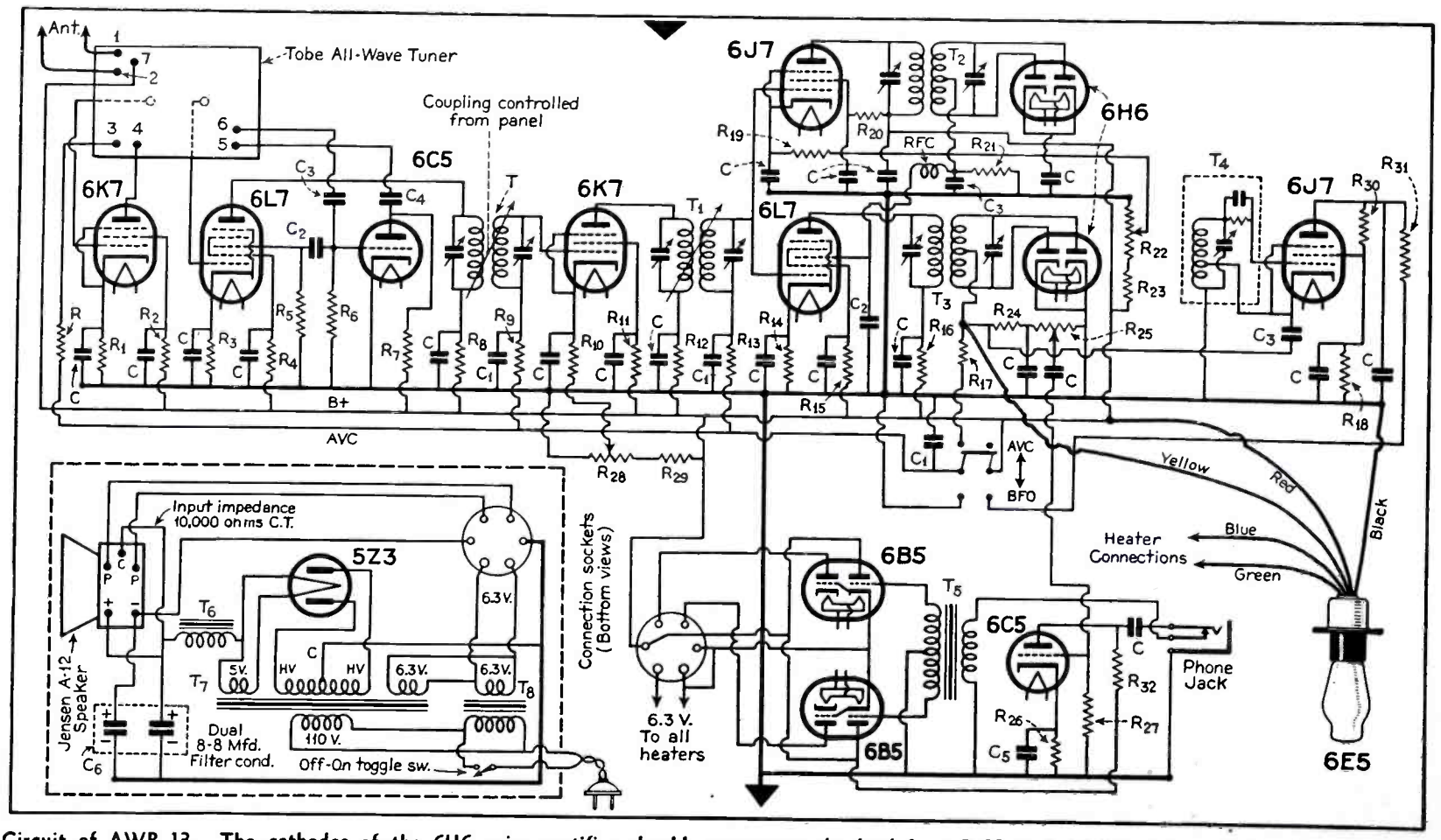
A fone jack is provided which is connected to the output of the first 6C5 audio amplifier. This permits of DX hunting with a pair of earphones by any person without disturbing the rest of the family. This feature is particularly useful late at night—or early in the morning. This circuit is so arranged that the audio gain control also controls the earphone output. Plugging in the fones automatically shuts off the speaker. The fone jack is dead as far as any voltages are concerned, eliminating the possibility of an annoying shock to anyone touching either the fones or the fone jack. In summer when the earphone user is pers-

LEGEND

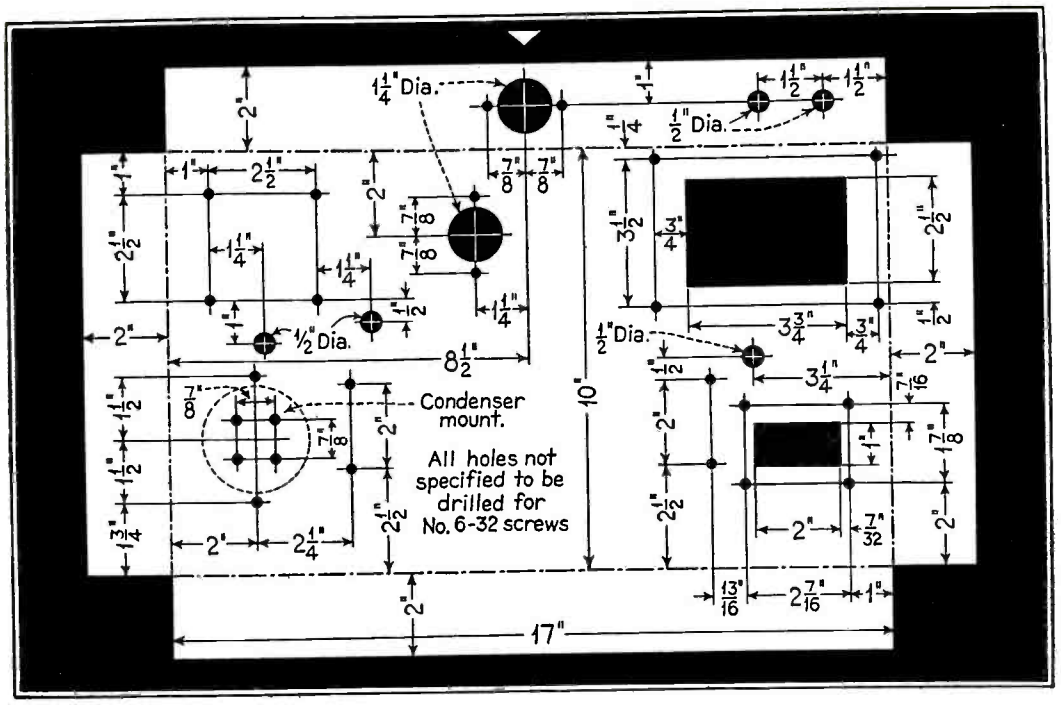
T —Hammarlund VT-465 variable coupling i-f transformer
T1—Hammarlund VT-465 variable coupling i-f transformer
T2—Hammarlund ATT-465-CT center tapped i-f transformer
T3—Hammarlund ATT-465-CT center tapped i-f transformer
T4—Hammarlund ATO beat oscillator transformer
T5—United Transformer Co. PA-132 audio transformer
T6—United Transformer Co. VS-2 swinging choke, 200 mil.
T7—United Transformer Co. PA-427 heavy-duty plate transformer
T8—United Transformer Co. PA-27 filament transformer, 6.3V.
C —Cornell-Dubilier .1 mfd, 400-volt tubular by-pass condenser DT-4P1 (21 needed)
C1—Cornell-Dubilier .01 mfd, 400-volt tubular by-pass condenser DT-4S1 (4 needed)
C2—Cornell-Dubilier .00005 mfd mica midget condenser
C3—Cornell-Dubilier .0001 mfd mica midget condenser
C4—Cornell-Dubilier .002 mfd mica midget condenser
C5—Cornell-Dubilier 5. mfd, 50-volt working electrolytic condenser.
C6—Cornell-Dubilier dual 8-8 mfd filter condenser, EA-8800

R —IRC 100,000-ohm, ½-watt resistor
R1—IRC 350-ohm, ½-watt resistor
R2—IRC 100,000-ohm, ½-watt resistor
R3—IRC 500-ohm, ½-watt resistor
R4—IRC 100,000-ohm, ½-watt resistor
R5—IRC 50,000-ohm, ½-watt resistor
R6—IRC 20,000-ohm, ½-watt resistor
R7—IRC 100,000-ohm, ½-watt resistor
R8—IRC 2,000-ohm, ½-watt resistor
R9—IRC 100,000-ohm, ½-watt resistor
R10—IRC 350-ohm, ½-watt resistor
R11—IRC 100,000-ohm, ½-watt resistor
R12—IRC 2,000-ohm, ½-watt resistor
R13—IRC 100,000-ohm, ½-watt resistor
R14—IRC 2,000-ohm, ½-watt resistor
R15—IRC 100,000-ohm, ½-watt resistor
R16—IRC 2,000-ohm, ½-watt resistor
R17—IRC 1-megohm, ½-watt resistor
R18—IRC 50,000-ohm, ½-watt resistor
R19—IRC 500-ohm, ½-watt resistor
R20—IRC 100,000-ohm, ½-watt resistor
R21—IRC 100,000-ohm, ½-watt resistor
R22—Electrad 5,000-ohm potentiometer
R23—IRC 50,000-ohm, 2-watt resistor
R24—IRC 50,000-ohm, ½-watt resistor
R25—Electrad 1-megohm potentiometer
R26—IRC 5,000-ohm, 1-watt resistor
R27—IRC 500,000-ohm, ½-watt resistor
R28—Electrad 50,000-ohm potentiometer
R29—IRC 100,000-ohm, ½-watt resistor
R30—IRC 100,000-ohm, ½-watt resistor
R31—IRC 100,000-ohm, ½-watt resistor
R32—IRC 50,000-ohm, ½-watt resistor
4—General Radio small knobs with pointers

1—Jensen Concert Model Speaker
6—National grid clips for octal tubes
2—Eby binding posts
2—6 prong speaker plugs
1—¼" Bushing
1—Hammarlund ganged variable coupling control (VTC)
3 feet of 6-wire cable with heavy wire for filament leads
1—A.C. cord and plug
1—Raytheon 5Z3
2—Raytheon 6B5
2—Raytheon 6C5
1—Raytheon 6E5
2—Raytheon 6H6
2—Raytheon 6J7
2—Raytheon 6K7
2—Raytheon 6L7
1—4 prong wafer socket
4—6 prong wafer sockets
10—Octal wafer sockets
1—Amphenol MSA-6 electric eye holder
1—Single-circuit-closed fone jack
1—20 millihenry r-f choke (R.F.C)
1—S.P.S.T. toggle switch
1—D.P.D.T. toggle switch
1—Tobe All-Wave Tuner, metal-tube type
1—Tobe metal panel and escutcheon
1—Tobe metal cabinet
1-14 gauge aluminum chassis for receiver, per drawing
1—Steel chassis for power supply, per drawing



Circuit of AWR-13. The cathodes of the 6H6 noise rectifier should connect to the lead from R-19 to R-22 instead of crossing it, as shown.



Details of the chassis for the power-supply unit of the AWR-13.

piring, touching the metal panel will not result in an uncomfortable tickling sensation.

An audio system is no better than the speaker it is used with, and this receiver is no exception to the rule. To match the high quality of the audio system a Jensen high-fidelity Concert Model speaker is used. This speaker faithfully reproduces all frequencies from 30 to 8000 cycles and will handle without distortion a full 10 watts output from the receiver.

Parts Layout

The layout of the components can be seen in the top-of-chassis photo. The three metal tubes directly to the left of the Tobe Tuner are the high-frequency tubes. The one nearest the panel is the r-f amplifier, a 6K7. The middle one of this group is the 6L7 first detector tube. The rear tube is the 6C5 high-frequency converter oscillator. The location of these three tubes close to the tuner provides very short leads and permits the dial to tune to its original calibration as shown on the calibrated dial card.

The transformer in the left rear corner of the chassis is the first interstage i-f transformer, T. The degree of coupling of the two coils inside of the transformer is controlled from the panel through a shaft and cam arrangement. The metal tube immediately to the right of this transformer is the 6K7 first i-f tube. The other variable coupling i-f transformer on the back of the chassis directly to the right of the tuner is the second interstage i-f transformer, T-1. The transformer directly to the right of this variable coupling transformer and in the right rear corner is the i-f coupling transformer connected between the 6J7 noise amplifier tube and the 6H6 noise rectifier tube. The three metal tubes directly in front of these two i-f transformers are, from left to right, the 6L7 second i-f tube, the 6J7 noise amplifier tube and the 6H6 noise rectifier tube. In front of these three tubes are two i-f transformers. That on the left nearest the tuner is the diode transformer coupling the 6L7 and the 6H6 second detector. That to the right is the beat oscillator transformer. Two metal tubes are mounted on this right side of the chassis next to the panel. The one on the left is the 6H6 second detector and that on the right the 6J7 beat oscillator tube. The audio system is in the left front corner of the chassis. The metal tube seen under the 6E5 electric eye tube is the 6C5 first audio tube. The audio transformer to the rear of this tube is the interstage audio transformer and the two glass tubes directly in back of the audio transformer are the two 6B5 power amplifier tubes.

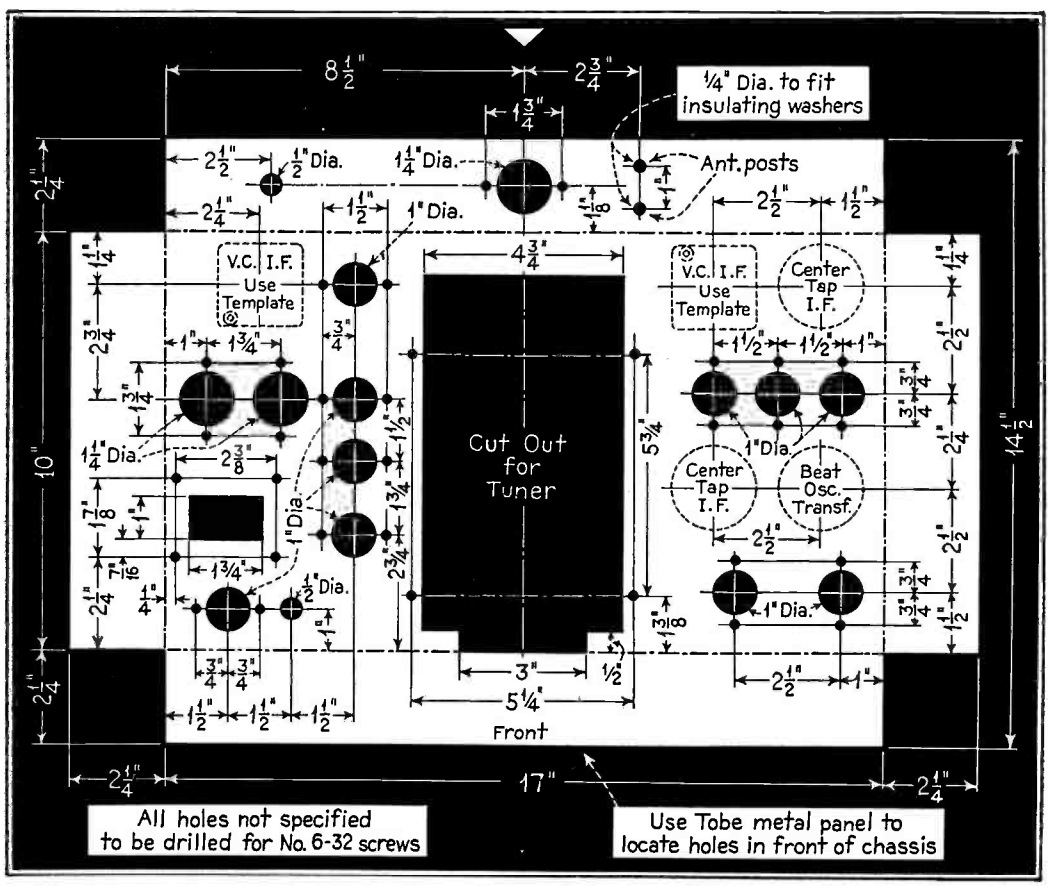
The controls on the panel are, from left to right, the fone jack and the selectivity control for varying the coupling in the first i-f transformer. Next in line is the i-f gain control. The two knobs mounted on the escutcheon are of course the tuning and band switching controls. To the right of the escutcheon is the audio gain control, the noise control for the silencer, and at the extreme right the toggle switch for avc and beat oscillator. The operation of this switch was explained before. On the back edge of the chassis are the two antenna binding posts and the power connection socket.

Constructional Details

The first step after drilling the receiver chassis is to mount all parts except the Tobe Tuner. The Tuner is next mounted according to the instructions in the booklet accompanying the Tuner. The panel should next be mounted and all controls put in place but not tightened. Now mount and line up the dial and pointers, again using the booklet for instructions.

The controls may now be tightened and the variable coupling mechanism installed, according to the instruction sheet accompanying the mechanism. The instruction sheet calls for a mounting bracket to support the back end of the shaft. As the chassis is not high enough to mount this bracket, a General Radio

[*Continued on page 252*]

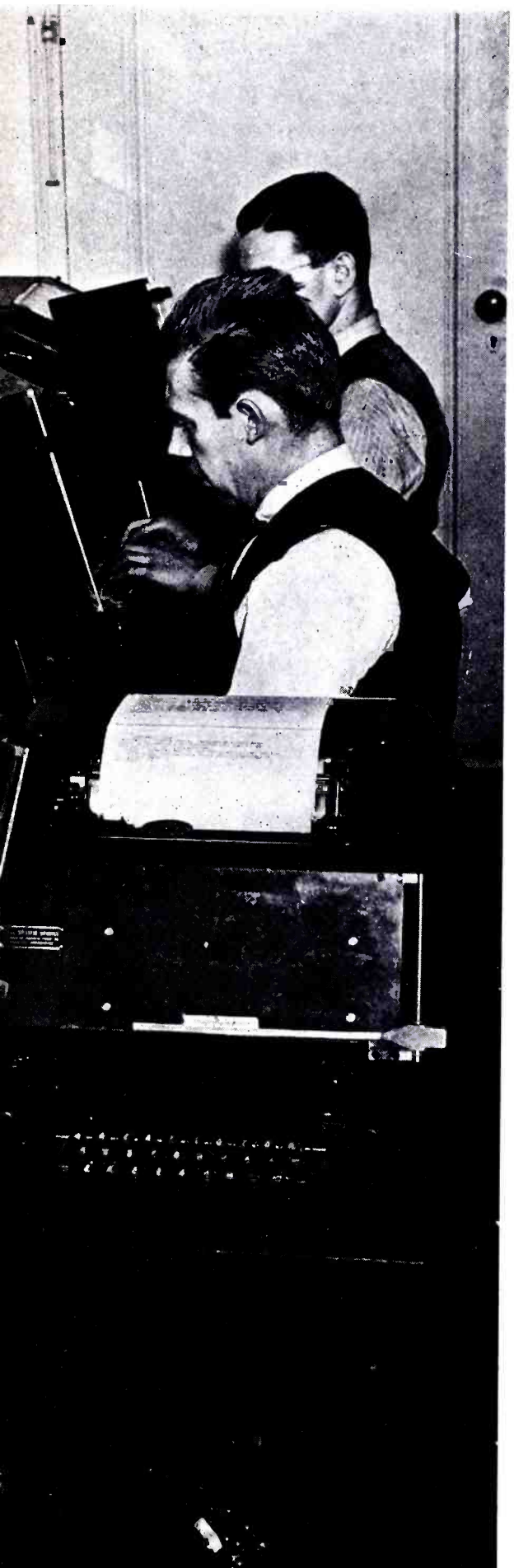


Details of the chassis for the AWR-13 receiver.

The Footloose Reporter

TRANSRADIO—

Teletypers



Caterer to the Fifth Estate

RADIO had its birth by broadcasting news before it had appeared in print, when election returns were flashed from KDKA. For over ten years after that, radio and newspapers got along like pals, until the Old Debbil Depression came along.

In 1930 the newspapers suddenly realized that while their revenues from advertising had dropped with a terrific thud, radio was waxing fat on profits. They started howling, naturally, and have been doing so ever since. Adding insult to injury, radio about that time was developing a new type of program, the news commentator, led by Floyd Gibbons, H. V. Kaltenborn and others.

These commentators were getting their news mainly from newspapers, cutting it down to fit their time allowance, and sending it out on the air. The cost of such news gathering was the price of one or more newspapers.

The newspaper publishers could hardly be blamed for getting hot under the collar about it, but for a year they contented themselves with calling radio dirty names. However, by 1931 they decided to clamp down on the upstart, Radio, and refused to publish broadcast listings or to give radio any publicity. The public, accustomed to finding radio programs listed in the newspapers, put up a howl, too, with the result that the listings were restored.

The Radio-Press fight continued, becoming more bitter, until the meeting of the American Newspaper Publishers Association in 1933. They took a firm stand and told Radio that it could not broadcast news unless the networks or the local stations did their own news gathering. The fight was on in earnest.

The public wanted news by radio, the stations wanted to give news broadcasts, but the papers said, "get your own news —stop stealing ours." Some of the stations created their own news staff, others obtained or bought news from the Associated Press, The United Press or the Hearst services. The publishers brought pressure to bear and the AP left Radio flat. The UP soon did the same.

The Columbia Broadcasting System organized its own news agency, the Columbia News Service, in the summer of 1933. It set up bureaus in key cities here and in Europe, an editorial staff headed by Paul White, veteran news man, and contracted for additional foreign news from a British agency. They were on their way, very successfully, but not for long.

There was dissension in Radio's own ranks. The National Broadcasting Company had no news-gathering service of its own, and was inclined to make terms with the publishers. Besides, there was the ever-recurring fear of newspaper agitation in favor of government ownership of Radio. These and various other reasons finally sounded the death knell for the Columbia News Service.

These two Radio Networks and the four Press Associations held many heated conferences and finally agreed on a Press-Radio Bureau. It meant that the Networks were to stop gathering news for broadcasting purposes; they were to use only news furnished them by the Press-Radio Bureau, which news could not be broadcast until after it had been published; and that "newscasting" was not to be sponsored. Also, the Networks were to broadcast news flashes twice daily in two five-minute periods, and were to urge listeners to read the daily papers for further details. The Networks signed the agreement and have kept it.

However, things were far from being peaceful; the independent stations, over four hundred of them, were yelling. They were not bound by the Press-Radio agreement, and the scramble for news was still on. Among the numerous news services that began operating at that time was one calling itself Transradio Press Service, Inc.

It was headed by Herbert S. Moore, who had been for years with the United Press and later served as editor with Columbia News Service, and still firmly believed such a service was practical. Rounding up as many of the C.N.S. men as possible, he started his organization and was ready to begin business one week before the Press-Radio agreement went into effect.

Transradio's New York headquarters coordinated its coverage east of Detroit, its Chicago headquarters supervised coverage of the Midwest; and the Pacific Coast and the eleven Western states news was handled through Los Angeles. Other news centers were set up throughout Europe, Asia and South America.

Their first thrill came a few days later, when John Dillinger escaped from Crown Point jail, and Transradio was first on the air with the story. Since that time they have signed up 250 broadcasting stations.

They have fully staffed bureaus in all the principal cities of the United States, staff correspondents in seventy major cities and eight hundred special correspondents in other cities and towns; and their own correspondents in London, Paris, Berlin, Rome, Geneva, Moscow, Shanghai, Tokyo, Mexico City, Havana, Buenos Aires, Honolulu, Manila, Rio De Janeiro, Panama, Montreal and Toronto.

Mr. Moore told me that he feels the publishers were justified in resenting radio's unauthorized use of their news. But he also believes that newscasting should not be a mere rehash of stale items which the listener has already read in the papers.

The function of Transradio is to present the news while it is still news, and in a concise, colloquial and dramatic manner, with absolute accuracy. That

Copy Chief

they have done so is proven by the fact that they were first on the air with flash news of all twelve of the events selected by the AP as the twelve biggest stories of 1934! They have maintained that pace ever since.

A newsman loves nothing better than making a scoop or beat and though, because of services such as the AP and UP render newspapers, the old days of scooping a rival paper are practically dead, the very nature of radio makes such a thing possible in Transradio Service.

They have a long list of such scoops to their credit, among them the Hauptmann verdict and execution. Among the many fantastic phases of that very fantastic trial, were the various stratagems devised by the 200 star reporters to get the verdict to their papers or organizations first.

Copy Desk

Long before the trial ran to its close, each one of the reporters decided that some sort of secret signal would be necessary if he was to get the verdict out of the locked courtroom first. Fifteen minutes before the verdict was given, it is said that the AP, in its anxiety to score a scoop, flashed the news that Hauptmann had been found guilty, with a recommendation for mercy. The AP's explanation of the error was "a mechanical failure in transmitting the verdict from one part of the courthouse to another." The following day the AP said, regarding the false verdict, that they had picked up a "wrong short-wave signal." It was probably as good an excuse as any.

Transradio's system proved the most successful. The verdict was returned at 10:44 P.M. and at 10:45 P.M., station WOR and other Transradio subscribing stations from coast to coast were on the air with the news.

Dixon Stewart of Transradio used what might be called the "Red, White and Blue method." Red for death, White for mercy, Blue for acquittal. Three blank pieces of colored paper were clutched in the perspiring hand of a rusty-haired messenger boy who stood at the locked door of the courtroom. His eyes were glued on Stewart who was down in the front of the courtroom among the newsmen.

The jury filed in and the foreman intoned the verdict. Stewart nervously wiped his forehead with a handkerchief as he listened. The handkerchief was red.

The messenger dived under the legs of a New Jersey State Trooper and slipped the piece of red paper under the door. By the time the trooper realized what was happening and had dragged the boy away from the door, the red

[*Continued on page 253*]

Globe Girdling

By J. B. L. Hinds

broadcasters' moving day . . . Siamese twins . . . moo-cow cuban controversy . . . bulgarian stations . . . japanese tests

MOVING DAY in the cities is about May 1st, but in short-wave radio it is a little before that date and sometimes runs beyond. This is evidenced by the rush of stations to the 31-meter band, and as a result some confusion exists there as well as on the 49-meter bands and other given points, by reason of the various changes.

Short-Wave Moving Day

Notwithstanding the additional stations assigned to the 31-meter band during the past few weeks, another new station, HJ1ABP is now operating on 9600 kc. XEME changed to 9520 kc, HJU to 9510 kc, and a new one—XGOX in Nanking, China, is on 9500 kc. HI5E, Trujillo, is assigned to 9500 kc; XEFF, on 6120 kc, advised over the air that they are changing to 9505 soon; HJ2-ABC, Cucuta, Colombia, from 5970 to 9575 kc. One listener says he recently heard HJ1ABB testing on or near 9500 kc, but the writer is of the opinion it was HJ1ABE, Cartagena, who is also testing on or near that frequency preparatory to moving there.

A similar condition of changes and confusion is found on the 49-meter band, especially around 6150 kc where some seven or eight stations have hung up their shingles. As a result of the crowding of stations in given frequencies, they are naturally shifting a few points one way or the other and as a consequence the actual operating frequencies are not in accordance with the assigned frequencies as shown in the station list. Perhaps the stations themselves know how this is to be worked out. So let us hope that time will remedy the situation.

MR. J. B. L. HINDS

A veri from PDM, Netherlands East Indies.

CO9GC Controversy

During the past 60 days or better there has been considerable comment about CO9GC, Santiago, Cuba, the writer taking part in the discussion in the March and April issues of ALL-WAVE RADIO. Many reports of reception were received and this station was heard clearly on both 6150 and 12,300 kc. Zeh Bouck, my worthy friend, and writer of note, contended that the higher frequency transmission was a harmonic of the fundamental, while the writer thought they were broadcasting on two frequencies from the fact that the station gave two call letters; namely, CO9GC and COKG, and stated that the latter call would eventually be used in broadcasting commercial programs, but still retained the first named call in their card replies.

Being unable to secure definite information from the station, I wrote the Secretary of Communications of Cuba, and now have advice from him to the effect that the signal heard on 12,300 kc was a second harmonic and that steps had been taken to remedy the condition. So, Mr. Bouck, with his technical knowledge is correct, and I take my hat off to him and offer my congratulations upon his ability, with good grace.

I am therefore changing the call on 6150 kc to COKG on the assumption that this will be done, although the Secretary of Communications speaks of CO9GC only in transmitting the information given above. The correspondence also establishes the fact that CO9WR, Sancti-Spiritus, Santa Clara, Cuba has been permanently assigned to 6280 kc from its old frequency of 11,800 kc.

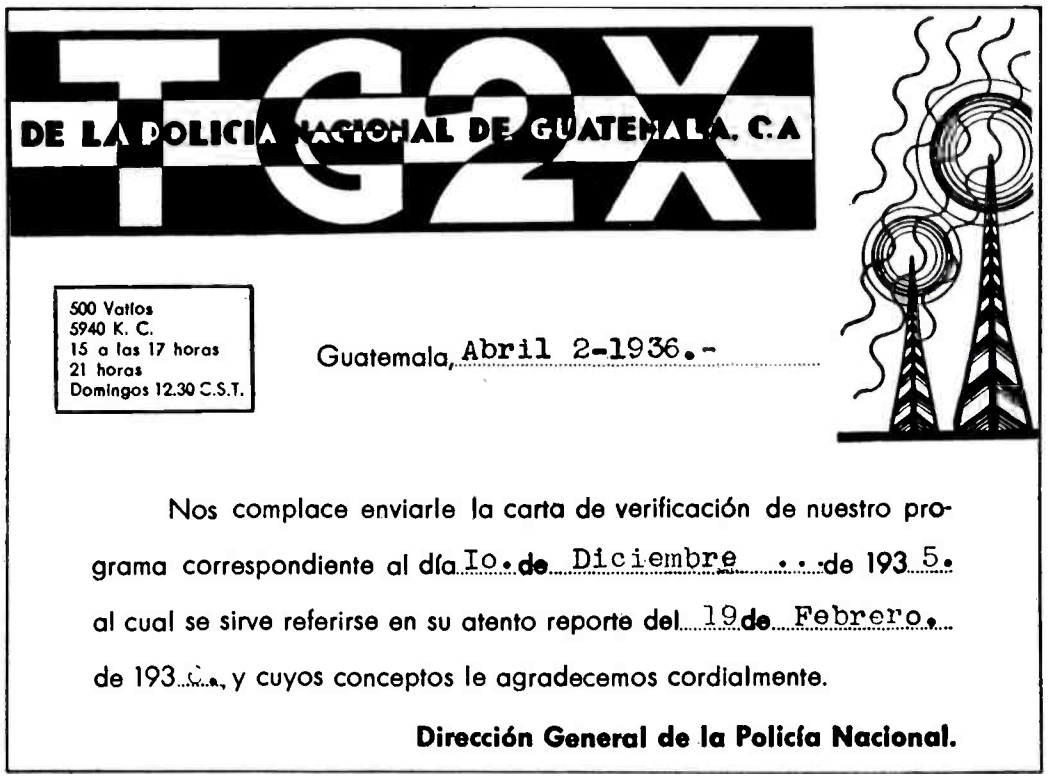
More on XEXA

Station XEXA, operated by the Secretary of Education from Mexico City advises that they are broadcasting on 6130 kc. They were formerly listed at 6180 kc. On account of so many reports showing the frequency other than 6130, it is shown in the station list at 6171 as that is closer to the actual operating frequency than 6130 kc.

Speaking of XEXA brings to my mind a recent request I received from Mr. R. Simpson, a reader of ALL-WAVE RADIO, and living at 80 Wilga Street, Concord West, New South Wales, Australia. He solicited my assistance in learning the identity of a station he had heard regularly on his 4-tube t.r.f. receiver, broadcasting each week-day between 8:00 and 8:30 A.M. E.S. Time. The broadcast opens with the musical selection, "March of the Toys," from Babes in Toyland, by Victor Herbert, and transmits a program of a physical exercise class. with piano accompaniment, and directed by a man speaking Spanish. The marching of the participants was plainly heard on each transmission, and Mr. Simpson, becoming more curious as the days went by, wrote to me. The station Mr. Simpson hears is XEXA. I made a copy of his letter and sent it to XEXA, with proper explanation, requesting them to reply to him, so as to save delay, and also advised Mr. Simpson accordingly.

Siamese Twins?

Mr. Simpson further states that he now has 134 verifications from 33 countries on short waves, all received on his 4-tube receiver, his latest pick-up being HS1PJ in Sala Daerg, Siam. An English news period was broadcast after which came the following announcement: "This is the experimental short-wave station HS1PJ in Sala Daerg transmitting on 27.38 meters 10,995 kc. All reports will be appreciated." Mr. Simpson heard them from 8:45 to 9:15 A.M., E.S. Time. Here is a station to listen for. Reports have been received from listeners in the United States hearing a station HS8PJ in Siam at the time mentioned, Dr. G. W. Twomey, of Minneapolis, being one of those reporting.



A blue and white veri from Guatemala. TG2X is the Police Transmitter.

Shorts

A contract between the Government of Peru and the Marconi Wireless Telegraph Company calls for the installation and completion of two broadcasting stations at Lima, Peru, by September of this year, one a medium-wave and one a short-wave transmitter, and each to operate with 10-kw power in the antenna.

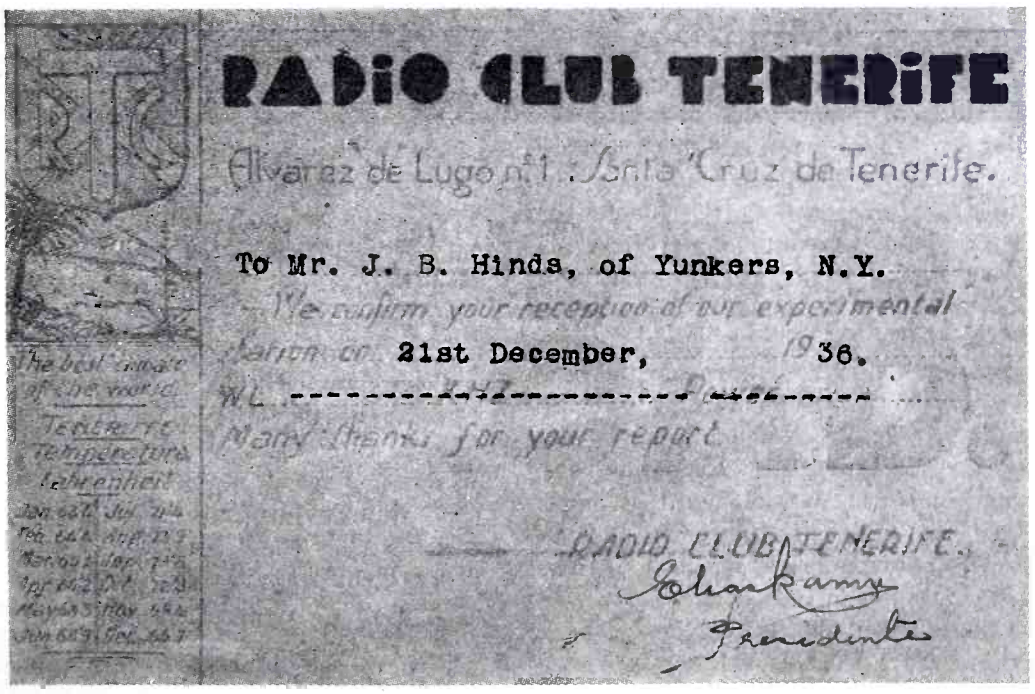
VE9DR is again carrying the programs of CFCF, Montreal, through the transmitter on 6005 kc, which makes it a bit difficult for the new Panama station, HP5K, to be heard on the same frequency.

Senor Antonio Zayas Bazan, Manager of COCH, Havana, Cuba, advises that on about May 15th they will have in operation on 9428 kc a new General Electric transmitter of 5-kw power.

The call of Germany's transmitter DJS on 12,130 kc has been changed to DZE, and DIQ on 10,290 kc has been changed to DZC.

The power of RNE, Moscow, 12,000 kc, is to be doubled within the next few months, and it is said that it will broadcast on both 12,000 and 6000 kc.

The United States State Department is forming an international short-wave circuit as a means of informing its far-flung diplomatic agents promptly of news developments in Washington, D. C. News bulletins of 1500 words will be broadcast nightly from Station NAA, Arlington, Va., in Morse code on the following frequencies: 15130-11730-9550 and 6120 kc. This information is given for use in calibration and also so listeners will know if interference occurs on these frequencies.



A veri from EA8AB, Canary Islands.

Bulgarian Stations

Through an authentic source of information, it is learned that preliminary work will be begun in Bulgaria this year in connection with the inauguration of a Bulgarian Broadcasting service. A 100-kw transmitter will be erected at Vakarel, a town some 25 miles from

Sofie. Two short-wave relay stations are also planned; one in Central Bulgaria, at Stara-Zagora, the other at Varna or at Burgas on the coast of the Black Sea.

The only short-wave station now operating in Bulgaria is LZA, mentioned in our April issue, which is a privately owned, low-powered station located at Sofie and operating on 14,970 kc or 20.04 meters. No reports have been received of its being heard in the United States.

Before reading this you may have heard the new transmitter of the Amalgamated Wireless, which owns the Australian short-wave broadcasters, VK2-ME at Sydney and VK3ME at Melbourne. This new transmitter is being established at Perth, the capital of West Australia and will have a range of from 20 to 50 meters. It is understood that the call is VK6ME.

Referring to YV9RC, Caracas, Venezuela, mentioned in my March article as being heard on 6400 kc, it is noted from the Department of Commerce bulletin that this station is assigned the frequency of 1010 kc with 200 watts power.

A revised list of Rugby, England, transmitters has been received and the changes and additions have been shown in the station list.

XEME, Merida, Yucatan, Mexico, has again moved from 8190 kc and is now shown in lists at 9520 kc.

Canary Island Broadcasts

A recent letter from EA8AB, Santa Cruz de Tenerife, Canary Islands, advises they are still broadcasting on Monday, Wednesday and Friday on 7245 kc —3:15 to 4:15 P.M. They contemplate broadcasting programs after 10 P.M., E.S. Time, for the benefit of late listeners, in which case due advance notice will be given.

Societe Haitienne de Radiodiffusion Port-au-Prince state that their regular programs are broadcast nightly over HH2S on 5910 kc. Transmitters HH2R and HH2T, 9545 and 11,570 kc respectively, are used only for occasional broadcasts.

Edward Startz, the genial announcer of PHI and PCJ, the "Dutch Twins," informs the writer in answer to an inquiry that the Sunday night broadcast of PCJ on 9590 kc is an hour sold to the Catholic Broadcasting Association over their transmitter, transmission originating at Amsterdam.

PHI on 11,730 kc has discontinued on that frequency and is now broadcasting on 17,775 kc or 16.88 meters daily except Tuesday and Wednesday, on which days experimental programs will be broadcast over PCJ on 15,220 kc.

YVI2RM, 6300 kc, Maracay, Venezuela sends a new veri card of bright colors which shows that the station is now known as "La Voz de Aragua" and also apprises us of the fact that Venezuela produces the best cocoa.

Verification cards from reception of TGWA on 9450 kc are being received but headed "TGW" although the frequency of TGWA is shown on the card. Mr. C. H. W. Nason, Technical Director of TGW Nacional, states that these cards are full verification even though no use of the word is made. The Government printing office said that *verification* is not a Spanish word and they would not include it.

Other recent veries received by the writer are: YNLF, Managua, Nicaragua; PPQ, Rio de Janerio, Brazil; ZFD Devonshire, Bermuda; JVE, Japan; XEME, Mexico, RV15, Khabarovsk, U.S.S.R.; HP5K, Colon, Panama; HRD, La Ceiba, Honduras; and EA8AB, Canary Islands.


RADIODIFUSORA NACIONAL

TGW

1.210 Kc.... 10,000 W.
9.450 Kc.... 200 W.

TELEFONO
Nº 2,227.

Agradecemos muy atentamente su interesante reporte.

Programas diarios: de 11 a 13, de 19 a 20 y de 21 a 23 horas.
Los dias sábados: de las 21 a las 5 horas.

República de Guatemala, 17 *de* [illegible] *de 193*6.

Another veri from Guatemala.

Japanese Overseas Tests

The overseas broadcasting tests are still being broadcast over JVP, 7510 kc, and JVN, 10,660 kc, on Mondays and Thursdays between 4 and 5 P.M., E. S. Time and various reports received indicating that they are heard consistently as well as JVM 10,740 kc in the early morning broadcasts.

The Central Executive Committee of Kuomintang, Central Broadcasting Stations, Nanking, China, informs us that they now have a 500 watt short-wave broadcasting station, call XGOX, in Nanking, radiating programs every week-day from 6:30 A.M. to 8:40 A.M. and on Sunday from 7:30 to 9:30 A.M. E. S. Time on 9500 kc or 31.58 meters.

Radio station YNLF, La Voz de Nicaragua, located at Managua is now broadcasting with 1-kw power on 6451 kc having changed from 5960 kc their former location. Their latest time schedule is shown in this issue.

A letter recently received from our friend, Antonio Funtes, of station HJ1-ABE, Cartagena, Colombia, advises that it is still operated by his brother, Rafael, who has just returned after a long illness and we are very happy to send our greetings and best wishes. HJ1-ABE's new 1000-watt Collins transmitter arrived lately, but badly damaged, being shipped together with some kind of acids. An explosion resulted and caused the damage mentioned. This will naturally delay the installation. The new transmitter will operate on 9500 kc, changing from 6115 kc or 49.06 meters. Tests are being made on 9500 kc and reports of reception being received. A new order issued by the Colombian authorities requires the installation and operation of 1-kw stations broadcasting on short waves; consequently certain stations will lose their right to operate and will soon be off the air.

HJU, Buenaventura, Colombia has settled on 9510 kc according to a verification card received. This station is known as "La Voz del Pacifico" and is operated by the National Railroads of Colombia.

The verification card in red, white and blue from HIG, Trujillo, Dominica, informs us that the cow "moo" is the identification signal of the station. The writer has heard a gentleman (?) snore quite loudly just before the announcements and is wondering if it is just another identification signal.

Dominican Stations

A new list of short-wave stations in Dominica shows the following additional stations and frequencies: HI2D, 6900

kc; HI7P, 6800 kc; HI8A, 6480 kc; and HI8Q, 6240 kc, all located at Trujillo. HI5E, Trujillo, is changed from 6900 to 9500 kc; HI3C, La Ramona, from 6900 to 6977 kc; and HI5N, Santiago, from 6475 to 6150 kc. The changes in frequencies and additional stations are reflected in May station lists.

Since revising the list of Dominican stations, I have letter from HI3U, Santiago de los Caballeros, advising that they are installing a new 100-watt Collins transmitter which they will operate, beginning the latter part of April, on 6015 kc instead of 6383 kc as listed. The theme song of this station is "Maria Lao," organ selection by Jesse Crawford. Their time on the air has been changed from 7:10 to 8:40 A.M., 10:40 A.M. to 1:40 P.M. and 4:40 to 9:40 P.M. on week-days, and 10:40 A.M. to 1:40 P.M. on Sundays.

A letter from station HC1PM, Quito, Ecuador, which was mentioned in March ALL-WAVE RADIO as being heard and not listed, states that they transmit each Tuesday from 9 to 11 P.M. on 5725 kc. At present this is a low powered station but a transmitter of greater power will soon be installed.

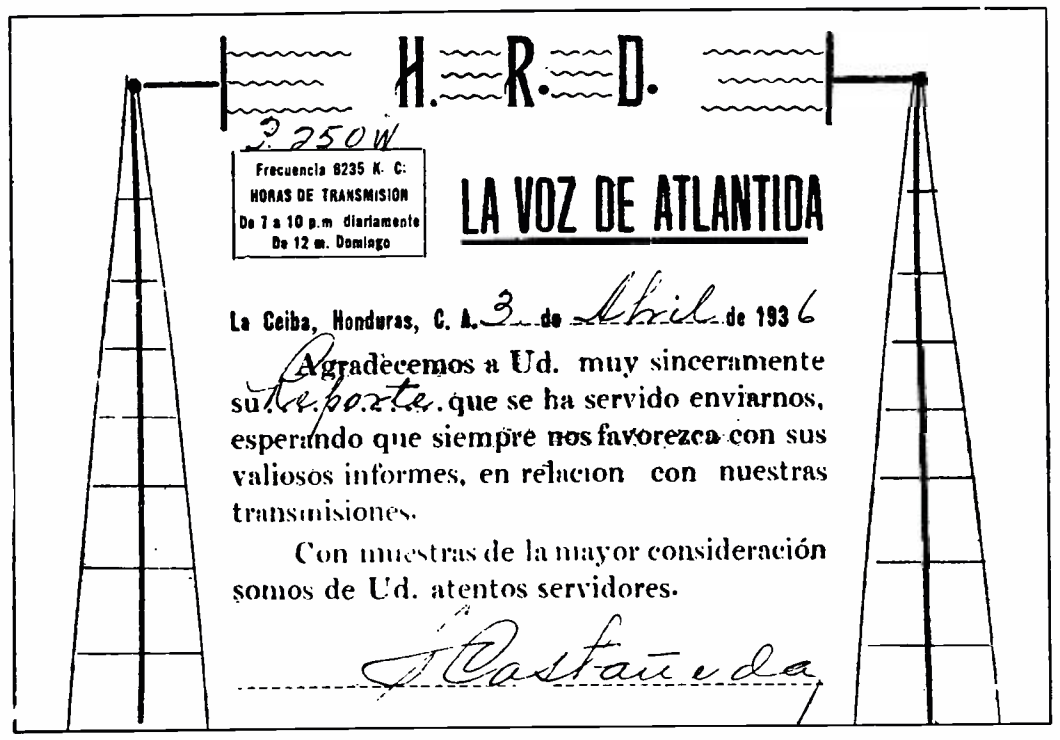
Deep, Dark List

The following stations are still backward in sending verifications: HJN, HKV, HJ3ABF, HJ3ABD, Bogota, Colombia; HRN, Tegucigalpa, Honduras; HC2CW, Guayaguil, Ecuador; HCETC, Quito, Ecuador; XBJQ, Mexico, D. F.; TIEP, San Jose, Costa Rica; CT1AA, Lisbon, Portugal; YNVA, Managua, Nicaragua; HJ4-ABD, Medellin; HJABB, Manizales; HJ1ABJ, Santa Marta, Colombia.

Amateur 'Phone Stations

I am listing below 20-meter amateur 'phone stations received during the past few weeks and reported to this department: K6LJB, Honolulu; YY2EA, Canal Zone; EA8AF, Canary Islands; CO6OM, Cuba; PZ1AA, Dutch Guiana; SU8MA, Egypt; HH5PA, Haiti; HI5X, Boca Chica, R. D., HP1A, Panama; LU6AP, Buenos Aires, Argentina; EA4AO, Madrid, Spain; VK2RB, Auburn, Australia; VO1I, Newfoundland; F8DR, Paris, France; VP2CD St. John's Antigua, B.W.I.; G5NI, Birmingham, England; K6CMC, Hawaii; EA2BT, Spain; VK7JB, Tasmania; VK2BQ, Australia; CT1BY, Portugal; VP6YB, Barbadoes; F8NH, France; OA4R, Lima, Peru, and G5SP, G5ML, G6QS, G6LK and G2DD, England.

Reports of far distant amateur stations received by readers will be gladly received. It is the thought of the writer that an abbreviated report could be made in these columns each month. Suggestions will be gratefully received.



A veri from Honduras. A Collins transmitter is used at HRD.

From the Dominican Republic—printed in blue and red.

Acknowledgment

I take pleasure in acknowledging the many fine reports and letters received from Mr. L. R. McPherson, Chicago, Ill., Leonard J. Bogert, Hillsdale, N. J., John W. German, Pittsburgh, Pa., Bernt Peterson, Philadelphia, Pa., Jack Gulick, Yonkers, N. Y., Frank W. Dowler, London, Ontario, Canada, Alfred Gudanes, Brooklyn, N. Y., Edward A. Bouck, New York City, E. C. Hunter, Kennett, Mo., H. E. Wykoff, Camp Roosevelt, Fla., S. P. Herren, Haskell, Tex., Troy Welper, Jackson, Mich., Ashley B. Wood, Jr., Bangor, Me., Donald Stroetzel, Geneseo, N. Y., John A. Kovach, Jr., Bronx, New York City, John G. Ruggier, Detroit, Mich., A. G. Bauernfeind, Green Bay, Wisc., Frank Emerson, New Haven, Conn., Gorden C. Fess, Rochester, N. Y., Freedom W. Vaara, Boston, Mass., J. M. Richards, Los Angeles, Calif., George D. Sallade, Sinking Spring, Pa., Ben Sweet, Bridgeton, N. J., Raymond Swenson, Rockford, Ill. and many, many others whose names have been listed previously and who have continued to furnish information of value to the readers. The expressions of good will and praise are greatly appreciated by ALL-WAVE RADIO and the writer of this department. It is through your assistance that ALL-WAVE RADIO will improve.

Reports of receptions, changes in time schedules, calls and matters pertaining to stations should be sent to me at 85 St. Andrews Place, Yonkers, New York. Questions of a technical nature should be sent to Queries Editor, ALL-WAVE RADIO, 16 East 43 Street, New York City, N. Y.

Night-Owl Hoots

By Ray La Rocque

comes the static . . . fcc quota list . . . the flood broadcasts nix on south-american split frequencies . . . veri confusing

WARMER weather! The call of the great open spaces! Electrical storms! Increased static! Very rare is the DXer who will stick to the old receiver throughout the summer in spite of all these detracting influences. There remains just about one more month of DXing in which he will take inventory of what has been accomplished in the season just past. If he has set a goal and it has not yet been reached, every opportunity will be grasped to add another station to the log so that the goal will be crossed before the curtain falls on the DX season of 1935-36.

There will be a few "dyed-in-the-wool DXers" who will keep at the post throughout the sweltering summer months and still a smaller number of them who really enjoy DXing with static at its highest. Perhaps this year the number will be greater than ever as this season, the poorest ever experienced by most of us, has been marked by the presence of a great amount of static, even on the coldest mornings, and most of us are now accustomed to bad conditions.

RAY LA ROCQUE

Picture-postcard-veri from old Tampico.

FCC Quota List

The past DX season has seen more new stations take the air than in all the five previous seasons totaled together. One of the major reasons for this fact is the division of the quota assignments into day and night listings by the Federal Communications Commission. The Commission formerly had only one listing for the entire 24 hours of the day, but two separate listings, one for daylight hours and one for the hours of darkness were adopted over a year ago. As the stations' signals do not reach as many people during the day, the number of quota units allowed each state during the day is nearly double the amount allowed during the night hours. Roughly speaking, quota units equal a certain amount of power in watts allowed each state; the number varying according to the population of each particular state. The advent of this change made room for the several new stations licensed to transmit during the daytime, and for the many increases in daytime power by stations already operating.

The latest FCC list of Quota Facilities Due and Assigned to broadcast stations has many startling revelations. The state of Utah, although it has only three stations, is 110 per cent over its assigned quota in the night listing. Louisiana, with a rating of 105 per cent over quota for night broadcasting is the only other state which is more than 100 per cent over quota. The highest over quota state in the daytime listing is Nebraska with 82 per cent. It is not likely that the FCC will grant any permits for new stations in these states. However, there are states which have not used up all the units assigned to them, and it is in these states that future new stations will probably spring up. Mississippi is in line for the largest increase in the night group because it is 48 per cent under the assigned quota.

Wyoming follows closely, being 41 per cent under quota for night broadcasting, and surpasses all others in the daytime listing by being 68 per cent under quota in that division. Vermont is the only state in either division having used up exactly the number of units allowed it in the daytime listing. Summing up everything the list shows us that at night there are 29 states over quota and 19 under quota, and in the daytime the situation is just about reversed with 29 states under quota and 18 over quota with one even.

Stations Help Flood Victims

Once again radio comes to the front. During the recent flood catastrophe throughout the East even the commercial broadcast stations relinquished their valuable time to assist the amateurs in forwarding messages when all other means of communication failed. It is impossible to list all the stations, inasmuch as practically every station in the flooded area did its part, but special mention is due to two of the midwest's greatest stations for their help in raising money for flood relief. WLS, the Prairie Farmer station, in Chicago, utilized their Saturday night Barn Dance program for that purpose, and WHO, in Des Moines, Iowa, conducted a program of a similar nature with many local artists, including Gene & Glen, taking part in the show.

Veri (Very) Confusing

Add to amusing experiences: We recently heard WCHS in Charleston, West Virginia on a DX program and wrote to them asking for verification of reception. About two weeks later a verification arrived from WCSC in *Charleston, South Carolina,* verifying reception of their DX program of the same date and time which we heard WCHS. The similarity of the call letters and location of both stations must have caused the old P. O. Dept. to slip up on this one—and WCSC must have been very careless in checking the report, or they would have found it incorrect.

A tip for those who have not heard the new KRNR in Roseburg, Oregon . . . they will remain on the air with election returns till 3 A.M. on May 16, according to the Canadian DX Relay. KRNR operates on 1500 kilocycles with a power of 100 watts—a real catch on the east coast!

Kilocycling Around

All the South American countries (except Brazil) agreed at the last Radio Convention down in Buenos Aires to refrain from operating on split frequencies. Not so good for us up here in North America. Some of these Latins could be heard squeezing in between some of our smaller stations, but now that they are on

A veri from XEAQ. The bands in the upper right corner are red and green.

the same frequencies it will be a greater task to log them. . . . The deep tones of Doctor Brinkley's voice interrupted for a 15 minute period every hour by the coarse and rather loud voice of the eminent "slip a dollar into an anvelope" astrologist ALMA, apparently did not harmonize with CHNS's transmissions on 960 kc. The Halifax station remained less than a month on that frequency and is now back at their old stand on 930 kc. . . . WDBJ has permission to step up their power to five kilowatts. KID will increase from 250 watts night, 500 watts day to 500 watts night and 1000 watts day. . . . XEFW, in Tampico, Mexico, send out a very colorful verification. Envelope and letterhead bear a cartoon in three colors with the call very prominently displayed. Included with the letter is a picture card showing a bird's-eye view of Tampico. . . . WROL, in Knoxville, Tennessee, on 1310 kc, is contemplating a regular Sunday morning DX program. The decision depends upon the response to a recent broadcast. . . . CMBX is now operating on 1070 kc, using all new equipment. They have a very good quality signal. Reports should be addressed to 190 San Miguel Street, Havana, Cuba. . . . The North Side Broadcasting Company has secured permission for a new station in New Albany, Indiana, to operate daytime only on 1370 kc with 250 watts. . . . KFPM the only low power station left in this country (15 watts) seeks to increase power to 100 watts and change frequency to 1420 kc. They also request the call KVOG. . . . America will have another super-power transmitter if WHO, in Des Moines, Iowa, is granted its request for 500 kilowatts. . . . Here's an odd request, gleaned from the FCC releases: Someone in Villa Grove, Illinois, applied for a new station to be operated on 1210 kc, *5 watts* day, *as many watts as allowed* at night. The application was returned because it was not in proper form! . . . Many thanks to the Canadian DX Relay, the Globe Circlers Radio Club, and the Quixote Radio Club for mentioning this column in their bulletins.

BOOK REVIEW

THE RADIO HANDBOOK, for Amateurs and Experimenters; 1936 Edition, by Frank C. Jones. Published by Pacific Radio Publishing Co., San Francisco, Calif. 6 x 9 inches, 360 pages, profusely illustrated, stiff paper cover. Price $1.00.

The Second Edition of *The Radio Handbook* is considerably increased in size and scope. The forepart of the book deals with learning the code, the fundamentals of electricity and radio, and the less complex calculations of electrical values.

There follows a well rounded chapter on the operation of the vacuum tube which should be of particular value to the layman.

The chapters covering receiver design and construction have real meat in them. Every conceivable type of receiver is covered and in each instance circuit values and coil winding tables are provided.

The next section of the book deals with the theory of c-w telegraphy and the design data on transmitters for this service. There are special sections covering keying, circuits for the elimination of key clicks, crystal-controlled and self-excited oscillators, doublers and buffers, and power-amplifier stages. Designs start with simple, low-power one-tube transmitters and run up to one-kilowatt multi-tube jobs. All essential

[*Continued on page 250*]

Channel Echoes

By Zeh Bouck

comments on news commentators . . . radio and the election

AMONG the hundreds of letters received every month by W1XAL from foreign listeners, are many praising their news broadcasts (daily except Saturday and Sunday, at 5:30 P.M. E. S. T., on 11.79 megacycles), particular emphasis being placed on the fair and square attitude of the commentator and the absence of all advertising. (W1XAL is the non-commercial broadcasting station of the World Wide Broadcasting Foundation, Boston, Mass.) Foreign listeners, it appears, especially those in Great Britain, object to the advertising in our sponsored news broadcasts.

W1XAL achieves a nice balance between devitalized bulletins and the over-personalized versions of Boake Carter—plus, of course, the elimination of the commercial element. Boake Carter is endowed with the innate qualities of a first-rate news commentator. He has voice and personality. Unfortunately, the latter too often runs away with his nose for news. Not that we should want a newscaster devoid of personality and his own opinion (whether we agree with it or not). Such a man would be about as interesting as a newspaper without a soul—its editorial policy. But Boake Carter's personality is too weighted with ego, and the implication in his every word is that the whole world agrees with his opinions.

Also, the publicity in his programs is not particularly palatable. It is injected in a sly, underhand manner that many listeners find much more objectionable than an honest plug before and after the news programs. We have heard this commentator slide, in some incomprehensible and devious manner, from a news item concerning the recent elevator strike in New York City, to Philco radios. The legerdemain was complicated and reminded us of the classic proof that a lazy dog is the same as a piece of ruled writing paper . . . to wit: A lazy dog is a slow pup; a slope up is an inclined plane; and an ink-lined plane is a piece of ruled writing paper! Q. E. D.

◆ ◆ ◆

DIGGING OURSELF out from the equinoxial flood in an effort to salvage a typical

ZEH BOUCK

post-flood portrait . . .

complement of cellar-stored treasures, we ran across a file of photographs accumulated in a score of years of radio peregrinations. Most of them are of historical interest—many amusing. The accompanying photograph is both. A year subscription to ALL-WAVE RADIO to the first reader who can identify this group. A few hints: Well over a decade ago, when this picture was taken, this group was the most popular on the air. Radio today is largely the result of their efforts—but they pioneered much better than most of those that followed. Some of the group are still on the air. One of them is today a famous orchestra leader—at least one of the group has signed-off for all time.

◆ ◆ ◆

ABOUT AS MANY times as we have been assured that television is just around the corner, have we heard or read the declaration that this is a presidential year, and that "radio will elect the next president." The first assertion we cannot deny—the truth of the second is highly doubtful. But even "Beat Note." for whose acumen and ratiocination we have the highest respect, falls into this fallacious thought.

Radio will absolutely have no influence upon the result of the election of the next president—one way or another. As a matter of almost certainty, the die already has been cast, for or against Mr. Roosevelt, and all the campaign speeches between now and November 3rd, whether stumped or miked, will not throw a grain into the balance.

A Republican or a Democrat will be elected this year for exactly the same

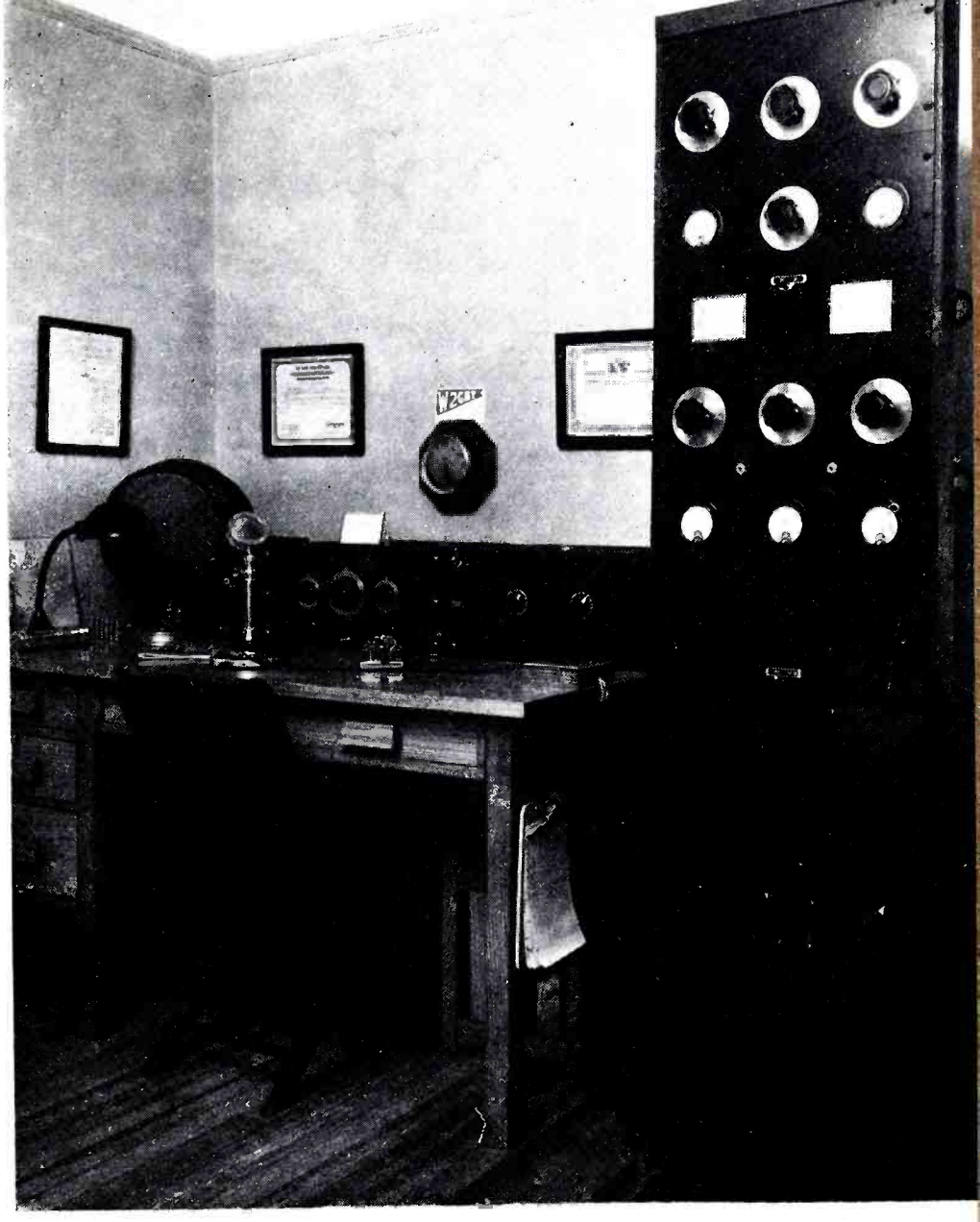
[*Continued on page 249*]

A TEASER FOR OLD TIMERS

W2GNT—

The Station With a Dialect

By C. F. MULLEN



Station W2GNT. On the desk are the receiver, speech amplifier and microphone. To the right of the desk is the complete 20-meter transmitter, operated with only 85 watts input.

IT takes all kinds of men to make the world of Ham Radio. There are youngsters and oldsters, there are doctors, dentists, lawyers, musicians—and there are manual training teachers.

Frank McKenna, Jr., of 447 Highland Ave., Palisades Park, New Jersey, owner and operator of station W2GNT, is the teacher of manual training in the Englewood (N. J.) Junior High School. Frank, who is known as "Mac" to the gang, is also instructor for a number of drum corps.

Mac's station is located on the west slope of the Palisades. Anyone approaching the house cannot fail seeing the non-directional V-type antenna with Zepp tuned feeders which has done so well for Mac in helping him get out and *into* places.

The complete station layout is shown in the accompanying photograph. All the apparatus was built by Mac, including the oak desk, which is not surprising seeing that Mac is a manual training teacher.

The Transmitter

On the right is the transmitter proper. The panel at the top of the rack carries a Collins antenna tuning unit. Below this is the final amplifier which is a pair of 801's in push-pull run at 85 watts input. Then comes the exciter unit which is composed of a 59 tritet with 80-meter crystal, a 46 doubler to 20 meters and a 210 buffer. Directly beneath the exciter unit is the meter panel, and below this the Class B modulator with a pair of Sylvania carbon-plate 210's. The next two units down are the 600-volt power supply for the exciter unit and the 700-volt power supply for the modulator and final amplifier.

The Receiver

On the left of the desk is the loudspeaker and frequency monitor, and in the center the receiver. This is an 8-tube single-signal superheterodyne with regenerative r-f stage, mixer, high-frequency oscillator, regenerative r-f stage, push-pull second detector, beat-frequency oscillator and pentode audio amplifier.

On the right side of the desk is the speech amplifier. This employs a 57-triode-connected to a 57 triode-connected to a 56 triode. The 56 feeds a pair of 45's in push-pull which in turn are coupled through a 500-ohm line to the Class B modulators. A crystal mike is used.

Mac's Dialect

Mac works W2GNT on 20 meters and sticks pretty close to fone. Possibly this is because his audience demands it, for Mac is master of a peculiar form of dialect of the Arthur Kober variety. He is wont to hurl this patter at anyone who gives him a shout, and has been known to leave many hams altogether speechless. But, from what we hear, W2DOZ gets the brunt of it. The stuff is so god-awful that it is fascinating to listen to. Where Mac picked it up we don't know, but it has the flavor of New York's lower east side, plus a touch of the Russian immigrant.

Mac has done some swell work on 20, and with only 85 watts input. He has worked ON4PA in Belgium every afternoon at 5 for three weeks straight. He recently gave ON4PA a message for a relative in Persia and had an answer via ham radio in 18 days.

Mac gets reports of R7 to 8 from LU6AP in Argentina, and has worked Australia three times, with reports as high as R9 from VK2AZ who was on fone during these QSO's. Also had a report of R9 from G5NI in England, R7 from NX2Z in Greenland, R8 from EA2BT in Spain and R5 from K6LJB in Honolulu. Pretty good with no more than 85 watts input and minus the dialect!

Power Supply for the "AWR 2-3" Xtal Transmitter

WHEN the AWR 2-3 Transmitter was tested for last month's article, a 600-volt power supply from another transmitter was used for the high voltage tests, a 250-volt receiver power supply being used for preliminary tests. This month we are describing a power supply which is built on a standard rack panel and chassis to match the transmitter in appearance. In order to make this power unit more versatile in use, two different power transformers were used. That shown in the photo and diagram gives an output from the unit of either 590 or 275 volts at 300 to 350 mils current. This makes the power supply suitable for running both the r-f final amplifier and modulator of a fone transmitter using 210's, 801's, or similar tubes. The total wattage that can be taken, using this larger power transformer, is nearly 250.

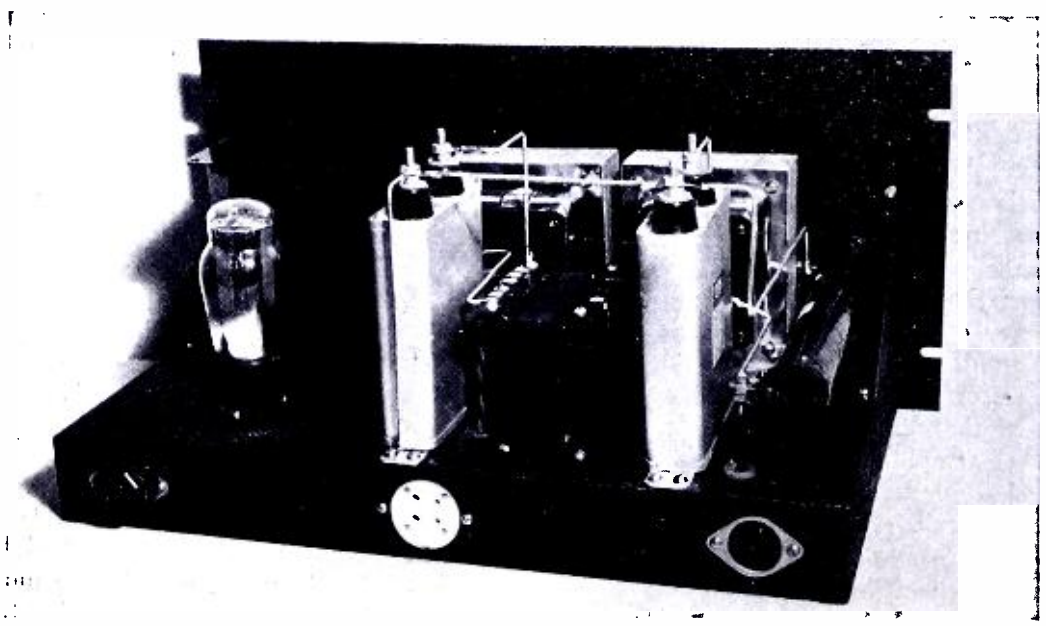
LEGEND

1—U.T.C. Plate Transformer Type CS-205. (T-1) (See text)
1—U.T.C. Plate Transformer, Type 1 PA-110. (T-1) (See text)
1—U.T.C. Filament Transformer, Type OT-4. (T-2)
1—U.T.C. Swinging Choke, Type CS-305 (Ch)
1—U.T.C. Smoothing Choke, Type CS-302 (CH-1)
2—Cornell-Dubilier 1000-volt, 2-mfd Condensers, Type TA. (C-1, C-2)
1—Ward Leonard 50,000-ohm, 160-watt Bleeder Resistor (R-1)
2—Hammarlund Type S-4 Isolantite Sockets
1—Raytheon Type 5Z3 Rectifier Tube
2—A-C Flush Receptacles
1—S.P.S.T. Toggle Switch
1—D.P.S.T. Toggle Switch
Miscellaneous hardware.

Power Supply Transformers

For use with the AWR 2-3 Transmitter only, a UTC Type PA-110 plate transformer should be substituted for the Type CS-205 shown. The power unit will then give either 400 to 500 volts at 200 mils. No other changes whatever are necessary. The mounting holes and cutout shown for the large plate transformer on the chassis layout should, of course, be changed to suitable dimensions for mounting the small transformer. The 400-volt output is useful for running 46's or 59's in Class B audio. If the 500-volt output is used instead, the 46's or 59's will turnish enough audio to modulate about 80 watts input to the Class C amplifier for voice work without detriment to the tubes.

The green pilot light at the left of the panel indicates that the adjacent filament switch is on. The red light at the right does the same for the plate switch. In order to prevent throwing plate voltage on the rectifier and transmitter tubes when the filaments are not lit, the two switches are hooked in series. In this way the filament switch must be turned on before plate power can be applied. If the filament switch should be turned off accidentally the plate power will automatically go off at the same time.



Rear view of the power supply for the AWR 2-3 Xtal Transmitter . . . neat and compact.

Power Control

Looking at the back edge of the chassis the a-c receptacle at the right is for the main a-c line input.

The receptacle at the left corner is hooked in series with the plate switch. If the power supply is located adjacent to the receiving position, a shorter a-c plug can be placed in this receptacle and the plate power controlled from the panel of the power supply. When the supply is located at a distance from the receiving position, a switch can be mounted near the key and plugged instead into this receptacle. This will give convenient control of the transmitter during operation.

Wiring

No particular precautions need be observed during wiring other than to see that all wiring is well insulated to withstand the high voltage. Stiff tinned bus was used for the above-chassis wiring and No. 14 tinned, stranded rubber covered wire below the chassis Rubber grommets were used where wires pass through the chassis.

When first testing the supply after completion, it is a good idea to hook an ordinary electric-light bulb into the extra control a-c receptacle temporarily so that a mistake in wiring or a high voltage short will do no more damage than to light up the bulb to greater brilliancy. If everything is O. K. it would be a

By
Willard Bohlen • W2CPA
and
Chester Watzel • W2AIF

good idea to take the light bulb out of the circuit, replace it with the shorted a-c plug or the external control switch and turn the whole supply on for a few seconds. Then turn the plate switch off and short the bleeder resistor, R-1, with a piece of *insulated* wire. If no spark or else just a tiny one is observed, the bleeder is O.K. But if a very heavy spark is seen it means that the bleeder is open. In this case handling of the supply or transmitter with an open bleeder will result in a nasty shock when the power is turned off.

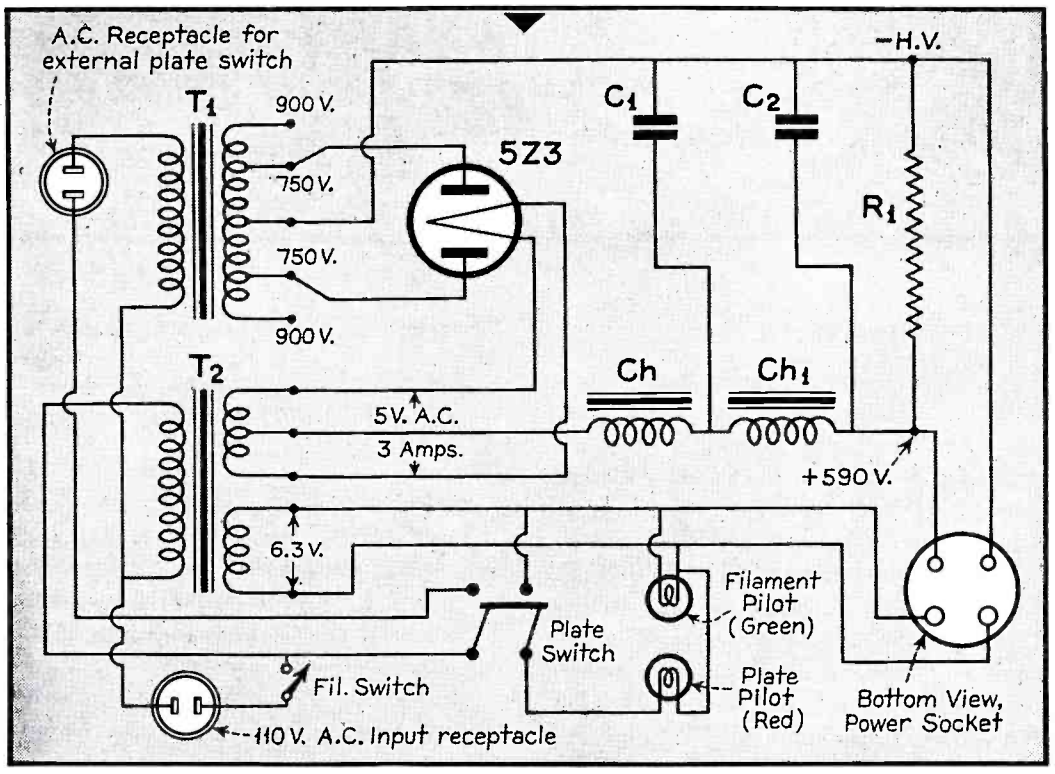
Transmitter Coil Connections

The connections of the doubler and quadrupler coils for the second section of the RK-34 in the AWR 2-3 Transmitter were not fully explained last month. It will be noted that in the diagram there is shown a bottom view of the doubler (quadrupler) socket with three connections to it. The 50-mmfd APC trimmer, C-5, is connected between the connection marked "to grid of second section of RK-34" and the second grid of the RK-34, and is supported below the chassis by a pair of stiff leads as shown in the bottom-view photo. The seven turns of the 20-meter doubler coil are wound between the "plate" and "H.V." prongs of the coil form, leaving the "grid" prong blank. The 50-mmfd APC trimmer is then automatically disconnected from the coil when the 20-meter doubler coil is plugged in. When winding the 10-meter coil the winding should be started from the "plate" prong and half the coil, or 2¼ turns, wound and the end of this section of the coil brought into the "H.V." prong. The other half is started from this "H.V." prong, before the first wire is soldered in, and continued through the other 2¼ turns before terminating in the "grid" prong. This is an easy way of getting the center tap. Then when this 10-meter coil is plugged in, the APC condenser is connected into the coil circuit through the "grid" prong.

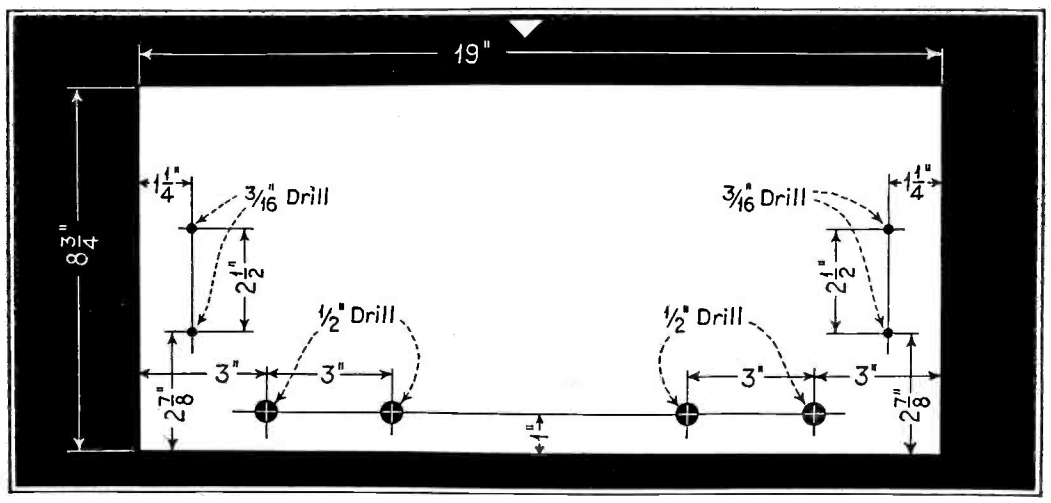
Antenna Coupling

The method of antenna coupling, of course, depends on the antenna used. Probably the simplest is to use a separate doublet for each band worked. This can be a Johnson Q antenna, twisted

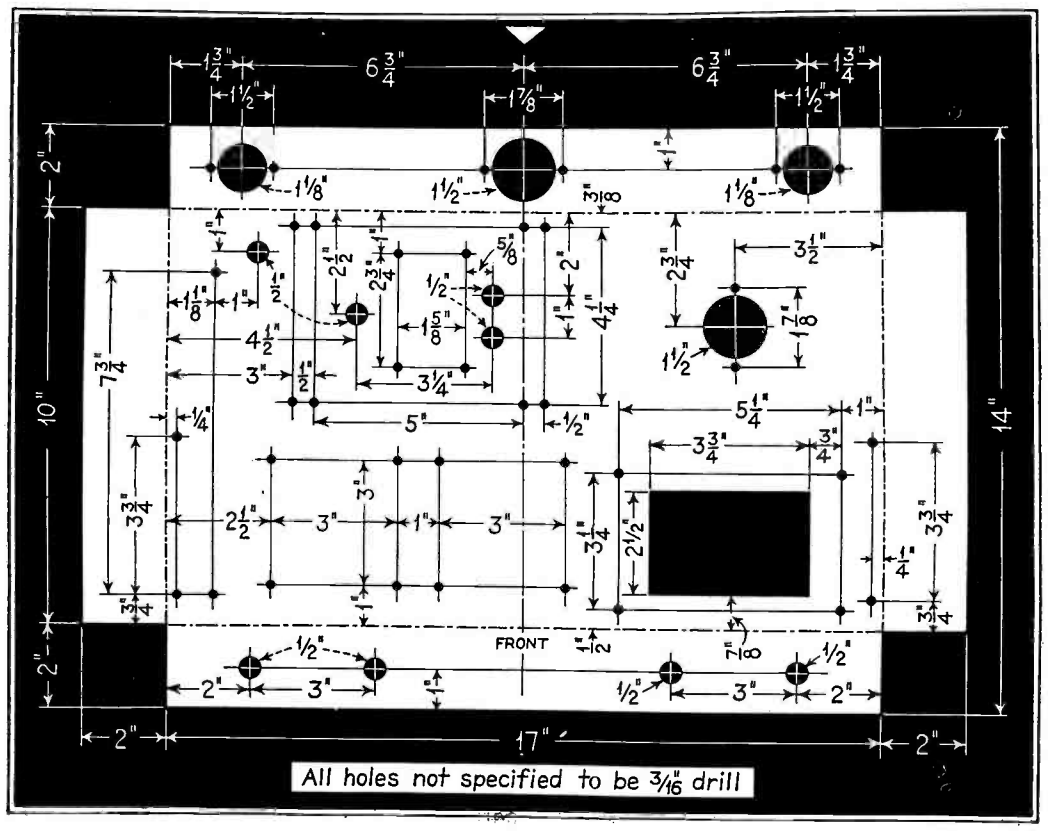
[*Continued on page 255*]



Circuit diagram of the power-supply unit for the AWR 2-3 Xtal Transmitter. Parts values are given in the legend on the opposite page.



Details of the front panel for the power-supply unit.



Details of the chassis for the power-supply unit. All necessary dimensions are given.

Queries

Question Number 6

"I have had my American Bosch Radio, Model 595M, only about two weeks. I have been getting very good reception of foreign stations with no fading at all, and not much noise. However, I cannot say the same of domestic short-wave stations. W9XAA, Chicago, fades badly, often going completely out, the tuning meter showing a broad shadow. The same unsatisfactory reception is experienced on W2XAD, and other 'local' stations on the 19 and 25-meter bands. I have listened to GSD and Pontoise, France, only a few kilocycles removed from W9XAA for several hours at a time without any sign of fading. Is this the fault of the American stations?

"I live in a very noisy location. If I disconnect antenna and ground, and turn up the volume control, I still get considerable noise. Does this mean that a line filter would help? I have heard several persons say that they do no good at all, but am not certain that they have tried good line filters.

"When the selectivity control is moved to the high-fidelity position, there is more noise present than when adjusted to the selectivity position. Should this be so?—

C. C., Mullens, West Va."

Answer

Taking the questions in the order asked:

There is nothing unusual in being able to receive stations many thousands of miles away, via short waves, with more consistent volume and less fading than stations only a few hundreds of miles distant. As a matter of fact, this is the rule—and C. C., in West Virginia, is at a poor reception distance from Chicago, W9XAA and Schenectady, W2XAD.

Some Modern Reception Problems

THE primary purpose of the Queries Dept. is to solve the technical and semi-technical problems of our readers who feel they require such assistance. However, questions, so long as they are related to radio, need not be of a technical nature. Every question will be answered personally—by mail. A self-addressed and stamped envelope should be included. Rather than publish the answers to many questions each month—in a necessarily abbreviated form—we shall select only one or two of general interest which will be elaborated upon and answered in detail. These questions will be numbered, an index will be published periodically, and, in time, your files of this department should prove a valuable reference work.

High-frequency radio waves follow the surface of the earth (the ground wave) for only a few miles from the transmitter. The useful part of the sky-wave, in any one direction, takes the form of a cone, and is reflected back to the earth by an ionized (electrified) stratum of rare atmosphere (the Kennelly-Heaviside layer), perhaps a hundred and fifty miles above the earth, at a point hundreds of miles from the transmitting antenna. Between the range of the ground wave and the area at which the reflected wave again touches the earth, there exists a no-reception area over a distance known as the "skip distance." Of course some reception, from time to time, will be had in this area, due to the fact that the reflection is not clear-cut—there exist fringe areas rather than clean lines of demarcation. The signal is now reflected from what may be called the first reception area (if we don't count the local ground wave area) to the Heaviside layer by the earth itself, to be reflected again to the earth for a second reception area at a still greater distance—with a second skip distance between the first and second reception areas. This is followed with similar earth and sky reflections.

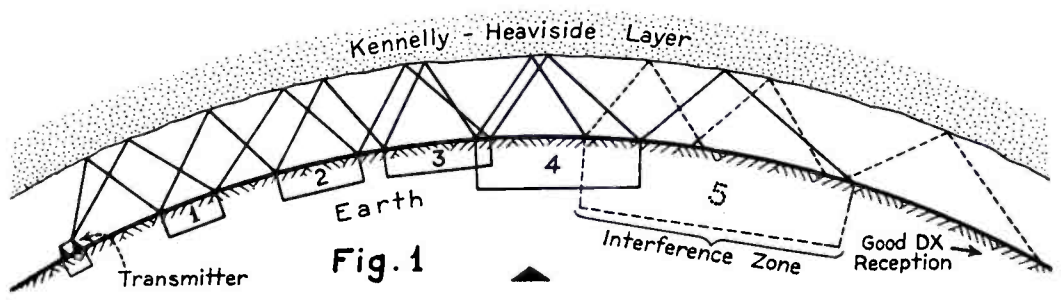
As the signal travels in the form of a cone—that is a cross-section of it is always expanding—the skip distances become less and less and the reception areas larger. After a few reflections, the reception areas overlap, causing another zone of poor reception—an interference area, as a result of reception areas getting into each other's way. However, after still further reflections, with more and more reception areas overlapping, the effect, as a whole, is that of a stronger signal with little fading.

Figure 1 provides a pictorial idea of just what happens—the reflections being carried out through the first overlapping or interference area. (Two continue the the drawing further—to show how several simultaneous overlappings provide an excellent reception zone—would result in a rather complicated maze of lines.) The oblong boxes indicate the various reception zones (the solid box indicating the area covered by the ground wave), and the distances between them represent the skip distances.

The skip distances, reception zones, interference areas and the distance from the transmitter for consistent DX reception all vary with the hour of the day, the time of the year and the frequency of transmission. This is due to the fact that the actual height of the reflecting layer changes diurnally as well as with the seasons, and the effective height varies with the frequency. In other words, different frequencies penetrate the layer to a greater extent than others before being reflectd.

From the tests without the antenna described by C. C., it would seem that some interference is coming through the power lines. A properly designed filter should help matters. Filter requirements differ with individual conditions. The failure of a filter to function is seldom the fault of the filter. Usually

[*Continued on page 249*]



Showing how a short-wave signal travels in repeated reflections between the Heaviside layer and the earth.

The Ham Bands

By Beat Note

flood complaints . . . trek to ten . . . the homing instinct

COMES the criticism: It appears that in our little tribute to the ham, that appeared in this department last month, we loved not wisely but too well. At least, so some think.

It is the contention of many that we should have made some mention of the recalcitrant amateur—the fellow who, presumably, thumbed his nose at his brother hams and continued to smudge the ether irrespective of QRR's and appeals to QRT.

To begin with, our tribute was obviously intended for those hams who did the real work. It was enough to deal with that phase of the emergency without hauling in the dirty clothes, if dirty clothes there were.

It is our own opinion that the percentage of recalcitrants in this case was exactly the same percentage one can count on in relation to any state of emergency. A human being is still little more than a fish out of water, and anyone so naive as to presume that he can tangle with life without running up against a number of outlaws, should go back to wearing ribbons in his hair. And to talk of the outlaws is the acme of idle chatter; these stinkers are found in every barrel of fruit shipped up from the Garden of Eden.

We believe that the people who have complained of the bad little boys were just a bit too quick on the draw. Naturally, there was QRM to spare during the flood emergency, just as there is most always QRM to spare in the majority of ham bands. What made it particularly obnoxious was the fact that emergency traffic had to be cleared not from one isolated area but from a whole flock of areas. Then, to make matters worse, there was the additional crosspatching of less urgent traffic from practically every principal city in the United States . . . anxious queries from friends and relatives of people in the flood areas, calls for data on travelling conditions in and near flood areas, and so on. And who was there to say that a message was not urgent?

Aside from this immense tangle of signals and fone carriers, there were undoubtedly numerous hams who did their bit in making matters much worse, but it is a question in our mind if these fellows were aware of the mess they were creating. Until they have been proven guilty, we are inclined to give them the benefit of the doubt.

But it doesn't help matters any for people who are ignorant of conditions in the amateur bands to denounce the fellows who inadvertently caused QRM. It helps less to have such people offer suggestions as to what should be done, such as, "we wonder why the latter never listen on their own bands before throwing the switch that puts their transmitters into action." What a *simple* solution to the problem!

Admittedly the situation was somewhat of a mess, but the amateur bands are somewhat of a mess at any time, the extent of the mess depending to some degree on the receiver one uses to look in on the bands. Just as long as hams are packed into these bands the way people are packed into the New York subways, it will continue to be a mess, unless some clever bloke learns of a way to crack the fourth dimension or split hairs with a sledge hammer.

But all the howlers want to know why the devil the ham bands can't be regulated during emergency conditions. We are not so sure that they should be, since they are purely experimental bands, but let's say that it is a good idea, anyway, and then inquire as to just how such regulation might be accomplished. First of all, during a case of emergency, no one has any idea as to what station or stations will be in a position to handle traffic, and, secondly, what stations will be able to maintain the necessary receiving positions and *how long they will be able to maintain them.* Moreover, there is no adequate means of clearing the amateur bands during a case of emergency any more than there is adequate ways for a ham to determine if there is something afoot 50 or 100 kc on either side of his own frequency.

Zeh Bouck has offered the only worthy suggestion we have so far run into. It is his opinion that if hams were obliged to listen in on selected key broadcast stations every hour on the hour, it would not be difficult to advise them of a state of emergency. It would be up to the FCC, of course, to determine when a state of emergency existed, and it would be up to the FCC to transmit the information to the key broadcast stations. Bouck admits that it would be a tough pill to swallow, but has anyone a better idea? One thing seems sure; if hams are to be advised of a state of emergency, it will be necessary to broadcast the information from one or more sources outside the ham bands, and always from sources that can be picked up at any time.

But possibly people have made a mountain out of a mole hill. You can't get around the fact that the hams handled one hell of a lot of flood traffic, and if QRM was as bad as some people have made it out to be, why not let the hams do their own house-cleaning? Kibitzers aren't really required.

✦

WE HAVE JUST returned from lunch and carry with us the knowledge that two more hams are preparing to place clothespins on their noses for their dive down into the region of 10 meters.

First thing we know, the boys are going to complain about duplexing on this band as being a selfish practice, considering the little space available!

In any event, loads of hams are diving down to 10, with the thought, probably, of making Hi while the sun shines.

As far as we are concerned, K4DDH owns the band.

✦

CROWDED BANDS are a sore spot with practically every ham, and for this reason we hesitate in remarking that there is strong evidence of the homing instinct at 20, 40 and 80. If one were to draw a graph of the relative population of any of these ham frequency bands, the result would be very similar to a graph indicating the distribution of population around a few key cities.

It depends, of course, how far you open a band, but the fact remains that there are a few rural districts in the 20-meter band, for instance, with a distinct one-horse flavor. In travelling from 14 to 14.4 mc, one runs into countrysides as quiet as a back road, and thence into densely populated cities as noisy as beehives.

The situation bears looking into. Are these frequency areas so polar as to be uninhabitable, or have the manufacturers of xtals been stacking the cards?

[*Continued on page 256*]

Review of World Radio

love and kisses by number . . . slander laws—or, "it can't happen here" . . . english hams to smile over ten-mile area

Musical Call Sign

QUEBEC: The Canadian Radio Commission has a musical call sign which is also a time signal; it is given daily from the Commission's Standard Frequency Laboratory at 11 P. M., The signal is a semibreve E, dotted crochet G, quaver G, and dotted semibreve C; in the key of C. Crochet time equals 120. This is all worked out so that the first note shall strike at 10.59 and 58 seconds P. M., the second at 10.59 and 59 seconds P. M., the third at 10.59 ond 59.75 seconds P. M., and the fourth at 11 P. M. sharp. The words put to the notes are "O Can-a-da!"

✦

Fiji Islands Takes To Air

WELLINGTON, AUSTRALIA: A broadcast station in the Fiji Islands has just been completed and is scheduled to go on the air shortly. The service will be provided by the Amalgamated Wireless (Australasia Limited) and will use a wavelength of 341 meters (880 kc). The hours of broadcast are to be from noon to 2 P. M. and from 6 P. M. to 9 P. M. daily except Sundays.

The programs to be broadcast will consist largely of musical recordings, news items both local and general, broadcasts of local entertainments, and rebroadcasts of important overseas programs.

Since up to the present time Fijian residents have been dependent upon outside broadcasting services for radio entertainment emanating from New Zealand, Australia and the United States, this new service is being eagerly awaited by them.

✦

Propose Slander Laws

PARIS: A bill has been introduced into the Chamber of Deputies by representative Felix Gouin to make the law of slander cover statements made on the air. At present, in order for a remark to be slanderous, it has to be made in a public place. A broadcasting studio is considered private so anything can be said there. (?)

French outlets will be used for political speeches during the coming election campaign and plenty of uncensored "wind" is expected. Second article of Gouin's slander bill provides all broadcast matter to be automatically transcribed under public control for record.

✦

New Television Sets Manufactured

RUSSIA: A Soviet plant has just completed the first lot of television sets, type B-2, for amateurs. A test of transmission sent from the Moscow station showed the machines to be well constructed, with perfect synchronization. On a small screen the images of a violoncellist, a singer and other artists were plainly visible; the instrumental and vocal music came over a radio receiver at the same time. Two thousand of these sets have been made, 500 as complete sets and 1500 in the form of parts to be assembled by the amateurs themselves. (*For Industrialization* 1/4/36).

✦

Correspondence By Radio

ROME: The Administration of Italian Telegraphs have devised means to conciliate the use of correspondence by radio sent to the Abyssinian expeditionary forces for families on the peninsula with economic means. For 4 Liras, fathers or parents of soldiers on the Abyssinian front have the right to radio telegraph a number of those from 1 to 640. Each numeral is significant of an ordinary greeting; for example, number 3 means "Everybody's happy—Love;" number 13, "Sending best wishes," and others like "Boy baby born—mother well."

Unfortunately, this telegraphic matter is very limited but can be useful on many occasions—undoubtedly they have a number which says "Writing by following mail" or the American equivalent of "What about that ten spot?"

✦

Micro-Ray Communication

LONDON: In England the development of micro-ray communication systems continue; outstanding is the commercial micro-ray link between Lympne and St. Inglevert operating on a wavelength below 50 centimeters. The problems experienced in optical transmissions are summarized as follows:

The most stable micro-ray conditions coincide with very stable atmospheric conditions.

Given stability of temperature and pressure, the actual values seem to have no importance.

Given stable temperature and pressure, rain, hail, snow or fog do not affect the link.

No definite relation between the atmospheric potential gradient and micro-ray stability has been found. Excellent operation has been obtained during thundery periods, but there is no information as to the general atmospheric stability at the time.

A high wind is almost invariably accompanied by good micro-ray transmission.

Sudden changes in temperature are usually accompanied by micro-ray fading; likewise sudden barometic changes. Rapid temperature fluctuations occur much more frequently on hot than on cold days; fading is much more pronounced during summer.

The settling of a heavy bank of fog has been accompanied by very severe and rapid fading, followed by stability when the fog bank has ceased to move.

During summer extremely violent fades of very short duration from 1 to 2 minutes have been noticed.

During summer, fading at audio frequency seems to occur in broad daylight and in darkness.

Ultra-short waves of 6 meters are much more stable than micro-rays over optical paths.

In noisy locations micro-rays have the advantage over ultra-short waves of being less affected by "man-made" static.

Micro-ray communication is much more private than ultra-short waves.

Micro-ray communication bands are those which embody the principles of optics and its technique and opens the beginning of a new, and as yet almost entirely unexplored, region of frequency spectrum. (*Electrician,* Feb. 7, 1936).

✦

Phonograph Litigation

BERLIN: Litigation in relation to the broadcasting of phonograph recordings which are the property of commercial firms has recently been providing the lawyers of several countries with extra work; in particular, a suit brought by seven German record-manufacturers against the Reichs-Rundfunk Gesellschaft, of Berlin. The plaintiffs had asked for an injunction to restrain the

[*Continued on page 256*]

Backwash

A PAGE GIVEN OVER TO THE EXPRESSIONS AND OPINIONS OF READERS

Valuable

Editor, ALL-WAVE RADIO:

I have purchased your magazine since it was first published. I generally buy from four to six radio magazines per month, and I can truthfully say that I get more real and worthwhile information from ALL-WAVE RADIO than all the rest combined.

C. K. RIDDLE,
OCEANPORT, N. J.

Thanks. Hope we can continue to live up to such high praise.—THE EDITOR.

Ouch!

Editor, ALL-WAVE RADIO:

I have read your publication with considerable pleasure since it first came out. This pleasure lasts till the Proving Post is reached.

I have before me as I write the March issue with the description of the Philco Model 116-B. The mechanical description of this receiver is excellent and most of the operation report is a lot of pious nonsense: "Output volume held at constant volume." Of course it's not. Why not tell what it is on short waves when variation is high, say 30,000 or 40,000?

"Calibration; most stations on the nose." What is the variation for the others in kilocycles?

What is "good sensitivity and selectivity?" Why not give the sensitivity in microvolts per meter and tell what the selectivity is?

"No hum from the loudspeaker." Philco would be glad to hear of such a speaker. Where is it? Why not give the overall gain in db and then give the hum level in db?

"Tone quality better than excellent for a table model." What adjectives would you use if the audio was Class A? No distortionless tube has ever been marketed. Why not give the percentage of harmonic distortion at full output and at a couple of watts where it should be good and the volume at least bearable?

The possibility of dead spots is mentioned. Why not tell where they are located in the band and give their amplitude. They should fall in a part of the band the average listener is not interested in.

You mention a standard receiver you test against and tell nothing of its characteristics. What's the use?

I presume the chassis of the Philco 116-B is hot. I would really like to know how hot.

Forgive me if I sound caustic, but your readers can't all be ignorant of the simple fundamentals, and there must be an opening for a magazine willing to state facts, show performance curves, tell the whole truth, and take "caveat emptor" off the masthead, or the Proving Post.

H. S. KNICKERBOCKER,
CARMEL, N. Y.

We certainly forgive you for sounding caustic. That is your privilege and the privilege of every other reader. We feel a bit battered, to be sure, but at least we know that one reader, and possibly many more, are not at all satisfied with the receiver reports.

The main purpose of the Proving Post has been to acquaint readers with receivers we have found to be satisfactory. Receivers that do not meet our fair requirements are not reviewed. The secondary purpose of the Proving Post has been to acquaint readers with new developments in receiver design. We have never attempted to go further than this.

One of the receivers we recently reviewed had the following characteristics in the standard broadcast band ranges: Sensitivity, 4.5 microvolts at 1 watt; Adjacent Channel Attenuation, 38 db; Image Ratio, 106 db; Automatic Volume Control Action, 40-db change in input—.5 to 1.0 watt change in output.

Now, aside from our belief that the majority of readers have no use for such data, we also feel that this form of information can be very readily mis-applied. For one thing, such values are interdependent and therefore two-faced. For another thing, if all the necessary data were provided to give a true picture of over-all receiver operation, it would involve the use of terms and expressions with which the average reader is not acquainted. Yet, if we were to tell only half of the story, it would more than likely turn out to be one, grand falsehood. This sort of technical bait has been used for years, as you probably know.

If you can show us how to provide a truthful report without getting too involved, we'd like to have the dope. The best we have been able to do is to generalize, as you have noticed.

We might add, however, that we have spent a considerable amount of time attempting to work out a satisfactory system of reporting on receiver tests. This was referred to in an editorial some time back. So far we have not been able to evolve a system that we feel would be completely satisfactory to the majority of readers. But, we have hopes.—THE EDITOR.

Likes Globe Girdling

Editor, ALL-WAVE RADIO:

I have been reading your magazine for the last few months with much interest. The articles are good and I think that "Globe Girdling," conducted by Mr. Hinds, is especially worthy of merit. That department has helped to increase my short-wave log greatly in recent months. I hope that the good work continues.

M. T. COOKE,
PHILADELPHIA, PA.

We are sure Mr. Hinds will appreciate your comments.—THE EDITOR.

Some Good Ideas

Editor, ALL-WAVE RADIO:

Your magazine is certainly first class. I like it for both its good articles, its clear-cutness and the cleverness with which it is put together.

How about a DX Club with AWR as its mouthpiece? I agree that Listening Post photos are bunk in great quantities, but a Listening Post trophy contest would be good. Also, you might print a day-to-day chart of DX stations only.

Also, why not a "first-to-hear it" section in which DXers can claim to have heard new stations first?

May I suggest a ban on all letters giving detailed logs or anything but information which may help the DXer in getting new stations?

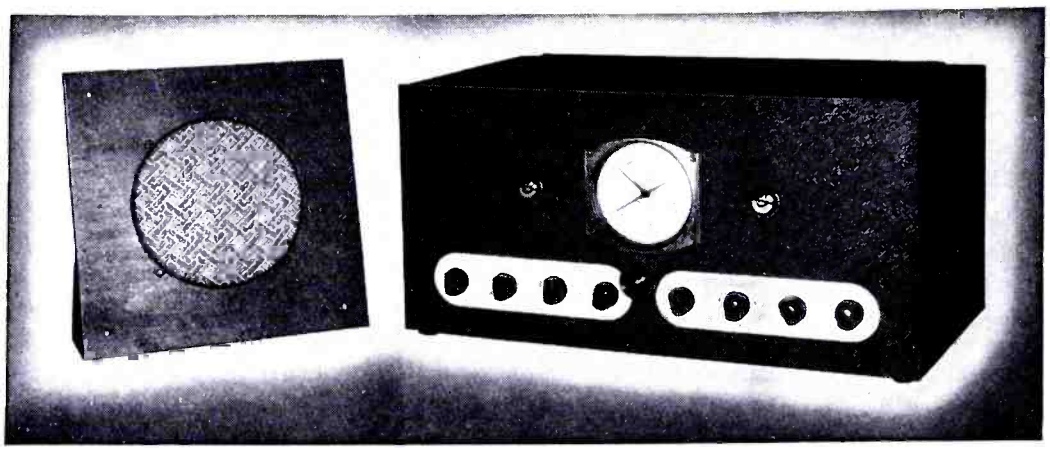
RICHARD WILBER,
NORTH CALDWELL. N. J.

Glad you like AWR. *In speaking of*

[*Continued on page 256*]

RADIO PROVING POST

FIGURE 1



FRONT VIEW

THE ACR-175

Amateur Communications Receiver

THOUGH designed principally for amateur work, the RCA ACR-175 Amateur Communications Receiver is also particularly suitable for DX reception in all short-wave bands. Since it has a continuous frequency range from 60 megacycles to 500 kilocycles, or 5 to 600 meters, the receiver covers every worthwhile communication service. Old timers will take particular delight in the 600-meter ship-shore band.

General

A front view of the receiver and associated electrodynamic speaker is shown in Fig. 1. The speaker is mounted on a wooden baffle with easel supports.

The airplane-type tuning dial is mounted in the center of the receiver front panel, and directly below it are the slow- and high-speed tuning-control knobs. To the left of the dial is the Stand-by Pilot Light which is illuminated when the Stand-by Switch is thrown to the "transmit" position. To the right of the tuning dial is the face of the 6E5 Electron-Ray Tuning Indicator.

The remaining controls are located on two porcelain inset panels to the left and right of the tuning-control knobs. The four controls on the left are: Combined Power, Tone Control, and Stand-by Switch; Calibrated Signal-Input Control; Selectivity (crystal phasing) Control; AVC On-Off Switch. The four controls on the right are: Band-Selector Switch; Audio Gain Control; Beat Oscillator On-Off Switch; Calibrated Heterodyne Control.

An interior view of the receiver is shown in Fig. 2. On the left is the power transformer, rectifier tube and a portion of the r-f, i-f amplifier components. At the right is the group of r-f transformers, the 6E5 and the 6H6, and on the separate chassis at the extreme right, the beat frequency oscillator, first a-f and power output tubes.

The interior of the metal cabinet is finished in white porcelain.

Special Features

The receiver has a number of interesting features which will be covered in detail later on. Of particular interest is the tuning dial, which is so designed that it is possible to log stations with an unusually high degree of accuracy. Then there is the r-f gain control which is calibrated so that when its adjustment is made in conjunction with the electron-ray tuning indicator, the operator can determine the signal input in microvolts.

The i-f transformers are also of special interest in that they have *adjustable* iron cores. The condensers shunting the primary and secondary windings are fixed, and final peaking of the transformers is accomplished by permeability tuning. There is one adjustable iron core for each primary and secondary winding.

The i-f coil used in conjunction with the beat-frequency oscillator also has an adjustable iron core. The adjustment control is brought out to the front panel of the receiver and is calibrated in kilocycles.

Mechanical

The receiver is very rigid in construction and weighs 55.5 pounds complete. The metal cabinet and panel have a black crinkle finish. The measurements are: 22" long, 10.5" high and 11.5" deep.

The tuning control operates on reduction ratios of 20:1 and 100:1. The two knobs are of the same diameter, with the result that the inner, high-speed knob, is inconvenient to operate. This is a minor fault since one becomes accustomed to using the high-speed knob for band-setting only, and the slow-speed knob for actual tuning. And this vernier knob is, without a doubt, the smoothest tuning control we have so far encountered. It is, if anything, too easy and responsive in operation, and until one gets used to it, it needs to be handled with extreme care. But after the handling of it becomes habitual, tuning is remarkably

easy. There is not the slightest evidence of play or backlash between this control and the "second hand" pointer. The slightest touch with one finger on this control knob sets the second hand in motion.

The tuning dial is semi-transparent, illuminated, and clearly marked. It incorporates the usual form of mechanical band-spread system but has *two* vernier scales, one centrally located and the other along the periphery of the dial. These are known as the *vernier* and *vernier-index* scales, the former being fully circular and the latter semi-circular.

The *vernier* scale is graduated from 0 to 100 and is traversed by a long single-ended red pointer (the "second hand"). The *vernier-index* scale is graduated from 0 to 9 and is traversed by a short double-ended black pointer used for the main frequency scales. The red pointer makes one complete revolution for each unit of travel of the short black pointer on the *vernier-index* scale. Thus, any station may be logged accurately with three digits; for example, if the *vernier-index* reading is between 3 and 4 and the *vernier* reading is 72, then the log number is 372. The index number is always the lower of the two numbers between which the pointer is located.

The four main scales of the dial are marked with their respective band-position letters—A, B, C, and D—and are calibrated directly in megacycles. Thus in logging stations, as in the above example, the full log number would be A-372, B-372, C-372, or D-372, depending upon the setting of the Range Switch. In no case is it necessary to refer to actual frequency markings on the scale in use.

All subsidiary receiver controls are smooth in operation with the exception of the Range Switch, which is a bit tight, and the Beat-Frequency Oscillator Control, which, through necessity, suffers slightly from the friction of the screw-thread adjustment on the movable iron core. These are minor faults, however, and do not detract from the all-around ease of operation of the receiver.

Electrical

The schematic diagram of the receiver is shown in Fig. 3. It will be seen from this that there is a stage of r-f using a 6K7, a mixer using a 6L7, an oscillator using a 6J7, two stages of iron-core i-f using 6K7's, a second detector-avc using a 6H6, a beat-frequency oscillator with a 6J7, an intermediate a-f voltage-amplifier stage using a 6F5 which is resistance-coupled to a 6F6 power pentode. Plate power is supplied by a 5Z4. The tuning indicator is a 6E5.

Separate sets of r-f coils are used for each of the four bands. Band A covers 500 to 1690 kc; Band B, 1690 to 6200 kc; Band, C, 6200 to 15,450 kc; and Band D, 15.45 to 60 mc.

The pre-amplifier stage is not used on Band D. The "coils" for this band, incidently, are composed of lengths of bus wire, and are shown as straight leads in the diagram.

The Sensitivity Control, R-5, controls the gain of the r-f and i-f tubes by the usual method of varying grid bias. Initial bias for all tubes, with the exception of the a-f and power tubes, is provided by cathode resistors. The 6F5 a-f tube is biased by returning the *cathode* to a point on the voltage divider which is *positive* with respect to ground, whereas the 6F6 power pentode is biased by returning the *grid* to a point on the power-supply return circuit which is *negative* with respect to ground.

It should be noted that the 6J7 heterodyne oscillator has its cathode above ground potential for r.f. while the plate is effectively at ground potential. This arrangement, together with the plate and screen series resistors, makes the circuit independent of supply-voltage variations in regard to stability and uniformity of output.

The crystal filter and phasing condenser are in the secondary circuit of the first i-f transformer. A switch is provided for shorting out the crystal when its use is not desired. With the crystal in circuit, the relative selectivity is controlled by the phasing condenser C-36. The effectiveness of this control in its various positions is indicated by the crystal selectivity curves shown in Figs. 4 and 5. Curve A shows selectivity with crystal shorted out of circuit. Curve B shows selectivity with crystal in circuit and phasing condenser in central, maximum, position. Curve C of Fig. 5 shows the rejection dip obtained with phasing condenser control in the full clockwise position, while Curve D shows the result with phasing control in full counterclockwise position.

With condition B prevailing, and the beat oscillator set to provide a beat requency between 500 and 1500 cycles, it is possible to effectively suppress any audio image from a c-w signal a few kilocycles removed from the desired signal, causing a beat of nearly equal pitch. With condition C prevailing a signal within a few hundred cycles of that of the desired signal can be placed in the rejection dip. Condition D offers similar possibilities.

Automatic volume control is provided by tapping off the d-c component of the rectified signal carrier developed across the diode load resistor R-19. This voltage is employed to bias the grids of the r-f and mixer tubes and the two i-f tubes. The time constant of the avc circuit is such that this automatic control action may be used while receiving c-w signals, providing transmission is not too slow.

The frequency generated by the beat oscillator, which is variable between 457 and 463 kc—3-kc on either side of the i-f peak of the receiver—is applied to

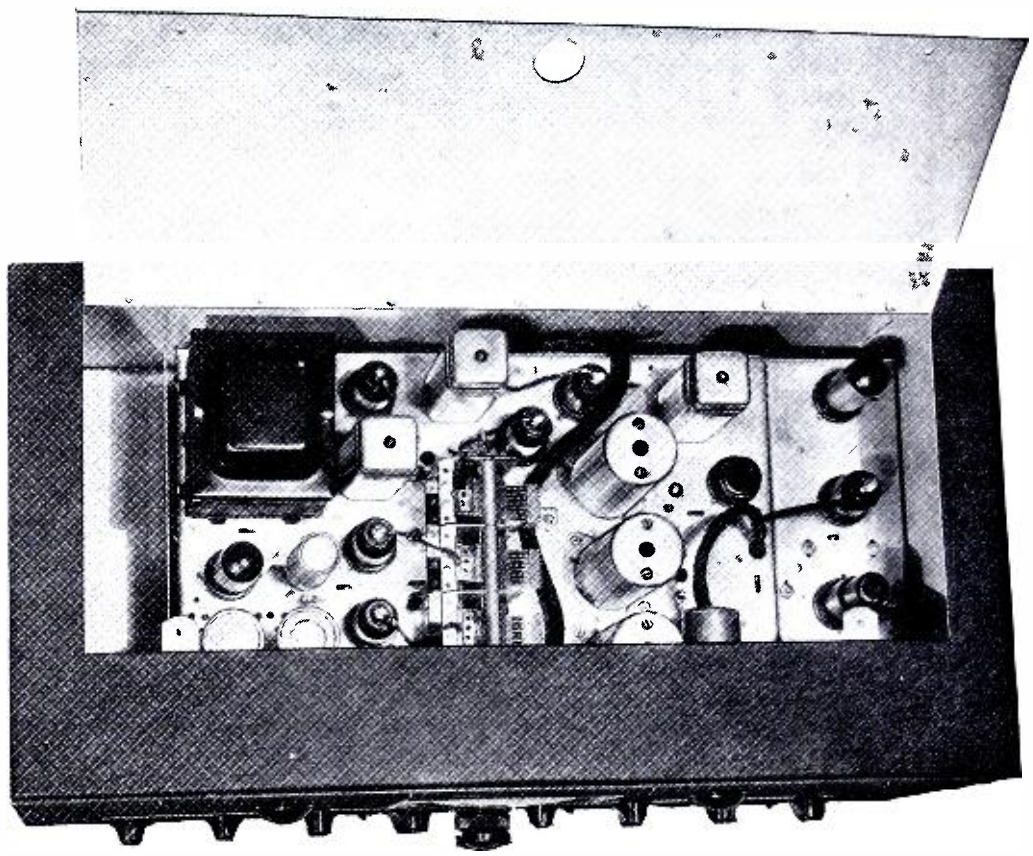


Fig. 2. Interior view of the RCA ACR-175 Amateur Communications Receiver.

the paralleled diode plates of the 6H6 second detector through the condenser C-52. The Beat Oscillator Switch on the front panel serves to interrupt the screen and plate-supply voltage to the b.f.o. tube. Since the heater of the tube is energized continuously, the beat oscillator is ready for instantaneous operation at all times during reception.

The grid of the 6E5 electron-ray tuning indicator is tied in with the avc system. The angle of the ray projected on to the screen of the tube therefore bears a definite relation to signal voltage. The angle of the ray will vary with a variation of signal voltage due either to fading or an alteration of conditions of resonance while tuning.

The speaker is an 8-inch dynamic with a voice-coil impedance of 2.25 ohms at 400 cycles.

The power consumption of the receiver is 110 watts.

Operation

The frequency stability of the receiver was found to be remarkably good. The drift from a cold start amounted to 20 kc at 14 mc, and after warming, drift was negligible. The receiver was held on *NPG-NPM* at 25.5 mc for a period of a half hour with the beat oscillator in operation, without any appreciable changes in the audible frequency of the beat. This was tried again later on *KUP* at 6.4 mc with the same results. At no time after the receiver was sufficiently warmed up to be completely stabilized, did commercial c-w signals wander out of beat or skip pitch.

A half-hour QSO with W5BDB ably demonstrated the excellent avc action. His fone signals were held constant for a period of 20 minutes before deep fading set in, and from then on 100-percent readability was maintained practically up to the point when his signals went through the bottom for the night. A part of this should be attributed to the high selectivity of the receiver which demonstrated its worth when the signals from W5BDB were down with the noise level.

The avc action was likewise tested on numerous c-w signals and was found to be instrumental in reducing signal blotches caused by rapid fading. The action of the avc assists considerably in increasing the readability factor of such signals, providing fading is not too deep or transmissions are not too slow.

The selectivity of the receiver with crystal out is of a high order, due in part to the use of iron-core i-f transformers. Odd as it may seem, this was particularly noticeable in the standard broadcast band where 86 stations were hauled in during an evening—better than one station per channel. As far as could be determined, the only interference experienced was that due to actual heterodyning.

Further tests were made at 6 mc. where 25 broadcasters were brought in without interference. At 9 and 12 mc the number of interference-free stations picked up were 14 and 10 respectively, at 10 P.M.

Selectivity in the amateur bands cannot be stated in quite so precise terms when frequencies and frequency spacings are unknown quantities. There is left only the laboratory check which is still inadequate in expressing what results may be obtained under operating conditions. It means something, though, to say that a local 20-meter fone signal of

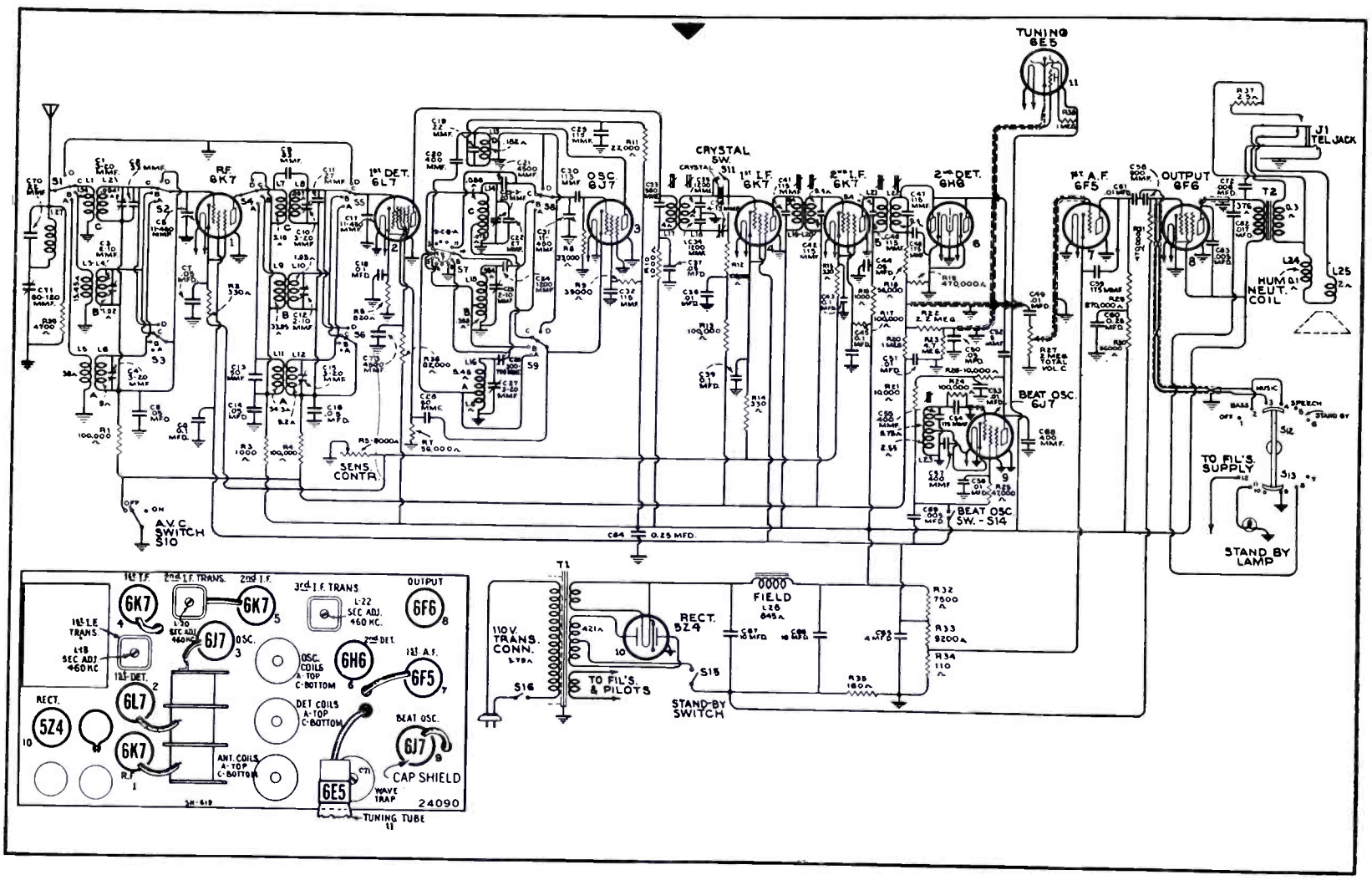


Fig. 3. Schematic diagram of the ACR-175. Also chassis sketch showing location of tubes and trimmer adjustments.

As mentioned previously, the Signal-Input Control is calibrated and may be used to determine actual signal input. This control is calibrated from 1 to 10,000, and its position when there is a slight deflection of the dark sector in the electron-ray tube is the signal input in microvolts. Readings can be taken on either fone or c-w signals.

The tone control is in the grid circuit of the 6F6 power pentode. The fone jack is in the output circuit of this tube. When fones are plugged in, the speaker is automatically silenced.

The power output of the receiver is 2 watts undistorted and 4.5 watts maximum.

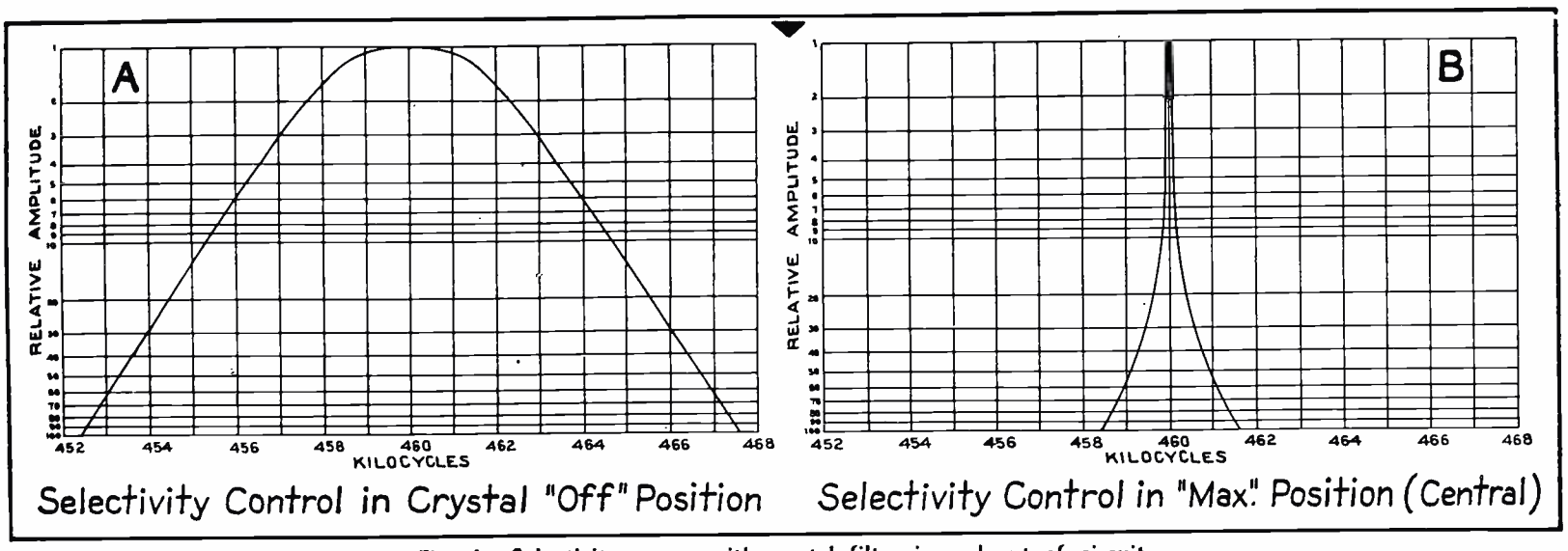


Fig. 4. Selectivity curves with crystal filter in and out of circuit.

10,000 microvolts or more input from a source one-half mile distant, is no interference problem to the ACR-175. The selectivity of the receiver is such that this signal can hold down gain only slightly beyond its own normal bandwidth. No difficulty was experienced in working up alongside this signal.

With the crystal filter in circuit no difficulty was experienced in separating badly hashed fone and c-w signals. We found ourself using the crystal most of the time, for both c-w and fone. Tuning is still quite an easy matter with the crystal in circuit, and though there may be a slight attenuation of signal strength when working in the 20-meter band, the quiet operation and additional selectivity more than offset the slight reduction in signal. We were able, for instance, to dig *FB8AB* out of the 20-meter fone band and hold him, without interference, until he signed. Without the crystal, he was hedged in with fone carriers and was well into the soup.

The crystal filter also proved effective on the 600-meter band, although one does not have the impression of ultra-selectivity. Nevertheless, it is of assistance in unscrambling signals in this fairly crowded channel. The following land stations were copied during a few hours' listening: *NAM, NAX, WAG, WAX, WBF, WDR, WIM, WMH, WMR, WNW, WNY, WOE, WSC, WSE, WSF, WSB, and VQI.*

The 160, 80 and 40-meter bands were merely checked to substantiate our tests on 20, and each band performed as we expected. No extensive loggings were made, but sensitivity and selectivity were every bit as good, relatively, as they were on 20 meters.

We logged numerous stations on 20 meters in the early evening and include some of them here (calls in italics are c.w.): CO2HY, CO2SV, CO2XF, CO6OM, CO7CX, CO8YB, CT1AY, D4DLC, EA2VT, EA8AO, *EA3AN,* EA8AO, F8DC, F8NH, *G2BM,* G5ML, G5NI, *HB9AF* HH5PA, H15X, HPIA, *K5AL, LU8DI,* NY2AE, ON4VK, *OZ3G,* PA0FB, *PLC* (off h-f end), *PZ1AA,* SU8MA, T12AW, VE1JA, VE4CP, VE5HI, VE5OT, VO1I, VP3BG, *VP5AF, W7CMO, W7DL, W7FBE,* XE3AG *XOH3NQ, YN1AA,* NY1HS.

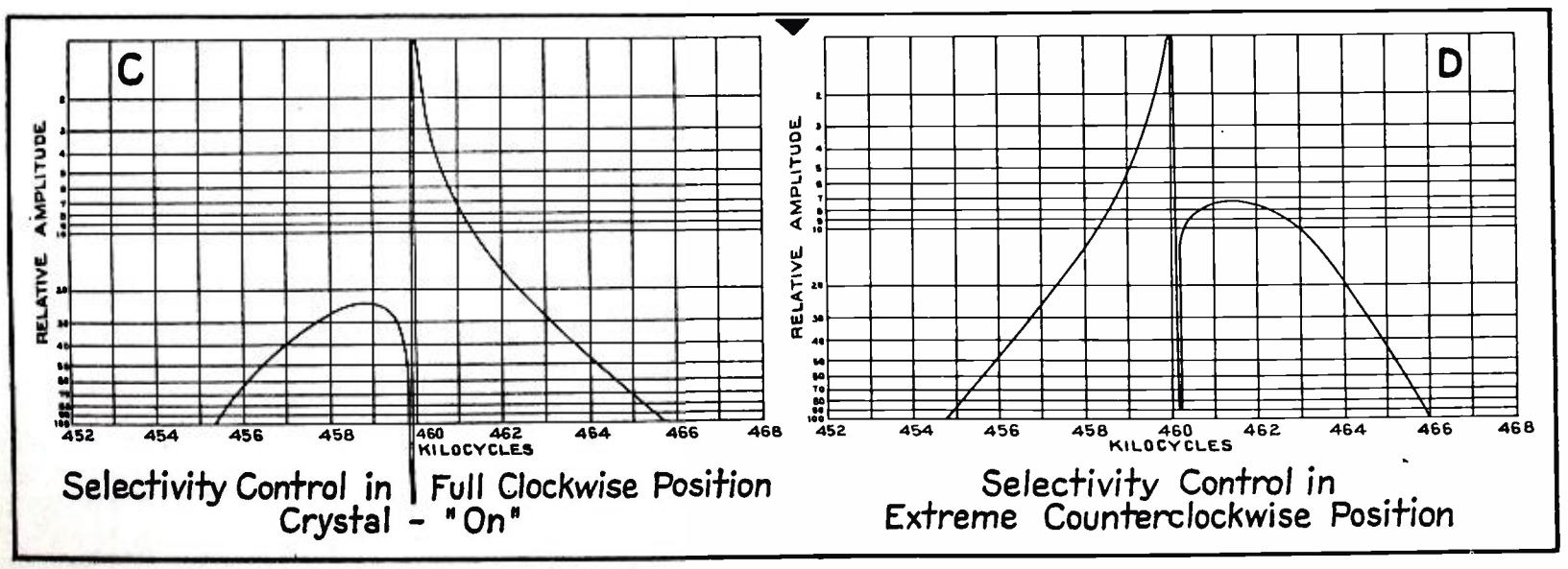
The 10-meter band has good sensitivity but has a low image ratio, due to the fact that the pre-amplifier idles on this band. However, the band is not so crowded that a few reflections are bothersome. Aside from a flock of 2's, 5's and 6's, we picked up CO6OM, K4DDH, NY2AE and VK3MR — enough to indicate that the receiver operates well in this band.

Between 10 and 5 meters, we intercepted W2XHL, New Rochelle Police two-way system, and what is presumably the Empire State Television Transmitter around 41 mc. We also brought in some broadcast pick-up transmissions in the vicinity of 39 mc.

The 5-meter band proved to be disappointing, not through a fault of the receiver, but due to the fact that the average 5-meter fone is not sufficiently stable to be intelligible in a receiver having such a high degree of relative selectivity at 65 mc as has the ACR-175. Any number of 5-meter fones were heard, but only a few were really readable. We are purposely refraining from giving calls.

In conclusion, we wish to state that the selectivity and sensitivity of the ACR-175 are such that there are very few instances when a weak signal cannot be pulled through background noise and bad QRM, and held. In our own experience with the receiver, the "signal mortality rate" was very low.

Fig. 5. Selectivity curves with crystal filter control in extreme positions.



SHORT-WAVE STATION LIST

BROADCAST STATIONS INDICATED BY DOTS • PHONE (P) • EXPERIMENTAL (E) • HOURS IN E.S.T.

KC	Meters	Call	Location	Time
21540	13.92	W8XK	• Pittsburgh, Pa.	7-9 A.M. daily
21520	13.94	W2XE	• Wayne, N. J.	7:30 A.M.-1 P.M. daily
21500	13.95	NAA	Washington, D. C.	(E) Time signals
21470	13.97	GSH	• Daventry, England	6-8:45 A.M.
21420	14.01	WKK	Lawrenceville, N. J.	(P) Phones LSN - PSA daytime; HJY - OCI-OCJ irregular
21160	14.19	LSL	Buenos Aires, Arg.	(P) Phones GAA mornings; DFB-DHO PSE-EHY irreg.
21140	14.19	KBI	Manila, P. I.	(P) Tests and relays P. M. irregular
21080	14.23	PSA	Rio de Janeiro, 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
20835	14.40	PFF	Kootwijk, Holland	(P) Phones Java days
20830	14.40	PFF	Kootwijk, Holland	(P) Phones Java days
20825	14.41	PFF	Kootwijk, Holland	(P) Phones Java days
20820	14.41	KSS	Bolinas, Calif.	(P) Phones Far EastA.M.
20380	14.72	GAA	Rugby, England	(P) Phones LSL mornings; LSY-LSM-PPU irregular
20040	14.97	OPL	Leopoldville, Belgian Congo, Africa	(P) Tests with ORG mornings and noon
20020	14.99	DHO	Nauen, Germany	(P) Phones PPU-LSM-PSA-LSL-YVR A.M.
19987	15.01	CFA	Drummondville, Que.	(P) Phones North America 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 A.M.
19720	15.21	EAQ	Madrid, Spain	(P) Relays & tests 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. Broadcasts irregularly
19500	15.40	LSQ	Buenos Aires, Arg.	(P) Phones daytime irregularly
19355	15.50	FTM	St. Assisse, France	(P) Phones LSM-PPU-YVR mornings
19345	15.52	PMA	Bandoeng, Java	(P) Phones PCK-PDK early mornings
19270	15.57	PPU	Rio de Janeiro, 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	Brussels, Belgium	(P) Phones OPL A.M.
19160	15.66	GAP	Rugby, England	(P) Phones Australia A.M.
19140	15.68	LSM	Buenos Aires, Arg.	(P) Phones DFB-FTM-GAA-GAB A.M.
18970	15.81	GAQ	Rugby, England	(P) Phones ZSS A.M.
18960	15.82	WOD	Rocky Point, N. Y.	(E) Tests LSY irreg.
18950	15.83	HBF	Geneva, Switzerland	(E) Phones So. A. A.M.
18920	15.85	WQE	Rocky Point, N. Y.	(E) Programs, irreg.
18910	15.86	JVA	Nazaki, Japan	(P) Phones and tests irregularly with Europe
18890	15.88	ZSS	Klipheuvel, So. Africa	(P) Phones GAQ-GAU mornings
18830	15.93	PLE	Bandoeng, Java	(P) Phones PCV mornings early; KWU evenings
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
18545	16.18	PCM	Kootwijk, Holland	(P) Relays and phones Java early A.M.
18540	16.19	PCM	Kootwijk, Holland	(P) Relays and phones Java early A.M.
18535	16.20	PCM	Kootwijk, Holland	(P) Relays and phones Java early A.M.
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 irreg.
18410	16.29	PCK	Kootwijk, Holland	(P) Phones PLE-PMC early A.M.
18405	16.30	PCK	Kootwijk, Holland	(P) Phones PLE-PMC early A.M.
18400	16.31	PCK	Kootwijk, Holland	(P) Phones PLE-PMC early A.M.
18388	16.31	FZS	Saigon, Indo-China	(P) Phones FTK early mornings
18340	16.36	WLA	Lawrenceville, N. J.	(P) Phones GAS A.M.
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	Irregular
18250	16.43	FTO	St. Assise, France	(P) Phones LSM-LSY mornings
18220	16.46	KUS	Manila, P. I.	(P) Phones Bolinas nights
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 A.M.
18135	16.54	PMC	Bandoeng, Java	(P) Phones PCK-PCV early A.M.
18115	16.56	LSY3	Buenos Aires, Arg.	(E) Phones DFB-FTM-GAA-PPU A.M.; evening broadcasts occasionally
18075	16.59	PCV	Kootwijk, Holland	(P) Phones PLE early mornings
18070	16.60	PCV	Kootwijk, Holland	(P) Phones PLE early mornings
18065	16.61	PCV	Kootwijk, Holland	(P) Phones PLE early mornings
18060	16.61	KUN	Bolinas, Calif.	(P) Phones Manila afternoons and nights
18040	16.63	GAB	Rugby, England	(P) Phones LSM noon
18020	16.65	KQJ	Bolinas, Calif.	(P) Phones afternoons; irregular
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,A.M.
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, A.M.
17850	16.81	LSN	Buenos Aires, Arg.	(P) Phones S. A. irreg.
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
17775	16.88	PHI	• Huizen, Holland	8-10:30 A.M. ex. Tues. and Wed.
17760	16.89	DJE	• Zeesen, Germany	6:30-11:00 A.M. and exp.
17750	16.91	IAC	Pisa, Italy	(P) Phones and tests to ships A.M.
17740	16.91	HSP	Bangkok, Siam	(P) Phones DFA-DGH-KAY early A.M.
17710	16.94	CJA-3	Drummondville, Que.	(P) Phones Australia and Far East early A.M.
17699	16.95	IAC	Pisa, 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	DAN	Nordenland, Germany	(P) Phones ships A.M.
17120	17.52	WOO	Ocean Gate, N. J.	(P) Phones ships daytime
17120	17.52	WOY	Lawrenceville, N. J.	(P) Phones England irregularly
17080	17.56	GBC	Rugby, England	(P) Phones ships daytime
16910	17.74	JZD	Nazaki, Japan	(P) Phones ships irreg.
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.
16140	18.59	GBA	Rugby, England	(P) Phones Argentina & Brazil irreg.
16117	18.62	IRY	Rome, Italy	(P) Phones Cairo, Asmara and others, broadcasts A.M. and early P.M.
16050	18.69	JVC	Nazaki, Japan	(P) Phones Hong Kong early A.M.
16030	18.71	KKP	Kahuku, Hawaii	(P) KWU afternoons and evening. Tests JVF - KTO - PLE mornings
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 A.M.

Short-Wave Station List

KC	Meters	Call	Location	Time
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 days
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.
15505	19.36	CMA-3	Havana, Cuba	(P) Phones and tests irregularly
15490	19.37	KEM	Bolinas, Calif.	(P) Phones Java and China; irregular
15475	19.39	KKL	Bolinas, Calif.	(P) Phones Manila and Japan; irregular
15460	19.41	KKR	Bolinas, Calif.	(P) Phones Manila and Japan; irregular
15430	19.44	KWE	Bolinas, Calif.	(P) Tests JYK-JYT-PLE evenings
15415	19.46	KWO	Dixon, Calif.	(P) Phones JVF evenings
15370	19.52	HAS3	● Budapest, Hungary	Sunday 9-10 A.M.
15360	19.53	DJT	● Zeesen, Germany	11 P.M.-1 A.M.
15355	19.54	KWU	Dixon, Calif.	(P) Phones Japan, Manila and Java evenings
15340	19.56	DJR	● Zeesen, Germany	1:30-3:30 A.M.
15330	19.56	W2XAD	● Schenectady, N. Y.	10 A.M.-2 P.M. daily
15310	19.60	GSP	● Daventry, England	6-8 P.M. daily
15305	19.60	CP7	La Paz, Bolivia	(E) Relays CP4 tests daytimes
15290	19.62	LRU	● Buenos Aires, Arg.	6 A.M.-10 P.M. Daily
15280	19.63	DJQ	● Zeesen, Germany	12:30 A.M.-7 A.M. daily
15270	19.64	W2XE	● Wayne, N. J.	1-5 P.M. daily
15260	19.66	GSI	● Daventry, England	12:15 P.M.-5:45 P.M.
15252	19.67	RIM	Tashkent, USSR.	(P) Phones RKI early mornings
15243	19.68	TPA2	● Pontoise, France	5:55-11 A.M. daily
15220	1971	PCJ	● Eindhoven, Holland	Tuesday and Wednesday 8-10:30 A.M.
15210	19.72	W8XK	● Pittsburgh, Pa.	9 A.M.-7 P.M.
15200	19.74	DJB	● Zeesen, Germany	3:50-11 A.M.
15180	19.76	GSO	● Daventry, England	12:15-5:45 P.M.
15140	19.82	GSF	● Daventry, England	9 A.M.-12 noon
15121	19.84	HVJ	● Vatican City, Vatican	10:30-10:45 A.M. weekdays
15110	19.85	DJL	● Zeesen, Germany	5:45-7:30 A.M. daily
15055	19.92	WNC	Hialeah, Fla.	(P) Phones daytime
15040	19.95	RKI	Moscow, USSR.	(P) Phones RIM early A.M.; broadcasts irreg.
15040	19.95	HIR	Ciudad Trujillo, R. D.	(P) Phones WNC days
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
14935	20.07	PSE	Rio de Janeiro, Brazil	(P) Phones LSL-WLK day irreg.; EDM-EHY 8 A.M.
14920	20.11	KQH	Kahuku, Hawaii	(P) Tests irregularly
14910	20.12	JVG	Nazaki, Japan	(P) Phones Formosa irregular
14845	20.19	OCJ2	Lima, Peru	(P) Phones HJY and others daytime
14800	20.27	WQV	Rocky Point, N. Y.	(E) Tests Europe irreg.
14790	20.28	RIZ	Irkutsk, USSR.	(P) Calls RKI 9:30 A.M.
14770	20.31	WEB	Rocky Point, N. Y.	(E) Tests with Europe; irregular
14730	20.37	IQA	Rome, Italy	(P) Phones Japan and Egypt; sends music at times
14690	20.42	PSF	Rio de Janeiro, 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 days
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 days
14485	20.71	TIU	Cartago, Costa Rica	(P) Phones WNC days
14485	20.71	YNA	Managua, Nicaragua	(P) Phones WNC days
14485	20.71	HPF	Panama City, Panama	(P) Phones daytime
14485	20.71	HRM	Tela, Honduras	(P) Phones WNC days
14485	20.71	TGF	Guatemala City, Guatemala	(P) Phones WNC days
14480	20.72	PLX	Bandoeng, Java	(P) Phones Europe irreg.
14470	20.73	WMF	Lawrenceville, N. J.	(P) Phones England daytime
14460	20.75	DZH	● Zeesen, Germany	12-2 P.M.
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	● Cali, Colombia	11:00 A.M.-12 noon daily Sun. 6:00-10:30 P.M.
13990	21.44	GBA2	Rugby, England	(P) Phones Argentina & Brazil irreg.
13900	21.58	WQP	Rocky Point, N. Y.	(E) Test daytime
13820	21.70	SUZ	Cairo, Egypt	(P) Phones DFC-DGU-GBB daytime
13780	21.77	KKW	Bolinas, Calif.	(P) Special relays; tests afternoon and evening
13745	21.83	CGA-2	Drummondville, Que.	(P) Phones Europe irreg.
13738	21.82	RIS	Tiflis, USSR.	(P) Tests with Moscow irregular
13720	21.87	KLL	Bolinas, Calif.	(P) Special relays; tests afternoon and evening
13690	21.91	KKZ	Bolinas, Calif.	(P) Tests Japan and Java early A.M.; days Honolulu
13667	21.98	HJY	Bogota, Colombia	(P) Phones CEC afternoons
13635	22.00	SPW	● Warsaw, Poland	11:30 A.M.-12:30 P.M. Mon., Wed., Fri.
13610	22.04	JYK	Kemikawa-Cho, Japan	(E) Tests irregular A.M.
13595	22.07	GBB2	Rugby, England	(P) Phones Canada days
13585	22.08	GBB	Rugby, England	(P) Phones CGA3-SUV-SUZ daytime
13560	22.12	JVI	Nazaki, Japan	(P) Phones Manchukuo irregularly
13465	22.28	WKC	Rocky Point, N. Y.	(E) Tests and relays; irregular
13435	22.33	WKD	Rocky Point, N. Y.	(E) Tests and relays; 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
13285	22.58	CGA3	Drummondville, Que.	(P) Phones England days
13240	22.66	KBJ	Manila, P. I.	(P) Phones nights and early A.M.
13220	22.70	IRJ	Rome, Italy	(P) Phones Japan 5-8 A.M., and works Cairo days
13180	22.76	DGG	Nauen, Germany	(P) Relays to Riverhead days
13075	22.95	VPD	● Suva, Fiji Islands	Mon. to Fri. inc. 12:30-1:30 A.M.
13020	23.04	JZE	Nazaki, Japan	(P) Phones ships irreg.
13000	23.08	FYC	Paris, France	(P) Phones CNR A.M.
12985	23.11	DFC	Nauen, Germany	(P) Phones KAY-SUV-SUZ early A.M.
12865	23.32	IAC	Pisa, Italy	(P) Phones ships irreg.
12860	23.33	RKR	Novosibirsk, USSR.	(P) Daily, 7 A.M.
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
12830	23.38	CNR	● Rabat, Morocco	Special broadcasts irreg.
12830	23.38	CNR	Rabat, Morocco	(P) Phones FYB-TYB-FTA irreg. days
12800	23.44	IAC	Pisa, Italy	(P) Phones ships and tests Tripoli, irreg.
12780	23.47	GBC	Rugby, England	(P) Phones VWY early A.M.
12394	24.21	DAN	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	Wellington, 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, 1:40-2:00 P.M.
12220	24.55	FLJ	Paris, France	(P) Phones ships irreg.
12215	24.56	TYA	Paris, France	(P) Algeria days
12150	24.69	GBS	Rugby, England	(P) Phones Lawrenceville days
12130	24.73	DZE	● Zeesen, Germany	7-9 P.M.
12060	24.88	PDV	Kootwijk, Holland	(P) PLE-PLV-PMC early mornings
12055	24.89	PDV	Kootwijk, Holland	(P) PLE-PLV-PMC early mornings
12050	24.90	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	CJA	Drummondville, Que.	(P) Tests VIY early A.M. and evenings

Short-Wave Station List

KC	Meters	Call	Location	Time
12000	25.00	RNE	● Moscow, USSR.	Sundays 6-7 A.M., 10-11 A.M., 4-5 P.M.; Mon. 4-5 P.M.; Wed. 6-7 A.M., 4-5 P.M.; Friday 4-5 P.M.
11991	25.02	FZS	Saigon, Indo-China	(P) Phones FTA - FTK early A.M.
11955	25.09	ETB	● Addis Ababa, Ethiopia	Sunday 4:30-4:50 P.M.
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	TPA3	● Pontoise, France	2-5 A.M., 11:15 A.M.-6 P.M. daily
11875	25.26	YDB	● Soerabaja, Java	5:30-11:30 A.M.; 5:45-6:45 P.M.; 10:30 P.M.-1:30 A.M.
11870	25.26	W8XK	● Pittsburgh, Pa.	5-9 P.M.
11855	25.31	DJP	● Zeesen, Germany	12-2 P.M. daily
11830	25.36	W2XE	● Wayne, N. J.	5-10 P.M. daily
11830	25.36	W9XAA	● Chicago, Ill.	Daily 11 A.M.-9 P.M.
11820	25.38	GSN	● Daventry, England	12:15-2:15 A.M. daily
11810	25.40	2RO4	● Rome, Italy	8:15-10:30 A.M., 11:30 A.M.-12:15 P.M. daily. Weekdays, News 1:20-1:35 P.M.
11800	25.40	HJ4ABA	● Medellin, Colombia	11:30 A.M.-1 P.M.; 6:30-10:30 P.M.
11795	25.43	DJO	● Zeesen, Germany	3-4:20 P.M. daily
11790	25.43	W1XAL	● Boston, Mass.	Sunday 2:30-3:45 P.M.; Mon. to Fri. inc. 4-5:15 P.M.
11770	25.49	DJD	● Zeesen, Germany	11:35 A.M.-4:20 P.M.-4:50-10:45 P.M.
11750	25.53	GSD	● Daventry, England	9 A.M.-12 noon; 12:15-5:45 P.M., 6-8 P.M., 9-11 P.M.
11720	25.60	CJRX	● Winnipeg, Manitoba	Week days 6-12 M.; Sun. 3-10 P.M.
11713	25.62	TPA4	● Pontoise, France	6:15-9 P.M.; 11 P.M.-1 A.M.
11630	25.68	KIO	Kahuku, Hawaii	(P) Phones Far East early A.M.
11670	25.62	PPQ	Rio de Janeiro, Brazil	(P) Phones WCG-WET-LSX evenings
11660	25.73	JVL	Nazaki, Japan	(P) Phones Taiwan eve.
11570	25.93	HH2T	● Port-au-Prince, Haiti	Sp'l programs irreg.
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
11050	27.15	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	8:15-10:30 P.M. irreg.
10975	27.35	OCI	Lima, Peru	(P) Phones CEC - HJY days
10975	27.35	OCP	Lima, Peru	(P) Phones HKB early evenings
10940	27.43	TTH	St. Assise, France	(P) Phones So. America irreg.
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, A.M.
10795	27.79	GCL	Rugby, England	(P) Phones Japan days
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. & P.M.
10740	27.93	JVM	● Nazaki, Japan	4-7:30 A.M. irregular
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 except Thurs. and Sat. 7-7:20 P.M.; Thur. & Sun. 8:30-9 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. irreg.; Mon. & Thurs. 4-5 P.M.
10620	28.25	WEF	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 nights
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 N. Am. 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	XGW	Shanghai, China	(P) Tests GBP - KAY early A.M.
10420	28.79	PDK	Kootwijk, Holland	(P) Phones PLV A.M., and special programs irreg.
10415	28.80	PDK	Kootwijk, Holland	(P) Phones PLV A.M., and special programs irreg.
10410	28.82	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) Programs, irreg.
10375	28.92	JVO	Nazaki, Japan	(P) Manchuria and Dairen early A.M.
10370	28.93	EHZ	Madrid, Spain	(P) Phones EHX days
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 B.A. 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. Broadcasts irreg.
10290	29.15	DZC	● 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) Afternoons
10220	29.35	PSH	Rio de Janeiro, Brazil	(P) Phones LSL-WOK evenings; special pgm. service irreg.
10169	29.50	HSG	Bankok, Siam	(P) Phones DGH early A.M.
10160	29.53	RIO	Bakou, USSR.	(P) Phones RIR-RNE irreg. A.M.; News irreg. 11 P.M.-3 A.M.
10140	29.59	OPM	Leopoldville, Belg-Congo	(P) Phones ORK afternoons
10080	29.76	RIR	Tiflis, USSR.	(P) Phones RIM-RKI 7-11 A.M.
10070	29.79	EHY	Madrid, Spain	(P) Phones YVR afternoons
10055	29.84	ZFB	Hamilton, Bermuda	(P) Phones WNB days
10055	29.84	SUV	Cairo, Egypt	(P) Phones DFC-DGU-GCA-GCB days
10042	29.87	DZB	● Zeesen, Germany	2-4 P.M.
10040	29.88	HJA3	Barranquilla, Colombia	(P) Tests early evenings irreg.
9990	30.03	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.	(P) Phones and tests; England irreg.
9870	30.40	JYS	● Kemikawa-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	Kemikawa-Cho, Japan	(E) Tests irregular
9830	30.50	IRM	Rome, Italy	(P) Phones JVP - JZT - LSX-WEL A.M.
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 evenings
9675	31.00	DZA	● Zeesen, Germany	5-7 P.M.
9650	31.09	CT1AA	● Lisbon, Portugal	Tues., Thurs., Sat., 4:30-7 P.M.
9650	31.09	YDB	● Soerabaja, Java	5:30-11:30 A.M.; 5:45-6:45 P.M.; 10:30 P.M. to 1:30 A.M.
9635	31.13	2RO3	● Rome, Italy	Daily 1-5 P.M.; Mon., Wed., Fri., American Hour, 6-7:30 P.M.; Tues., Thurs., Sat., South Am. Hour, 6-7:45 P.M.

Short-Wave Station List

KC	Meters	Call	Location	Time
9630	31.15	CFA5	Drummondville, Que.	(P) Phones No. America days
9620	31.17	DGU	Nauen, Germany	(P) Phones SUV A.M. Relays irreg.
9620	31.17	FZR	Saigon, Indo-China	(P) Phones Paris early A.M.
9600	31.25	HJ1ABP	●Cartagena, Colombia	Daily 6-11 P.M.
9600	31.25	CB960	●Santiago, Chile	7 P.M.-12 Midnight
9600	31.25	XEFT	●Vera Cruz, Mexico	Same as 6120 KC.
9595	31.27	HBL	●Geneva, Switzerland	Saturday 5:30-6:15 P.M.
9595	31.27	HH3W	●Port-au-Prince, Haiti	1-2 P.M., 7-8:30 P.M.; Sunday 12-1 P.M.
9590	31.28	W3XAU	●Philadelphia, Pa.	Sun. 12-7 P.M.; Weekdays 12-8 P.M.
9590	31.28	VK2ME	●Sydney, Australia	Sundays 1 A.M.-3 A.M.; 5:00-9:00 A.M., 10:30 A.M.-12:30 P.M.
9590	31.28	HP5J	●Panama City, Panama	11:30 A.M.-1 P.M., 7:00-10 P.M.; Sundays 6:30-10:30 P.M.
9590	31.28	PCJ	●Eindhoven, Holland	7-8 P.M. to N. America Sunday
9580	31.31	GSC	●Daventry, England	6-8 P.M., 9-11 P.M. daily
9580	31.31	VK3LR	●Melbourne, Australia	Mon., Tues., Wed., Thur., 3:15-7:30 A.M.; Fri., 10:30 P.M.-2 A.M.; Sat., 5-7:30 A.M.
9580	31.31	LRX	●Buenos Aires, Arg.	6 A.M.-10 P.M. daily
9570	31.33	W1XK	●Boston, Mass.	Weekdays, 7 A.M.-1 A.M. Sunday 8 A.M.-1 A.M.
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 A.M.-3:00 A.M., 8:05 A.M.-11 A.M., 4:50 P.M.-10:45 P.M.
9545	31.44	HH2R	●Port-au-Prince, Haiti	Sp'l programs irreg.
9540	31.45	DJN	●Zeesen, Germany	12:30 A.M.-3:50 A.M., 3:50-11 A.M., 4:50-10:45 P.M.
9530	31.48	W2XAF	●Schenectady, N. Y.	4 P.M.-12 A.M. daily
9520	31.51	XEME	●Merida, Yucatan, Mex.	10 A.M.-3:30 P.M., 5:30-11 P.M.
9515	31.53	LKJ1	●Jeloy, Norway	5-8 A.M., 11 A.M.-6 P.M. daily
9510	31.55	GSB	●Daventry, England	12:15-2:15 A.M., 12:15-5:45 P.M.
9510	31.55	VK3ME	●Melbourne, Australia	Mon.-Sat. 4:30-7:00 A.M.
9510	31.55	HJU	●Buenaventura, Colombia	12-2 P.M., 8-11 P.M., Mon., Wed., Fri.
9501	31.56	PRF5	●Rio de Janeiro, Brazil	4:45-5:45 P.M. daily; 9-10:45 P.M. irreg.
9500	31.58	XGOX	●Nanking, China	Week days 6:30-8:40 A.M.; Sundays, 7:30-9:30 A.M.
9500	31.58	HI5E	●Ciudad Trujillo, R. D.	6:40-8:40 A.M., 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M.
9490	31.61	KEI	Bolinas, Calif.	(P) Phones Indo-China and China A.M.
9490	31.61	CQN	●Macoa, China	Mon. & Fri., 5-8 A.M.
9480	31.65	PLW	Bandoeng, Java	(P) Phones Australia early A.M.
9480	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 A.M.
9450	31.75	TGWA	●Guatemala City, Guate.	Daily ex. Sun. 12-2 P.M., 8-9 P.M., 10 P.M.-12 A.M.; Sun., 12 noon-2 P.M., 12 A.M.-6 A.M.
9430	31.80	YVR	Maracay, Venezuela	(P) Tests mornings
9428	31.81	COCH	●Havana, Cuba	Week days 8 A.M.-12 midnight; Sundays 12-1 P.M., 8-10 P.M.
9415	31.86	PLV	Bandoeng, Java	(P) Phones PCV-PCK-PDK-VLZ-KWX-KWV early A.M.
9400	31.92	XDR	Mexico City, Mexico	(P) Phones XAM irreg. days
9385	31.97	PGC	Kootwijk, Holland	(P) Phones East Indies nights
9375	32.00	PGC	Kootwijk, Holland	(P) Phones East Indies nights
9370	32.02	PGC	Kootwijk, Holland	(P) Phones East Indies nights
9330	32.15	CGA4	Drummondville, Que.	(P) Phones GCB-GDB-GBB afternoons
9280	32.33	GCB	Rugby, England	(P) Phones Canada afternoons
9240	32.47	PDP	Kootwijk, Holland	(P) Phones East Indies nights
9235	32.49	PDP	Kootwijk, Holland	(P) Phones East Indies nights
9180	32.68	ZSR	Klipheuvel, S. Africa	(P) Phones Rugby afternoons reasonally
9170	32.72	WNA	Lawrenceville, N. J.	(P) Phones GBS-GCU-GCS afternoons
9147	32.79	YVR	Maracay, Venezuela	(P) Phones EHY afternoons
9125	32.88	HAT4	●Budapest, Hungary	600-7:00 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.
8975	33.42	CJA5	Drummondville, Que.	(P) Phones Australia nights, 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 New York early evenings
8790	34.13	HKV	Bogota, Colombia	(E) Tests early evenings and nights
8790	34.13	TIR	Cartago, Costa Rica	(P) Phones Cent. America daytime
8790	34.13	HKV	●Bogota, Colombia	6:00-11:00 P.M. irregular
8775	34.19	HCJB	●Quito, Ecuador	Sunday 4-10:45 P.M.; Tues. to Sat., inc., 7-10 P.M. or later
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	130-3:15 A.M., 6 A.M.-12 noon
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	●Camaguey, Cuba	7:45-9:00 P.M. weekdays.
8650	34.68	WVD	Seattle, Wash.	(P) Tests irregularly
8590	34.92	YNVA	●Managua, Nicaragua	1-2:30 P.M., 7:30-10 P.M. daily
8560	35.05	WOO	Ocean Gate, N. J.	(P) Phones ships days
8500	35.29	JZF	Nazaki, Japan	(P) Phones ships irreg.
8470	35.39	DAN	Nordenland, Germany	(P) Phones ships irreg.
8404	35.70	HC2CW	●Guayaquil, Ecuador	7:30-11 P.M. ex. Sunday
8400	35.71	HC2AT	●Guayaquil, Ecuador	8:00-11:00 P.M. ex. Sun.
8380	35.80	IAC	Pisa, Italy	(P) Phones ships irreg.
8190	36.65	PSK	Rio de Janeiro, Brazil	(P) Phones LSL-WOK evenings and special programs
8155	36.79	PGB	Kootwijk, Holland	(P) Phones Java irreg.
8140	36.86	LSC	Buenos Aires. Arg.	(P) Tests evenings and nights irreg.
8120	36.95	K1P	Manila, P. I.	(P) Phones KWX-KWV-PLV-JVQ A.M.
8110	37.00	ZP10	●Ascunsion, Paraguay	8:00-10:00 P.M.
8075	37.15	WEZ	Rocky Point, N. Y.	(E) Program service P.M.; irregular
8035	37.33	CNR	Rabat, Morocco	(P) Phones France nights
8035	37.33	CNR	●Rabat, Morocco	Special broadcasts irreg.
7970	37.64	XGL	Shanghai, China	(P) Tests early mornings
7968	37.65	HSJ	Bankok, Siam	(P) Tests 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.
7854	38.19	HC2JSB	●Guayaquil, Ecuador	9 A.M.-1:30 P.M., 6-11:15 P.M.
7840	38.27	PGA	Kootwijk, Holland	(P) Phones Java irreg.
7835	38.29	PGA	Kootwijk, Holland	(P) Phones Java irreg.
7830	38.31	PGA	Kootwijk, Holland	(P) Phones Java 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
7780	38.56	PSZ	Rio de Janeiro, Brazil	(P) Tests LSX early evenings
7770	38.61	PDM	Kootwijk, Holland	(P) Special relays to E. Indies
7765	38.63	PDM	Kootwijk, Holland	(P) Special relays to Dutch Indies
7760	38.66	PDM	Kootwijk, Holland	(P) Special relays to E. Indies
7740	38.76	CEC	Santiago, Chile	(P) Phones evenings to 8:30 P.M.
7735	38.78	PDL	Kootwijk, Holland	(P) Special relays to E. Indies
7730	38.81	PDL	Kootwijk, Holland	(P) Special relays to E. Indies
7715	38.39	KEE	Bolinas, Calif.	(P) Relays programs to Hawaii seasonally
7669	39.11	TGF	Guatemala City, Guat.	(P) Phones TIU-HPF daytime
7626	39.31	RIM	Tashkent, USSR.	(P) Phones RKI early mornings
7620	39.37	ETD	●Addis Ababa, Ethiopia	Irregular
7610	39.42	KWX	Dixon, Calif.	(P) Phones KKH nights; KAZ-KTP-PLV-JVT-JVM A.M.
7565	39.66	KWY	Dixon, Calif.	(P) Phones Shanghai early mornings
7550	39.74	TI8WS	●Puntarenas, Costa Rica	5:30-6:30, 7:30-9:30 P.M.
7520	39.89	KKH	Kahuku, Hawaii	(P) Tests KEE evenings; Phones KWX-KWV nights
7518	39.90	RKI	Moscow, USSR.	(P) Phones RIM early mornings

Short-Wave Station List

KC	Meters	Call	Location	Time
7510	39.95	JVP	●Nazaki, Japan	(P) Tests Point Reyes early A.M.; broadcasts Mon. and Thurs. 4-5 P.M.
7500	40.00	CFA-6	Drummondville, Que.	(P) Phones N. America 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	40.45	WEM	Rocky Point, N. Y.	(E) Special relays evenings
7390	40.60	ZLT-2	Wellington, N. Z.	(P) Phones Sydney 3-7 A.M.
7385	40.62	OEK	Wein, Austria	(P) Tests early evenings very irreg.
7380	40.65	XECR	●Mexico City, Mexico	Sundays 7-8 P.M.; occasionally later
7370	40.71	KEQ	Kahuku, Hawaii	(P) Relays programs evenings
7345	40.84	GDL	Rugby, England	(P) Phones Japan irreg. A.M.
7282	41.20	HJ1ABD	●Cartagena, Colombia	11:15 A.M.-1:15 P.M., Sun. Weekdays 7:15-9:15 P.M.
7245	41.41	EA8AB	●Santa Cruz, Canary Is.	Mon., Wed., Fri., 3:15-4:15 P.M.
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	PI1J	●Dordrecht, Holland	Sat. 10:10-11:10 A.M.
7080	42.37	VP3MR	●Georgetown, Br. Guiana	Sun. 7:45-10:15 A.M.; Weekdays 4:45-8:45 P.M.
7074	42.48	HJ1ABK	●Barranquilla, Colombia	3-6 P.M. Sunday
7000	42.86	PZH	●Paramaribo, D. Guiana	S. A. Sun. 9:45-11:45 A.M.; Mon. & Fri. 5:45-9:45 P.M.; Tues. and Thurs. 2:45-4:45 P.M., 8:45-10:45 P.M.; Wed. 3:45-4:45, 5:45-9:45 P.M.; Sat. 2:45-4:45 P.M.
6990	42.92	JVS	Nazaki, Japan	(P) Phones China mornings early
6977	43.00	HI3C	●La Ramona, R. D.	11:40 A.M.-1:40 P.M., 4:40-8:40 P.M.; Sat. 11:40 P.M.-1:40 A.M.
6950	43.17	WKP	Rocky Point, N. Y.	(E) Relays programs evenings
6950	43.17	GBY	Rugby, England	(P) Phones U.S.A. irreg.
6905	43.45	GDS	Rugby, England	(P) Phones WOA-WNA-WCN evenings
6900	43.48	HI2D	●Ciudad Trujillo, R. D.	Daily 6:40-8:40 A.M., 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M.
6895	43.51	HCETC	●Quito, Ecuador	8:15-10:30 P.M. ex. Sun.
6890	43.54	KEB	Bolinas, Calif.	(P) Tests KAZ - PLV early A.M.
6880	43.60	CGA-7	Drummondville, Que.	(P) Phones Europe days
6860	43.73	KEL	Bolinas, Calif.	(P) Tests KAZ - PLV early A.M.
6845	43.83	KEN	Bolinas, Calif.	(P) Used irregularly
6830	43.92	CFA	Drummondville, Que.	(P) Phones N. Amer. nights
6814	44.03	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.
6800	44.12	HI7P	●Ciudad Trujillo, R. D.	Daily 6:40-8:40 A.M., 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M.
6795	44.15	GAB	Rugby, England	(P) Phones Canada irreg.
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	1:45-2:15 A.M. 4-7:45 A.M. 5-5:20 P.M. 7-7:15 P.M. 9:45 P.M. 11:45 P.M.
6725	44.60	WQO	Rocky Point, N. Y.	(E) Tests evenings irreg.
6720	44.64	YVQ	Maracay, Venezuela	(P) Phones and relays N. Y. evenings
6720	44.64	YVQ	●Maracay, Venezuela	8-9 P.M. Saturdays
6718	44.66	KBK	Manila, P. I.	(P) Phones A. M. seasonally
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.
6650	45.11	GBY	Rugby, England	(P) Phones U.S.A. irreg.
6650	45.11	IAC	Pisa, Italy	(P) Phones ships irreg.
6635	45.00	HC2RL	●Guayaquil, Ecuador	5:45-7:45 P.M. Sunday, 9:15-11:15 P.M. Tues.
6630	45.25	HIT	●Ciudad Trujillo, R.D.	12:10-1:40 P.M., 6:10-8:40 P.M. ex. Sun. Sat. DX 11:40 P.M.-12:40 A.M.
6618	45.33	Prado	●Riobamba, Ecuador	Thursday 9:00-11:15 P.M.
6555	45.75	HI4D	●Ciudad Trujillo, R.D.	12:15-2:00 P.M., 5:00-8:00 P.M. except Sun.
6550	45.81	TIRCC	●San Jose, Costa Rica	Daily 12-2 P.M. 6-7 P.M. Thurs. Extra 7-10 or 11 P.M. Sunday 11 A.M.-1 P.M. 8-10 P.M.
6520	46.01	YV6RV	●Valencia, Venezuela	10:30 A.M.-1:30 P.M., 5:30-9:30 P.M. daily
6500	46.15	HIL	●Ciudad Trujillo, R.D.	12-2 P.M., 6-8 P.M.
6490	46.30	HJ5ABD	●Cali, Colombia	7:00-10:00 P.M. ex. Sun.
6480	46.30	HI8A	●Ciudad Trujillo, R. D.	Daily ex. Sunday 8:40-10:40 A.M., 2:40-4:40 P.M.
6451	46.50	HJ4ABC	●Ibague, Colombia	7-10 P.M. ex. Sunday
6451	46.50	YNLF	●Managua, Nicaragua	8-9 A.M., 1-3 P.M., 6:30-10:30 P.M. daily
6450	46.51	HI4V	●Ciudad Trujillo, R.D.	11:40 A.M.-1:40 P.M., 5:10-6:40 P.M. daily
6447	46.51	HJ1ABB	●Barranquilla, Colombia	1145 A.M.-1:00 P.M., 5:30-10:00 P.M. daily
6425	46.69	W9XBS	●Chicago, Ill.	Not regular. Usually Tuesday and Thursday 1:00-5:00 P.M.
6420	46.70	HI1S	●Puerto Plata, R.D.	11:40 A.M.-1:40 P.M. 5:40-7:40 P.M.
6420	46.70	W3XL	●Bound Brook, N. J.	No regular schedule
6415	46.77	HJA3	Barranquilla, Colombia	(P) Phones HJA2 evenings
6385	46.99	TIPG	●San Jose, Costa Rica	6:00-11 P.M.
6383	47.02	HI3U	●Santiago de los Caballeros, R. D.	Daily 7:10-8:40 A.M., 12:40-2:10 P.M., 8:10-9:40 P.M.
6375	47.10	YV4RC	●Caracas, Venezuela	4:30-10:30 P.M.
6357	47.19	HRP1	●San Pedro de Sula, Honduras	8 P.M.-12 A.M.
6330	47.39	JZG	●Nazaki, Japan	5:00-7:00 A.M. irregular
6316	47.50	HIZ	●Ciudad Trujillo, R.D.	Daily 11:30 A.M.-2:45 P.M., 5:30 P.M.-9 P.M. Sat. to 10 & 11 P.M.
6300	47.62	YV12RM	●Maracay, Venezuela	6:30-9:30 P.M. ex. Sun.
6280	47.69	CO9WR	●Sancti-Spiritus, Cuba	4-6 P.M., 9-11 P.M. daily
6280	47.77	HIG	●Ciudad Trujillo, R.D.	7:10-8:40 A.M., 12:40-2:10 P.M., 8:10-9:40 P.M.
6275	47.81	HJ1ABH	●Cienaga, Colombia	Broadcasts and phones. Irregular evenings
6240	48.08	HI8Q	●Ciudad Trujillo, R. D.	Daily 6:40-8:40 A.M., 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M.
6235	48.10	OCM	Lima, Peru	(P) Phones afternoons
6235	48.00	HRD	●La Ceiba, Honduras	8-11 P.M. daily; Saturday to 12 A.M.
6230	48.15	HJ4ABJ	●Ibague, Colombia	8:00-11 P.M.
6230	48.15	OAX4G	●Lima, Peru	7-11 P.M. daily.
6182	48.53	HI1A	●Santiago de Caballeros, R. D.	Daily 11:40 A.M.-1:40 P.M., 7:40-9:40 P.M.
6171	48.61	XEXA	●Mexico City, Mex.	8-11:30 A.M., 3-6 P.M., 7-11 P.M. daily
6170	48.62	HJ3ABF	●Bogota, Colombia	11 A.M.-2 P.M. 6-11 P.M.
6165	48.66	YV3RC	●Caracas, Venezuela	10:30 A.M.-1:30 P.M. 4:30-10:00 P.M.
6150	48.78	HJ5ABC	●Cali, Colombia	Daily 11:00 A.M.-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	GBT	Rugby, England	(P) Phones U.S.A. days
6150	48.78	HI5N	●Santiago de los Caballeros, R. D.	Daily 6:40-8:40 A.M.,, 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M.
6150	48.78	CB615	●Santiago, Chile	12-1 P.M. 8:30-9:30 P.M.
6150	48.78	COKG	●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 A.M. daily
6137	48.88	CR7AA	Lourenco Marques, Africa	12:45-3 P.M. daily; 8-10:30 A.M. Sundays
6135	48.90	HJ4ABP	●Medellin, Colombia	6-10:30 P.M.
6130	48.92	ZGE	●Kuala Lumpur, S.S.	Sun., Tues, Fri. 6:40-8:40 A.M.
6130	48.92	TGX	●Guatemala City, Guat.	Irreg.
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.
6122	49.00	HJ3ABX	●Bogota, Colombia	11 A.M.-2 P.M., 7-11 P.M.
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.	10-11 P.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.

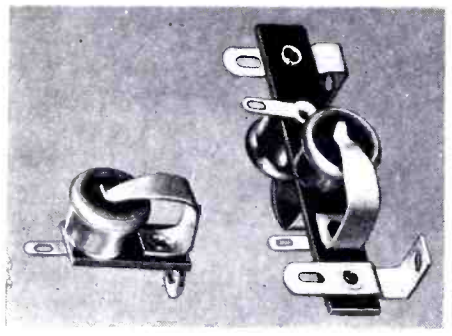
Short-Wave Station List

KC	Meters	Call	Location	Time
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	4-10 P.M.
6100	49.18	W9XF	● Chicago, Illinois	Sun., Tues., Thurs., Fri. 9 P.M.-2 A.M. Mon., Wed., Sat. 1-2 A.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	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. 6:30-9:30 P.M. daily
6080	49.34	CP5	● LaPaz, Bolivia	11:30 A.M.-1 P.M., 6-7:45 P.M., 8:30-11 P.M. weekdays; Sunday 3:30-6:00 P.M.
6080	49.34	HP5F	● Colon, Panama	Daily ex. Sunday 11:45 A.M.-1 P.M.: 7:45-10 P.M.; Sun. 10:45 A.M.-11:30 A.M.; 4-6 P.M.
6079	49.35	DJM	● Zeesen, Germany	7:30-9:30 P.M.
6072	49.41	OER2	● Vienna, Austria	Weekdays 9 A.M.-5 P.M. Saturdays to 6 P.M.
6070	49.42	VE9CS	● Vancouver, B.C.	6:00-7:00 P.M. Sunday 1:45 P.M.-1:00 A.M.
6065	49.45	HJ4ABL	● Manizales, Colombia	11:00 A.M.-12 noon Sat. to 5:30, 5:30-7:30 P.M.
6060	49.50	W8XAL	● Cincinnati, Ohio	Daily 6:30 A.M.-8 P.M., 11 P.M.-2 A.M.
6060	49.50	HJ4ABD	● Medellin, Colombia	6-11 P.M. ex. Sun. 10:30 A.M.-1 P.M.
6060	49.50	W3XAU	● Philadelphia, Pa.	8-11 P.M. daily
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 10 A.M.-6:30 P.M.
6050	49.59	HI9B	● Santiago de los Caballeros. R. D.	Daily 6:10-9:40 P.M.; Sat. 11:40 P.M.-12:40 A.M.
6050	49.59	HJ3ABD	● Bogota, Colombia	Daily 12-2 P.M., 8-11 P.M.
6043	49.65	HJ1ABG	● Barranquilla, Colombia	11:30 A.M.-2 P.M., 5:30-11 P.M.; Sat. to 12:30 A.M.; Sunday 11 A.M.-3 P.M., 5-8 P.M.
6040	49.67	PRA8	● Pernambuco, Brazil	9:30-11:30 A.M., 2:30-8:30 P.M.
6040	49.67	YDA	● Tandjonprick, Java	5:30-11:30 A.M., 5:45-6:45 P.M., 10:30 P.M.-1:30 A.M.
6040	49.67	W4XB	● Miami, Florida	Sun. 11:30 A.M.-2:30 P.M., 9:30-10:30 P.M.; Mon., Wed., Sat., 12-2:30 P.M., 8:30-10:30 P.M.; Tues., Thurs., 12-2:30 P.M., 9:30-10:30 P.M.; Friday, 12-2:30 P.M., 9-10:30 P.M.
6040	49.67	W1XAL	● Boston, Mass.	Sun., 4-6 P.M.; Mon., Tues., Thurs., 6-8 P.M.
6030	49.75	HP5B	● Panama City, Panama	12 noon-1 P.M., 8-10:30 P.M.
6030	49.75	PGD	Kootwijk, Holland	(P) Phones Java and E. Indies irreg.
6030	49.75	VE9CA	● Calgary, Alberta, Canada	7 P.M.-1 A.M.
6025	49.79	PGD	Kootwijk, Holland	(P) Phones Java and E. Indies irreg.
6020	49.83	PGD	Kootwijk, Holland	(P) Phones Java and E. Indies irreg.
6020	49.83	DJC	● Zeesen, Germany	11:35 A.M.-4:20 P.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., Sun. 4-11 P.M.
6011	49.89	HJ1ABC	● Quibdo, Colombia	Sun. 3-5 P.M., 9-11 P.M.; Mon. to Sat., 5-6 P.M.; Wed., 9-11 P.M.
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., 7-10:30 P.M.; Sun., 1-2 A.M.
6005	49.96	HP5K	● Colon, Panama	7:30-9 A.M., 12-1 P.M., 6-9 P.M.
6005	49.96	VE9DR	● Montreal, Que.	2 P.M.-1 A.M.
6005	49.96	VE9DN	● Montreal, Que.	Used irregularly
6000	50.00	XEBT	● Mexico City, Mexico	10 A.M.-1:45 A.M.
6000	50.00	RV59	● Moscow, USSR.	Sun., Mon., Wed., Fri., 4-6 P.M.
5980	50.17	HJ2ABD	● Bucaramanga, Colombia	Daily 11:30 A.M.-12:30 P.M., 6-10 P.M.
5980	50.17	HIX	● Ciudad Trujillo, R. D.	Mon. to Sat., 12:10-1:10 P.M., 4:40-5:40 P.M.; Tues. & Fri also 8:10-10:10 P.M.; Sunday 7:40-9:40 A.M.
5975	50.20	XEVI	● Mexico City, Mexico	Sun. 1-2:15 P.M.; Mon., Wed., 3-4 P.M.; Tues. & Thurs. 7:30-8:45 P.M., 10:30 P.M.-12 M.; Fri. 3-4 P.M., 9 P.M.-12 M.; Sat. 9-10 P.M.
5970	50.25	HJ2ABC	● Cucuta, Colombia	11 A.M.-12 noon, 6:30-9:00 P.M.
5969	50.26	HVJ	● Vatican City, Vatican	2-2:15 P.M., Sunday 5-5:30 A.M.
5950	50.42	HJN	● Bogota, Colombia	8-10:45 P.M. irregular
5940	50.51	TG2X	● Guatemala City, Guat.	Daily 4-6 P.M., 10 P.M.-12 A.M.
5930	50.60	HJ4ABE	● Medellin, Colombia	11 A.M.-12 noon, 6-10:30 P.M.
5910	50.76	HH2S	● Port-au-Prince, Haiti	7-10 P.M.
5900	50.85	YV8RB	● Barquisimeto, Venezuela	12-1 P.M., 6-10 P.M.
5885	50.98	HCK	● Quito, Ecuador	Mon. & Fri. 9-11 P.M.
5880	51.02	ETG	● Addis Ababa, Ethiopia	Used irregularly
5875	51.11	HRN	● Tegucigalpa, Honduras	Week Days 12-1:30 P.M., 6-7:30 P.M., 8-11:15 P.M.; Sun., 3-5 P.M., 6-7:30 P.M., 8-11:15 P.M. and later
5865	51.15	HI1J	● San Pedro de Macoris, R. D.	Daily 6:25-7:40 A.M., 11:40 A.M.-1:40 P.M., 4:40-9:40 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., 5:30-10:00 P.M.
5850	51.28	GBT	Rugby, England	(P) Phones U.S.A. irreg.
5845	51.33	KRO	Kahuku, 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 P.M.-12 midnight
5800	51.72	KZGF	Manila, P. I.	(P) Tests A.M. irreg.
5800	51.72	YV2RC	● Caracas, Venezuela	8:30 A.M.-9:30 P.M. Sundays; 11:15 A.M.-1:30 P.M., 4:30-9:30 P.M. week days
5790	51.81	JVU	Nazaki, Japan	(P) Phones JZC early mornings
5780	51.90	CMB-2	Havana, Cuba	(P) Phones and tests irregularly
5780	51.90	OAX4D	● Lima, Peru	9-11:30 P.M. Wed., Sat.
5760	52.08	HJ4ABD	● Medellin, Colombia	10:30 A.M.-1 P.M., 6-11 P.M.
5750	52.17	XAM	Merida, Mexico	(P) Phones XDR - XDF early evenings
5730	52.36	JVV	Nazaki, Japan	(P) Phones JZC early A.M.
5725	52.40	HC1PM	● Quito, Ecuador	Tuesdays 9-11 P.M.
5720	52.45	YV10RSC	● San Cristobal, Venez.	11 A.M.-12 N., 6-8:30 P.M.
5713	52.51	TGS	● Guatemala City, Guat.	6-9 P.M. irreg.; Sun. 6-8 P.M.
5705	52.59	CFU	Rossland, Canada	(P) Phones CFO and CFN evenings; news 8:30-8:45 P.M.
5670	52.91	DAN	Nordenland, Germany	(P) Phones ships irreg.
5500	54.55	TI5HH	● San Ramon, Costa Rica	3:30-5 P.M., 8-9:30 P.M. daily
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
5410	55.45	ZBW	● Hong Kong, China	1:30-3:15 A.M., 6 A.M.-12 N.
5400	55.56	HJA7	Cucuta, Colombia	(P) Phones irreg.; 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. America irregular
5260	57.03	WQN	Rocky Point, N. Y.	(E) Program service; irregular
5140	58.37	PMY	● Bandoeng, Java	Daily 4:45-10:45 A.M., 5:45 P.M.-2:15 A.M.
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
5040	59.25	RIR	Tiflis, USSR.	(P) Phones afternoons irregular
5015	59.82	KUF	Manila, P. I.	(P) Phones Bolinas; irregular
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
4810	62.37	YDE2	● Solo, D. E. I.	5:30-11:30 A.M., 5:45-6:45 P.M., 10:30 P.M.-1:30 A.M.
4795	62.56	VE9BK	● Vancouver, Canada	Week days 11:30-11:45 A.M., 3-3:15 P.M., 8-8:15 P.M.; Sat. 7:30-7:45 P.M.
4752	63.13	WOY	Lawrenceville, N. J.	(P) Tests irregularly
4752	63.13	WOO	Ocean Gate, N. J.	(P) Phones ships irreg.
4752	63.13	WOG	Lawrenceville, N. J.	(P) Phones Rugby irreg.
4600	65.22	HC2ET	● Guayaquil, Ecuador	9:15-10:45 P.M. Wed. & Sat.
4555	65.95	WDN	Rocky Point, N. Y.	(P) Tests Rome and Berlin evenings
4550	65.93	KEH	Bolinas, Calif.	(P) Phone; irreg.

On the Market

Mallory Grid-Bias Cell

THE MALLORY Grid-Bias Cell, a potential cell to furnish grid bias for various tubes in the radio receiver, is now available. This cell, used for several years by radio engineers and manufacturers, is a small acorn-shaped, self-contained device, 5/8-inch in diameter and 11/32-inch deep. Its principal use is to furnish bias for the first audio amplifier tube in modern high-



gain avc receivers and speech amplifiers—such tubes as 75, 2A6, 6F5 and others. It is widely used for this purpose, because (1) it effectively eliminates a number of components, (2) it provides a fixed bias voltage, independent of varying tube characteristics and (3) it simplifies the circuit. It has also been effectively used to furnish initial bias to the r-f, i-f and converter tubes on the avc line. In this application it is necessary to use several cells in series. Satisfactory mounting devices have been developed and may be obtained either as an individual unit or as an integral part of a strip. Both the cells and mounting devices are now carried by leading radio parts distributors—or complete information may be obtained by writing P. R. Mallory & Company, Inc., Indianapolis, Indiana. *All-Wave Radio.*

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Carbon Element vs. Wire-Wound Volume Controls

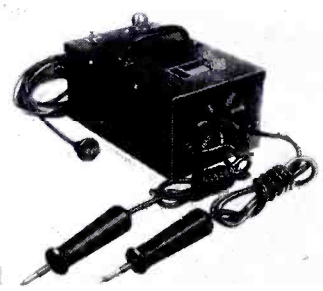
THERE ARE two broad types of volume controls in general use: first the composition element or so-called carbon type; second, the wire-wound type. Because the composition-element type has the advantage of greater resistance range and flexibility in the matter of tapered values, points out George Mucher, Chief Engineer of the Clarostat Mfg. Co., it is in the majority today, especially when intricate resistance curves are required for those critical circuits and tubes. The wire-wound element on the other hand is capable of handling heavier currents with safety, even though it does not offer as much flexibility in the matter of tapers, nor as great resistance ranges. *All-Wave Radio.*

New Acme Dielectric Tester

THE NEW DIELECTRIC or breakdown tester manufactured by The Acme Electric & Mfg. Co., of Cleveland, Ohio, not only indicates shorts, opens, or grounds—but actually checks circuits at approved standard testing voltages. The manufacturer states that this unit is entirely different in principle from the common insulation testers in present day use—in that the Acme Dielectric Tester will permit actual application of the standard testing voltage of double the rated voltage plus 1000 to the appliance device or equipment under test and thus prove the dielectric strength of the insulation to meet standard safety limits. Any windings with rotted, old or defective insulation, below minimum safety standards would break down under test necessitating proper rewinding or repairing and thus preventing the usage of unsafe, electrical equipment.

The Acme Dielectric tester is a compact complete unit. A 6-ft. primary cord is plugged into a 110-volt, 60 cycle convenience outlet. Secondary connections are supplied with 4-foot high-voltage cable leads each equipped with test prong. The secondary test voltage is manually controlled by a tap-switch that provides any voltage; 500, 1000, 1250, 1500, 1750, 2000, or 2500 volts, simply by rotating the indicator. The short circuit current is 1 amp. at 500 volts and 200 m.a. at 2500 volts. The 100% leakage type transformer used in this device permits short circuit for a period of time without any damage. This current limitation also eliminates burning of materials at point of breakdown of apparatus under test.

Acme engineers point out particularly the use of a second secondary winding on the same common core but shielded from the high-voltage secondary. This second secondary supplies 110 volts to a small indicating ruby lamp. Lamp is inset and shielded by metal mask. This lamp glows when Dielectric Tester is turned on—thus warning operator of live secondary leads. On partial breakdown the lamp dims and on complete breakdown goes out.



Off and on toggle switch conveniently mounted on the face of the device permits complete control of primary current. Equipped with a sturdy metal handle, this unit lends itself to portability. *All-Wave Radio.*

Two More Arcturus "Coronet" Tubes

TO THE THIRTEEN types of "Coronet" Metal Tubes for replacing old glass types, the Arcturus Radio Tube Company, Newark, N. J., has added the types 25A6 "Coronet" and 25Z6 "Coronet." These replace the types 43 and 25Z5, respectively.

Modernizers to permit the interchange have been developed. The 25A6 Coronet uses the standard Arcturus 6-prong modernizer, while the 25Z6 Coronet requires a special 6-prong modernizer which has also been added to the line. *All-Wave Radio.*

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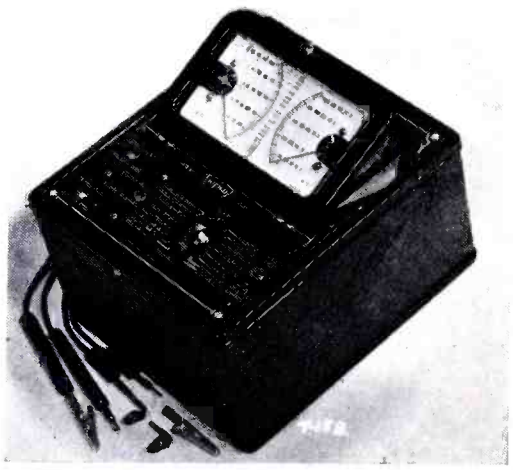
Volt-Ohm-Milliammeter

THE MODEL 1200 Triplett Volt-Ohm-Milliammeter contains the popular twin instrument having separate a-c and d-c movements. An exclusive tilting feature is incorporated for adjusting the instrument to proper alignment for correct readings. One switch quickly selects all instrument readings. Newly developed shunts limit amount of current passing through switch contacts to one milliampere or less, minimizing contact error.



The volt-ohm-milliammeter is easy to operate, accurate and as nearly fool-proof as possible. Scale readings, D-C: 10-50-250-500-1000 volts at 2000 ohms per volt; 1-10-50-250 m.a.; 1500 ohms, 1.5 and 3 megohms. A-C: 10-50-250-500-1000 volts. Model 1200 is manufactured by the Triplett Electrical Instrument Co., Bluffton, Ohio. *All-Wave Radio.*

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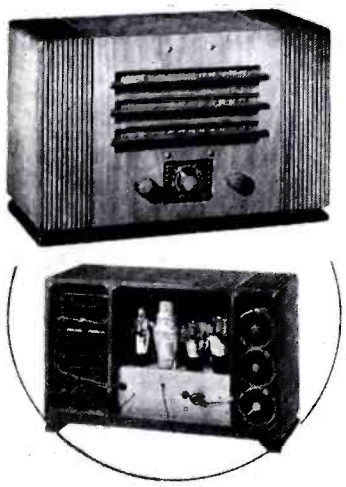
United Electronics Mercury Rectifiers

UNITED ELECTRONICS CO., 42 Spring St., Newark, N. J., has released a technical folder dealing with the construction and characteristics of the types 972, 966-A, 966 and 972-A Mercury Rectifiers for amateur use. Copies may be had on request to the manufacturer. *All-Wave Radio.*

Kadette Battery-Operated Portable

WITH RAPID PROGRESS being made in the radio field, it was almost a foregone conclusion that someone would eventually devise a simple and practical radio to operate at a low cost from ordinary batteries such as can be bought at any store. Now word comes from Ann Arbor, Michigan, that such a radio has been developed.



There are many interesting things about this radio that will interest those who must operate their sets from batteries. To begin with, the original battery cost has been reduced 50% because no expensive "A" batteries are required. A further saving of at least 20% is claimed because of a device called the International Battery Saver. Added to this is the 80% reduction of speaker battery drain through use of the new Perm-O-Flux dynamic speaker which utilizes a newly developed substance that will lift 140 times its own weight as against nine times in the ordinary magnet.

The new Kadette Battery permanent dynamic Superheterodyne Model 400, just announced, is completely portable with aerial attached and batteries entirely self-contained, weighing approximately 25 lbs. Uses three ordinary 1½ volt ignition drycells for "A" supply, giving approximately 300 hours of service. Three portable size B batteries are used, supplying 135 volts and giving extremely long life because of exceptionally low battery drain.

Two distinct tuning ranges cover both Standard Broadcast and Short Wave.

A superheterodyne circuit is employed, using the following tubes: one 1C6, one 34, one 1B5, and one 950.

The cabinet is in a modern design of selected walnut. Completely portable, with aerial attached, and suitable for use on boats, in camps, farms or cottages, or even in automobiles. *All-Wave Radio.*

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Lafayette Phono-Radio Combination

A SEVEN-TUBE portable photo-radio combination, completely self-contained and capable of operation on either alternating or direct current, has been brought out by Lafayette Radio Mfg. Co., 100 Sixth Avenue, New York, N. Y. Known as the Model J-81, this instrument is designed especially for travelers, residents of summer hotels, etc., who want to supplement radio entertainment with selected phonograph records.

A specially constructed Fabricoid covered carrying case houses the radio chassis, loudspeaker, phono turntable, motor and pick-up and a partition for a dozen records. Any 78 r.p.m. record, either 10 or 12 inch, can be played. The loudspeaker, protected by a drop door, is located in the front end of the case, and acts as an efficient sound projector. All controls are conveniently located. The entire combination measures 27½ by 13½ by 10⅜ inches and weighs 40 pounds.

The radio receiver covers the 18-56, 67-193 and 186-560 meter bands and uses the following tubes: 1-6A8, 1-6K7, 1-75, 1-43, 1-25Z5, 1-2Z3 and 1-50A2MG. A special European model tunes the 18-56, 186-560 and 793-2110 meter bands. *All Wave Radio.*

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Allied Radio Display

THOUSANDS OF radio amateurs and servicemen thronged the floors of the recent I.R.S.M. radio show at Chicago, examining the interesting displays of radio equipment. Among the leading exhibitors was the Allied Radio Corporation, with a graphic display of slide pictures and panels, illustrating the tremendous strides taken by radio in the past few years. Everyone present agreed that it was the finest I.R.S.M. radio show ever held and great optimism was expressed concerning the future of the industry.

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Sprague Announces New Condenser Features and Important Price Reductions

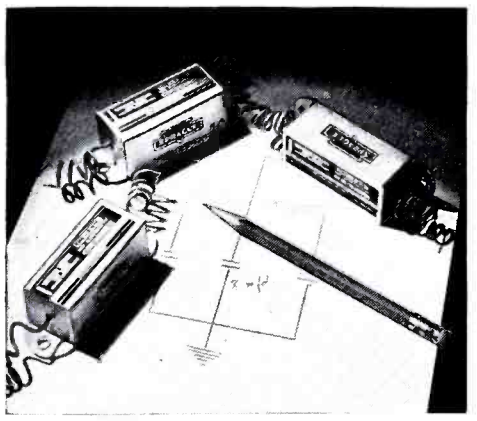
MANY CONDENSER developments as well as important price reductions on standard items are featured in the 1936 Sprague Condenser Catalog just issued by Sprague Products Company, North Adams, Mass.

Various new 450-volt condensers have been added to the Sprague line, thus making a full range of types and capacities.

Prices on many Sprague "600" Line Condensers have been materially reduced.

Sprague 450 v. and 600 v. units.

Servicemen will welcome the introduction of the new Sprague Universal Mounting Flange which reduces the mounting of replacement condensers to the simplest possible form, and enables them to match up with any mounting holes already in the chassis.



Sprague Tiny Mikes.

New low prices on Sprague Oil Impregnated Transmitting Condensers will prove popular with amateurs. Another feature of strong appeal to amateurs is the Short Wave High Frequency Condensers which serve as durable and inexpensive substitutes for mica condensers in many circuits.

Additions to the line for 1936 include a new Automobile Vibrator Condenser, a new Ford type Auto Radio Condenser and various others.

A copy of the catalog will be sent free on request to the manufacturers, or it may be obtained from leading jobbers throughout the country who feature Sprague Condensers. *All-Wave Radio.*

✦

New RCA Cathode-Ray and Phototubes

THE RCA RADIOTRON Division of the RCA Manufacturing Co., Inc., Harrison, N. J., has announced three new Cathode-Ray Tubes, three new Phototubes and a triode audio amplifier. Brief details follow:

RCA-909:

HIGH-VACUUM CATHODE-RAY TUBE (Electrostatic type with Long-Persistence Screen —5" Diameter.

The 909 is a new cathode-ray tube electrically and physically similar to the RCA-905, except that it employs a fluorescent-screen material capable of glowing for several minutes after the excitation has been removed. The 909 is particularly useful in oscillographic applications where either extremely low-speed phenomena or high-speed non-recurring phenomena are to be observed.

RCA-910:

HIGH-VACUUM CATHODE-RAY TUBE (Electrostatic Type with Long-Persistence Screen—3" Diameter).

The 910 is a new cathode-ray tube electrically and physically similar to the RCA-906, except that it employs the same fluo-

rescent-screen material used for the RCA-909. The 910 is particularly useful in oscillographic applications where either extremely low-speed phenomena or medium-speed non-recurring phenomena are to be observed.

RCA-911:

HIGH-VACUUM CATHODE-RAY TUBE (Electrostatic Type with Medium-Persistence screen—3" Diameter—and Gun Unusually free from Magnetization Effects).

The 911 is a new cathode-ray tube electrically and physically similar to the 906, except that its gun is unusually free from magnetization effects. The 911 is especially suited for certain oscillographic applications involving precise measurements where it is desirable that permanent beam deflections due to magnetization effects be minimized.

RCA-917:

PHOTOTUBE (Vacuum Type). Constructed with a top-cap anode connection, this new tube is especially suited for applications where the use of a high resistance load is desirable to give maximum circuit sensitivity.

RCA-918:

PHOTOTUBE (Gaseous Type). The 918 is a new phototube similar to but more sensitive than the RCA-868.

RCA-919:

PHOTOTUBE (Vacuum Type). The 919 is a new phototube similar to the 917 except that the cathode is brought out to the top-cap connection. By choice between these two types, it is practical to arrange circuits with the top cap of the phototube connected to the top cap of its amplifier tube. This arrangement is desirable for minimizing leakage currents and for obtaining very high overall sensitivity.

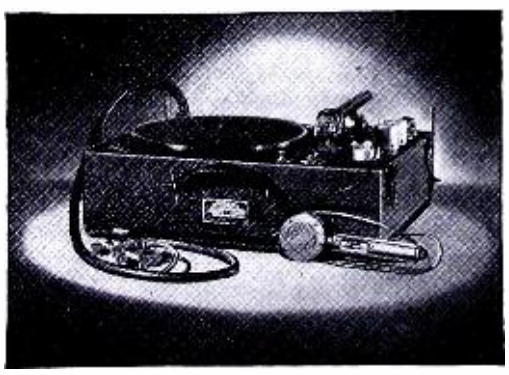
RCA-1602:

AMPLIFIER TRIODE. The 1602 is a three-electrode tube intended for use as an audio-frequency amplifier in applications critical as to microphonics. This tube was formerly designated as the RCA-10 Special. *All-Wave Radio.*

◆

Operadio Model 112 Mobile P-A System

RADIO AND public-address men will find a ready and profitable market for this Mobile Public Address System made by the Operadio Manufacturing Company, St. Charles, Illinois. It can be sold for political use, outdoor advertisers, street ballyhoo, etc.



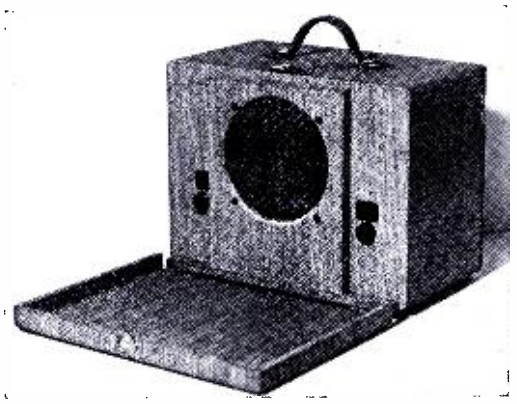
Ideal for use in any automobile, this model is designed to set on the front seat alongside the driver. The false bottom may be adjusted to any angle to maintain a level turntable regardless of the pitch of the seat itself. This feature assists greatly in keeping the pickup from sliding across the face of the record while the car is in motion.

Operating from a 6-volt storage battery, this system delivers 20 watts Class "A" power output. Complete with two-speed turntable which will play up to 16" records, it comes with Crystal Contact Type Hand Microphone, and tubes. It is made to mix both microphone and phonograph inputs. Detailed specifications may be obtained by writing Operadio Manufacturing Company, St. Charles, Illinois. *All-Wave Radio.*

◆

Ansley Portable Battery Set

THE ANSLEY RADIO Corporation, 240 West 23rd St., New York, N. Y., has placed on the market a new battery-operated four-tube superheterodyne receiver that is completely self-contained in a portable carrying case.



The receiver employs dual-purpose tubes and is operated from two No. 6 dry cells and two small 45-volt "B" batteries. The batteries slip into place and the connections are made automatically by means of phosphor-bronze spring contacts.

The life of the dry cells with average daily use is two to three weeks, while the life of the "B" batteries is two to three months. Provision is made for connecting large batteries outside the case if the set is to be used permanently in one place.

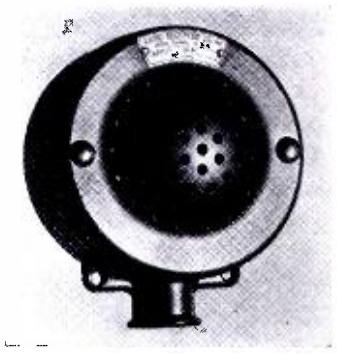
The case is furnished in black leatherette or in gray or tan airplane cloth. The size of the set is 13 x 10½ x 8 inches. The loudspeaker is 6 inches. The weight of the receiver, complete with batteries, is 20 pounds. *All-Wave Radio.*

◆

Radio Receptor Dynamic Microphones

RADIO RECEPTOR CO., 106 Seventh Ave., New York, N. Y., has introduced a line of dynamic microphones for use with public-address equipment and for amateur fone transmitters. Three models are available.

Model 7A is designed for both voice and high-fidelity music reproduction. Its sensitivity is such that high amplification is not required. The manufacturer states that the response is substantially flat from 50 to 9000 cycles. Its sensitivity per bar is —69 db and, with normal speech at three feet, —59 db.



Model 7B is specially adapted for public-address and remote pick-up work. It has high output and may be substituted in most cases for a carbon microphone without the use of a pre-amplifier. Response is substantially flat from 100 to 5000 cycles. Sensitivity per bar is —61 db and at normal speech, 3 feet distant, —51 db.

Model 7C is designed for public-address and amateur fone work. Response is substantially flat from 100 to 5000 cycles. Sensitivity per bar is —69 db and at normal speech —61 db.

The impedance of all three models is 30 ohms at 1000 cycles. *All-Wave Radio.*

◆

New Amperite Banquet Stand

THE SMOOTH AND positive action of the new Amperite banquet stand is due to the incorporation of the Amperite ball bearing clutch. A ⅛ turn with the tip of the fingers is all that is necessary to tighten the stand securely. Once tightened, the stand will not "creep" yet the ball bearing permits the microphone to be rotated without loosening the clutch. There are no parts to wear out or require adjustment. Its up and down action is pneumatic-like. The quick grip thread requires only two or

three turns to fasten the microphone. By removing the rod, the base can be used for a desk stand. Obtainable in gunmetal or chrome finish. Manufactured by the Amperite Co., 561 Broadway, New York, N. Y. *All-Wave Radio.*

QUERIES

[*Continued from page 232*]

it is due to an attempt to cure noises for which filters are not designed to combat, or the use of the wrong filter for existing conditions. Many excellent filters are on the market, and the average serviceman is willing to install one—or let the customer make the very simple installation himself—on free trial.

Figure 2 illustrates several filter circuits which the all-wave listener can try without much technical knowledge. The values of the *paper* condensers are given on the diagrams. In all circuits, the condensers should have a safe rating of 400 volts. In circuit A, obviously the most simple, the plug should be reversed in the receptacle to determine which of the two possible connections provides the more noise reduction. Circuit B is electrically similar to circuit A, only, in most cases, no difference in filter action will be experienced in reversing the plug. Circuit C employs radio-frequency choke coils for more effective filtering. Each choke is wound with 100 turns of number 18 double-cotton-covered wire (ordinary bell or annunciator wire will do) on cardboard tubes 6 inches long and 2.5 inches in diameter. Each choke will require about 65 feet of wire. The chokes should be separated by several inches, and should be mounted at right angles to each other. In some instances the filter shown in Figure 2C will be more effective with the condensers connected on the line side as suggested by the dotted lines.

With a-c operated receivers, a switch should be provided as the condensers will draw a small current. The switch may be placed at X or X′ in Figure 2A. However it must be placed in the high side of the line in B and C. One side of the line is grounded as shown by the dotted lines, and unless the switch is properly placed, current will pass through condenser C-1, even with the switch turned off. The position of the switch may of course be changed merely by reversing the plug. When connected properly, there will be no spark when the connection is made or broken between the ground and the center tap of the two condensers if the switch is turned off. D-c circuits require no special switch.

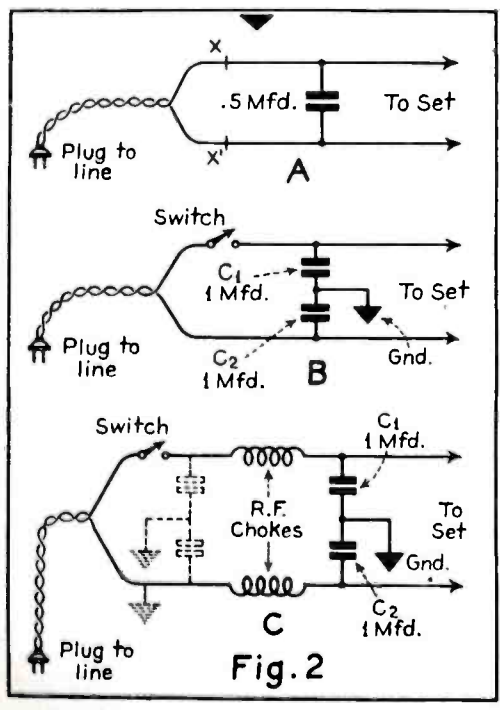


Fig. 2. Some simple filter circuits for line noise which the average all-wave listener can utilize.

Noise frequencies are composed largely of the higher audio frequencies. When a receiver is adjusted for high-fidelity reception, the circuit is so arranged that these higher frequencies are admitted, as they are represented in the higher harmonics of musical instruments. Thus more noise will be heard when a receiver is switched to or adjusted for high-fidelity reception.

CHANNEL ECHOES

[*Continued from page 228*]

reasons a Republican or a Democrat has been elected in the past—yea, even before Marconi sent the letter S, or a good facsimile thereof, across the Atlantic Ocean.

A voter will make an X opposite Roosevelt's name for one or more of several reasons. Because he likes the man, has confidence in him, likes his friendly, intimate, smiling countenance, and believes that he has done as well or better than anyone else could in the face of circumstances. Because the voter agrees with the policies of the present administration. Because his father and his grandfather always voted Democratic. Because her husband or son is going to vote Democrat. Because the town has always been Democratic. Because a Democratic Member of the State Assembly got him or her a WPA job, or followed through an application for relief work. Because of the pressure of ward politics. Because Roosevelt put an end to prohibition. Because the voter's personal business has taken an upturn during the present administration. Because Woodrow Wilson and Thomas Jefferson were Democrats.

A voter will cast a Republican ballot because he has confidence in the candidate, or at least believes he is better than Roosevelt and can pull us out of a hole. Because he disagrees with the policies of the present administration. Because Roosevelt grins too much. Because there has been a divorce in the President's family. Because he (or she) doesn't like Mrs. Roosevelt. Because the voter has

received a ticket for speeding where the Roosevelt progeny seem to get away with murder. Because his father and grandfather have always voted Republican. Because the town has always been Republican. Because her husband or son tells her to vote Republican. Because a Democratic Member of the Assembly didn't h lp him when perhaps he could have. Because Roosevelt put an end to prohibition. Because the voter's personal business has not been assisted by the New Deal. Because Abraham Lincoln and Roosevelt the First were Republicans.

Of course, the various facets on these political gems will be well polished over the air—and many voters will be swayed from one side to the other. But it is almost a mathematical certainty that as many voters will be persuaded into the Democratic fold as will be swayed by this radioratory to Republicanism. The Democrats will have just as persuasive exaggerators as the Republicans, their radio time, by law, will be the same—as will be the net result!

The only influence radio will have on the election will in no way influence the outcome. More persons will have the opportunity of listening to the claims of both parties. Thus, more intelligent persons emancipated from the biases outlined above, will figure things out for themselves. If most of what each party has to say about the other is true (and their respective statements will be largely based on facts) then the candidate of neither party is worth voting for. The result will be a larger vote than ever cast with the minor parties—a result that we predict, and the credit for which should go to RADIO!

BOOK REVIEW

[*Continued from page 227*]

constructional data is given in each case. Of particular interest in these chapters is the dope on multi-band transmitters and the new and improved Jones all-band exciter unit.

Following the section on c-w transmitters are chapters on fone equipment. Modulation and modulation methods are described and circuits shown for simple and complex speech amplifiers and modulators. Many different low and high-power fone transmitters and power-supply units are described, and design data given. Considerable space is devoted to an explanation of controlled-carrier modulation and details are provided for the construction of a transmitter using this system.

There are 18 pages of the latest data on 10-meter equipment. These pages include information on both transmitters and receivers of various types. Another chapter deals with ultra-high-frequency transmitting and receiving equipment, principally for 2.5 and 5 meters.

There are 26 pages covering antenna systems—everything from the simple, single-wire aerials to the complex directional arrays. Dimensions are given in all cases.

There follow chapters on the design and construction of receiver and transmitter power supplies, on test instruments and calculations, and on the FCC Rules and Regulations Governing Amateur Radio Stations and Operators.

There is an index in the back of the book.

The Radio Handbook is a warehouse of real, practical information. It is outstanding in that numerous charts and tables are provided to aid the constructor who cannot, or does not wish to make his own calculations. G.S.G.

W8XWJ

[*Continued from page 207*]

pre-amplifier. All other sources of program have a sufficiently high output level to operate directly into the line amplifier. All amplifiers are completely a-c operated. The associated power supplies are located in the steel cabinet that houses all speech input equipment.

The overall audio-frequency response of the entire set-up, from microphone to antenna, is substantially flat. The range is flat within two db plus or minus from 30 to 15,000 cycles, truely high fidelity! When the equipment was installed and tested, much trouble was experienced with radio frequency feeding back from the transmitter and antenna system into the speech input. Eventually this trouble was completely eliminated by properly and completely filtering all incoming and outgoing circuits of the speech input equipment as well as power circuits to the transmitter.

Operating Schedule

The operating schedule in E.S.T. follows:

Weekdays	6:15 A.M.—12.30 P.M.
	2.00 P.M.— 5.00 P.M.
	7.00 P.M.—10.00 P.M.
Sundays	2.30 P.M.— 7.30 P.M.

The programs broadcast at present consist mainly of WWJ's programs which include NBC Red Network features as well as locally produced programs. In addition however, three times a week a code class is conducted on W8XWJ, which has a considerable following. Programs of interest to short-wave listeners and Amateurs are put on once a week. In the near future, a series of programs originating in the *Detroit News* Airplane "Early Bird" will be a regular feature on W8XWJ, while conversely, the same

airplane will be used to make observations on this station's signals. For this purpose a special ultra-high-frequency receiver will be installed in the ship, in addition to the present radio equipment which includes a Western Electric 50-watt aircraft transmitter and a Lear three-band aircraft radio receiver. A trailing antenna is used for transmitting, while a fixed, built-in antenna in the tail fin is used for receiving.

Listeners' Reports Requested

Because we of W8XWJ will depend largely upon listener's reception reports, to determine the service area of the station, all such reports will be very much appreciated. Such reports may be mailed to W8XWJ, 4465 Penobscot Building, Detroit, Michigan.

Incidentally, *The Detroit News* is at present completing the installation of new Western Electric transmitting equipment at a new location, much more favorable than WWJ's present location among the downtown buildings. This equipment will be operated at 5 kw during daytime, and one kw nights, and will employ the first of a new type vertical radiator. This radiator, ⅜ wave long, is 400 feet high and has a uniform cross section of six feet. A new studio building is also in the process of construction and will be completed some time this summer.

TWO EMBRYO HAMS

[*Continued from page 214*]

whole business comes over you all of a sudden. You slave away day after day and presume you are making no headway at all. Then one day you are surprised to learn that all the plugging has been etching sounds on the subconscious. Before you realize what has happened, the subconscious has opened up, and there you sit, really copying stuff by its sound. It's just like the sun breaking through a cloud bank.

Unquestionably you will experience the same thing—everyone does. So, don't lose confidence. Absorb as much of the code as you possibly can. When you aren't practicing together, tune to some of the short-wave commercial radio telegraph stations and drink in their constant repetition of *v*'s followed by *de* and their call letters. You will find some who send quite slowly. I'm going to spot a few for you and include them in my next letter. In the meantime, you might hunt for a couple yourselves.

List of Books

Since the two of you won't be practicing code all the time, I think you ought to start in absorbing a bit of information about amateur radio in general. I am sending you some inexpensive books which you will eventually find indispensable. The first one is, "How To Become a Radio Amateur," published by the American Radio Relay League. This little book is elementary and will give you a good idea as to what amateur radio is all about—not that I won't tell you myself!

The second little book is. "The Radio Amateur's License Manual." This tells you how to apply for an amateur license, what grade of license you can obtain as a beginner, and what amateur bands such a license will permit you to operate in. The book also includes 198 typical questions and answers as are asked in the government examinations. When the time rolls around, you will be asked ten of these questions, picked at random from a standard group of about 200. Since you can't do the picking, and since you won't know which ten questions will be placed before you, it is important that you know the answers to all of those in the book listed under the heading "Examination For Classes B and C." Don't make the mistake of even *looking* at the questions for the Class A Examination. You can't obtain a Class A license until you have been on the air for a year. Besides, the questions asked in this examination will scare the life out of both of you. Later on they won't seem so tough. *But, leave them alone for the present.*

Though there are 198 questions in the little book, you will note that many of them are practically duplications—the same questions asked in a different manner. So, really, you don't have to learn the answers to 198 *different* questions.

I would suggest that for the time being you and Barb confine yourselves to the questions dealing with the Federal Communications Commission Laws and Regulations. We will get around to the "Theory" and "Practice" questions later on.

The third book I am sending you is, "The Radio Amateur's Handbook." This is a big fellow. I am also sending you a copy of "The Radio Handbook for Amateurs and Experimenters." This is another big fellow.

These last two books cover much the same ground. and either one alone would fill the bill. They are being provided for reference purposes only. You couldn't possibly absorb everything in them, but you will find them very handy when you want to get the low-down on some particular subject that has you guessing.

I would suggest that you browse through both of them. No doubt you will get some ideas of your own as to what sort of transmitter you want when the two of you have obtained your licenses. You'll find everything from soup to nuts in these books.

Well, that's about all for now. But don't forget that you are to send me

duplicates of your reports to Mr. Candler. He is going to be of great assistance to you in radio theory and practice, as well as code instruction, so you will not have to count on me as much as you thought. However, I am the fellow you should throw your questions at, so start shooting. You and Barb get together and write down all the brow wrinklers and send them to me. Never mind how silly they may sound to you—send them along anyway. You'll get the answers pronto.

Sincerely.

GERALD.

AWR-13

[*Continued from page 219*]

shaft bushing is used on the back edge of the chassis. The instructions also call for an extra cam and spring to mount on the shaft and oppose the spring in the i-f transformer to give smooth control of the panel knob. With only one i-f transformer this extra cam and spring were not found necessary, the friction in the front and back bearing being sufficient to hold the coupling at any desired point and still provide smooth control.

Wiring

In wiring, the filament circuit should be done first. Next all r-f leads should be put in place. After that the by-pass condensers and resistors should be wired in. The mounting bolt for each tube socket that is next to the shield prong should have a soldering lug placed under its nut and this lug used as the ground point of all by-pass condensers connected to the circuit of that particular tube. This gives single-point grounding for each stage which is necessary for complete stability of all circuits. These grounding lugs can be soldered directly to the adjacent shield connections of the sockets. The r-f lead from the plate of the first i-f tube to the second i-f transformer which runs across the back of the chassis should be kept away from the adjacent d-c and a-c wiring. It was not necessary to shield this lead in the original receiver.

No. 16 solid tinned pushback wire was used throughout the receiver. The one exception is the pair of leads from the 6B5 plates to the connection sockets. In order to prevent the audio from breaking down the insulation—a thing which has happened in other receivers when a lot less audio was used—these two wires are rubber covered.

The power supply and speaker unit can be wired in any desired manner as long as well insulated wire is used. No. 14 tinned stranded rubber covered wire was used throughout this unit. The power and filament transformers may be mounted with the lugs on top if it is desired to avoid the making of the square cutouts. In connecting the leads from the filament transformer T-8 to the leads of the filament winding on the power transformer T-7, first turn on the a-c power and touch the 6.3-volt leads of T-8 to those of T-7, in both directions. They should be connected in the direction which shows no spark.

In the drilling plans for the receiver chassis it will be noted that no holes have been marked for the several i-f transformers, only the outline being given. It is much easier to lay the templates in the proper places as shown by these outlines and mark through the necessary holes than to measure all these holes. For the beat oscillator and diode transformers the bottom plate can be taken off and used as the template. All of these three transformers have identical bottom plates so that it will be only necessary to remove the plate from one transformer.

The first i-f variable coupling transformer, T, should be turned so that the condenser adjusting screws face the left edge of the chassis. The second i-f variable coupling transformer. T-1, is faced so as to have these adjustments facing the rear edge of the chassis. The diode noise transformer, T-3, and the second detector diode transformer. T-2, are turned so that the two diode leads come out nearest the back of the chassis. The beat oscillator transformer, T-4, is turned so that the shielded grid lead comes out of the front nearest the beat oscillator tube.

The 6E5 electric eye is mounted so that the center of the hole is 2½" from the left edge of the panel and 2" from the top. This center hole should be 1⅛" in diameter. Using the escutcheon as template, drill two ⅛" holes on each side about 1/16" above center. The entire electric eye assembly can be mounted as shown in the top-of-chassis photo. The tube socket can be rotated so that the variable section of the eye is at the bottom.

Receiver Alignment

The Tobe Tuner comes already lined and tracked according to the calibrated dial. *Do not touch* any of the adjustments on the Tuner until the receiver is working properly and the i-f amplifier lined up.

When lining up the i-f amplifier the r.f. gain control should be wide open and the noise control set so as to put maximum bias on the noise amplifier and rectifier tubes. Then set the adjustment screws of the two variable i-f transformers at half capacity (diagonal position) and the coupling rods on the tops of the same transformers at about half position. The avc-beat oscillator switch should be thrown to the beat oscillator position to remove the avc, but the grid cap taken off the beat oscillator

temporarily until the i-f amplifier is lined up.

Next the top and bottom condenser screws of the second detector i-f diode transformer should be adjusted for greatest noise level. After that the condenser screws of the two variable coupling transformers should be lined for greatest noise level also. These adjustments will give an approximate lining up of the i-f amplifier. If everything is connected as it should be, and no parts are defective, the receiver should now be working and signals should be heard on all the bands.

The Tobe Tuner can now be finally adjusted according to the Tobe instruction booklet. Only slight adjustments should be necessary as the tuner is accurately adjusted at the factory.

Quality Test

For testing, the speaker unit was mounted in a cabinet which formerly housed a public-address speaker. This speaker cabinet is simply a two and one-half foot square baffle of one inch Celotex, supported by a frame of four two and one-half foot by eight-inch boards. The back of this cabinet is open. This provided an adequate baffle surface for the large 12-inch speaker used.

It was expected that good quality would be had, but the actual quality obtained was amazing. We have built and operated various receivers and public-address systems which we thought were pretty good, but this receiver has them all stopped for high fidelity—and we are plenty critical of good quality, one of us being a professional musician. As to a-c hum, it is absolutely unnoticeable.

We believe we are safe in saying that the quality of this receiver is equal to that of the finest and most expensive commercial radios today, at least all we have heard.

Selectivity Adjustment

The selectivity adjustment provides quite a kick to the uninitiated. Using maximum selectivity, distant broadcast stations (on the regular broadcast band) can be pulled through right on the next channel to a powerful 50-kilowatt local, without a sound from the local. But if the control is now turned to minimum selectivity (high fidelity) the adjacent local station will completely block out the distant station. This is also an interesting demonstration. The actual maximum selectivity is enough to provide fair single-signal c-w reception if so desired. With a ham tuner replacing the all-wave one, this receiver should be a really excellent set for both the fone and the c.w. ham.

The sensitivity on the short-wave bands is more than can be used. The noise level, or signal-to-noise ratio, is exceedingly low. Using the noise silencer to minimize automobile and similar interference, short-wave reception becomes a pleasure. The noise silencer is also easy to adjust. With the noise control turned near minimum the adjusting screws of the noise diode transformer are merely adjusted for minimum noise, using a car engine to produce the noise. In operation the noise control should be turned to suit conditions.

Speaker and Power Supply

For those builders who would like to cut the cost of parts, a smaller speaker and power supply can be used. (The speaker used has a 150-180 volt field). The speaker should have a 10,000-ohm input inpedance, center tapped. The receiver will work on a lower plate voltage, and also with only one 6B5 if the speaker input impedance is changed to 7000 ohms. However, best quality and results of course are obtained with the specified apparatus.

TRANSRADIO

[*Continued from page 221*]

slip which told of Hauptmann's doom was being rushed to the wire room by a second messenger.

It had been decided by Transradio's court room reporters that if the trooper caught the slip of paper, the boy was to shout a sentence containing his nickname or that of his blond pal: "Hey, this is Red" (Death); or "Hey, Whitey, are you there?" (Mercy). They evidently thought Hauptmann's chances of acquittal very slim.

Other newsmen had similar systems; few seconds later another slip, the Boston Globe's, got through the locked door. Then came a flock of paper slips, headed by the UP, AP and INS. The State Trooper must have feared a charge of discrimination for he let them all past. The scramble on the other side of the door sounded like a football scrimmage.

Many reporters favored a system of flashing huge placards from the windows of the courtroom. Sadly, for them, the shades of the windows were tightly drawn when the jury came in with the verdict.

A New York *Journal* man had four huge cards bearing the numbers 1, 2, 3 and 4 hidden under his topcoat, the Standard News had large colored cardboards. These and others were for signaling their men in the courtroom balcony, who were to release ready-written flashes over the top of the balcony door to their fellow conspirators. Much to the dismay of these conspirators, the flood of slips that poured over this door were calmly collected by an officer standing guard there. Only the Standard News slip managed to get by him, and there were disgruntled charges of favoritism.

A complete portable short-wave transmitter, built into a briefcase, was smuggled into the courtroom by a New York *Daily News* man. The transmitter couldn't have sent a message more than a few hundred yards, but that was far enough for the reporter. However, he was so anxious to keep it concealed that he only succeeded in attracting the attention of a deputy. Just as the jury filed in, the deputy pounced on the brief case and confiscated it, transmitter and all.

Another scheme of the AP's which seemed fool-proof failed to work. They had bought the official transcript of the trial at considerable expense. The testimony, which was taken down by the court stenographers was rushed outside for typing every minute and a half. The AP men figured the court stenographers would be able to get out of the courtroom with the verdict while the doors were still locked. However, the UP and INS men, hearing of the plot, rushed in a body to Judge Trenchard and protested vehemently. He ruled that the stenographer should not be permitted to leave the courtroom until the doors were unlocked.

The AP men, still undaunted, set up a teletype machine in the attic of the courthouse. It was set into a cupola overlooking the grounds. Rivals suspected that the AP, whose reporters had stationed themselves at the windows of the courtroom; hoped to signal out the window. To guard against meddling, the AP men had a door with a strong padlock built on the cupola and locked up the teletype until the verdict was in. As soon as the verdict was rendered, an AP man rushed to the attic, keys in hand. But the AP was foiled again—

he found not one padlock but two; the second one placed there by the AP's suspicious rivals. The teletype was not used.

In the meantime Transradio, aware of the unprecedented international interest in the story, was putting its full wireless facilities at the disposal of every foreign broadcasting station in the world, as a courtesy to world listeners. It also notified every ship that it was free to give the full news to its passengers.

Transradio delivers both by wire and wireless. Its short-wave service consists of brief news dispatches transmitted several times a day. The service is limited to authorized subscribers.

Transradio's method of presenting news as it occurs seems ideal for broadcasting purposes, and still does not conflict with newspapers. Since radio newscasting is necessarily concentrated in form, the public can turn to newspapers for the detailed account of any news event.

W. R. HYNES.

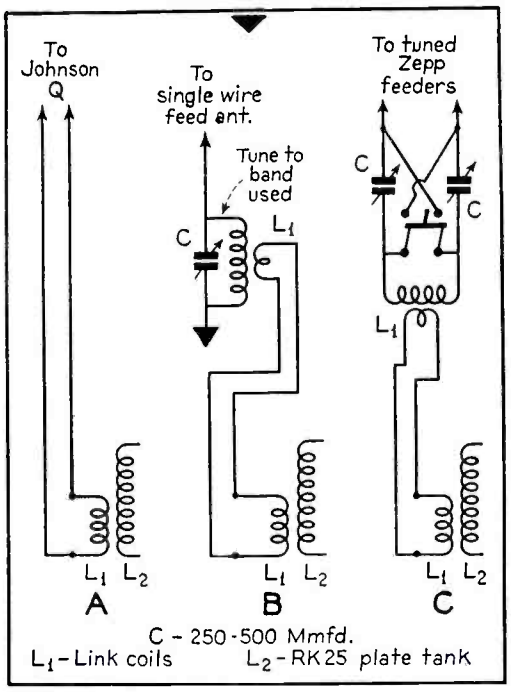
AWR 2-3 POWER SUPPLY

[*Continued from page 231*]

pair feeders having too great a loss at 10 meters. No antenna tuning will be necessary other than to adjust the number of turns in the link-coupling coil to draw the proper plate current on the RK-25. This will be indicated by a total current reading of between 90 to 100 mils for the RK-25. Connections to two other types of antenna systems are shown in the accompanying figure. Experiment will be necessary to determine the correct number of turns for the link and antenna coils. In diagrams B and C the wires connecting each pair of link coils can be rubber covered wire twisted together, and can be several feet long. In B and C it is also possible to eliminate each pair of link coils and the interconnecting twisted pair by mounting the antenna coil right on the transmitter in place of the link coil.

Reports On Transmitter

Last month we promised to give the results of operation on the air with this rig. Due to a large amount of work necessary to prepare future articles not much time could be spent in testing, but during odd moments during the day, W2CPA went on the air using this rig in place of his regular 300-watt transmitter. Here are the contacts that were made in the little time available: On 10 meters; K4KD-Q5R6, W5ACP-Q5R8, G2PL-Q5R5, PAOPN-Q5R6, D4NWR-Q4R4, OK2HX-Q5R5, VK3HM-Q4R4. On 20 meters; W9HSF-Q5R8, W6IWC - Q5R6, G5QY - Q5R5, W9RME - Q5R8, ZL2SX - Q4R4,



Methods of coupling the transmitter to different types of antennas.

ZL1CE-Q4R5. No time was available for working DX on 40 meters but several U. S. contacts were made to check operation on this band. It should be realized that both a good location and good antenna were used for these tests and that a different location and antenna can produce quite different results Sometimes a dead spot is encountered from which little or no DX can be worked.

Adapting Transmitter to Fone

Experiments are now being conducted in modulating this transmitter for fone and next month we will describe a suitable modulator and its operation. The amount of fone output will be rather small for 20-meter operation in view of the heavy QRM from overmodulated fone transmitters using unnecessarily high power, and particularly the week-end QRM. However, good results can be obtained when conditions are right and an occasional DX fone contact should be snared on 20 meters. On 20 meters QRM presents no particular problem and the small amount of power necessary on this band should make possible some good DX fone contacts. It is probable that hams using this transmitter for fone will use it on the 10-meter band mostly, as a Class A operators ticket is necessary for 20-meter fone operation.

THE HAM BANDS

[*Continued from page 234*]

WHAT IS THERE about 5 meters that leads the average ham to believe that he can be trivial? There is no reason to assume that commonplace equipment is good enough for this band. On the contrary, 5-meter transmitters are now the worst offenders of the sancitity of broadcast listening, due to the radiation of spurious frequencies. It's not cricket.

Besides this, it's about time some real effort was made to introduce crystal-controlled oscillators in 5-meter rigs. Lots of hams are using them and being well repaid for their labors. It's no great trick.

✦

ON A TUESDAY we asked some of the boys if they had heard the new Shadow hovering over the 20-meter band. None had, which seemed odd, as we were picking up an a-c carrier every 100 kc.

We listened again on Tuesday and sure enough, there he was, every 100 kc on the dot. We called in the wife and asked her to witness the phenomenon. She heard him, too—no doubt about it.

It was a nice, juicy discovery, and we spent considerable time explaining the possibilities to the better half. But she kept glancing around the room, and finally inquired if the dingus plugged into the wall outlet could have anything to do with it. Of course it couldn't, we explained with some evidence of disgust at her ignorance—but what dingus was it she meant? She pointed to our RCA Crystal Calibrator!

We have since eaten humble pie.

BACKWASH

[*Continued from page 235*]

contests and DX Clubs, we have something quite out-of-the-ordinary on the way. It won't break for a while, though.

We will continue to use our pages for worthwhile data.—THE EDITOR.

Re W2BSD

Editor, ALL-WAVE RADIO:

I have subscribed to several radio periodicals for some time, but have never seen one that could compare with AWR. Your magazine is nearer to perfection than any I have seen so far.

However, I think it would be better if you would only put the Short-Wave Station list in every other month, and on alternate months you could cram in more feature articles.

I enjoyed very much the descriptions of W6AM and W2FDA in the March and April issues respectively. Let's have more like them.

I see that Beat Note would like to know how W2BSD gets that "international flavor" in his transmissions. Well, Ted has a recording which he plays at the end of each day. Lately, however, the record has been getting noisy, and he will soon have to get a new one. Maybe he will include the Scandinavian in that one—Hi!

I might suggest that you publish a description of W2BSD in a future issue. He has one of the finest amateur stations in the world, and I am sure it would prove of interest to many readers.

While I'm writing, I might as well include a description of my listing post. My receiver is a "home-brewed" regenerative job, using a 30 detector and a 30 audio amplifier. Some are wont to scoff at the simple regenerative receiver, but with mine I have made a record which few superhets can equal. In a period of less than two months I heard amateur stations in 44 countries on all continents on the 20-meter band only. I have also heard 45 U. S. states and all Canadian provinces, including northwest territory. I also boast a veri from ON4-CSL in the Belgian Congo, heard R3 to R4 on 20-meter phone.

Many of these stations come in surprisingly loud; for instance, U3QE, R5; VK7JB, R7, and ON4VK, R8 on phone.

Well, as the "hams" say, "I guess I've said enough on this transmission, so I'll say 73 and CUL."

JULIAN HIRSCH,
NEW ROCHELLE, N. Y.

Why don't you suggest to Healy or Cannon that they provide us with a write-up on BSD. We'd be pleased to have one, naturally—THE EDITOR.

WORLD RADIO

[*Continued from page 234*]

German broadcasters from using records made in their factories. While judgment was given for the plaintiffs in respect of records of the spoken word—even though such records have been obtained on loan—their plea was refused as far as records of music and words have been concerned. It was largely a question of whether or not the broadcast of a record was or was not a "public performance" according to German copyright law. The Court decided it was. (*World-Radio* 2-14-36.)

✦

Promoting Good Fellowship

UNITED KINGDOM: The Radio Society of Great Britain has appointed a prominent amateur in each town "to promote good-fellowship among his colleagues within a radius of ten miles"; also has appointed a committee of four to study all matters bearing on amateur radio which may be discussed at the International Telecommunication Conference at Cairo in 1938. (*Can such a movement be started here?*)

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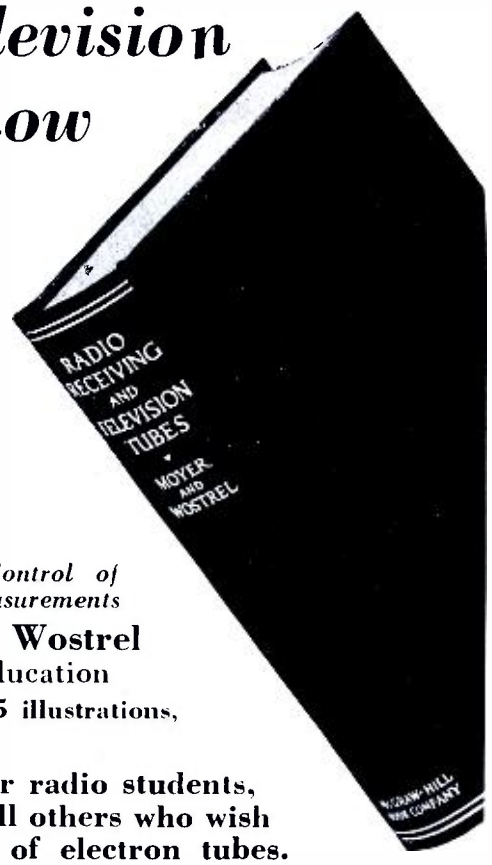

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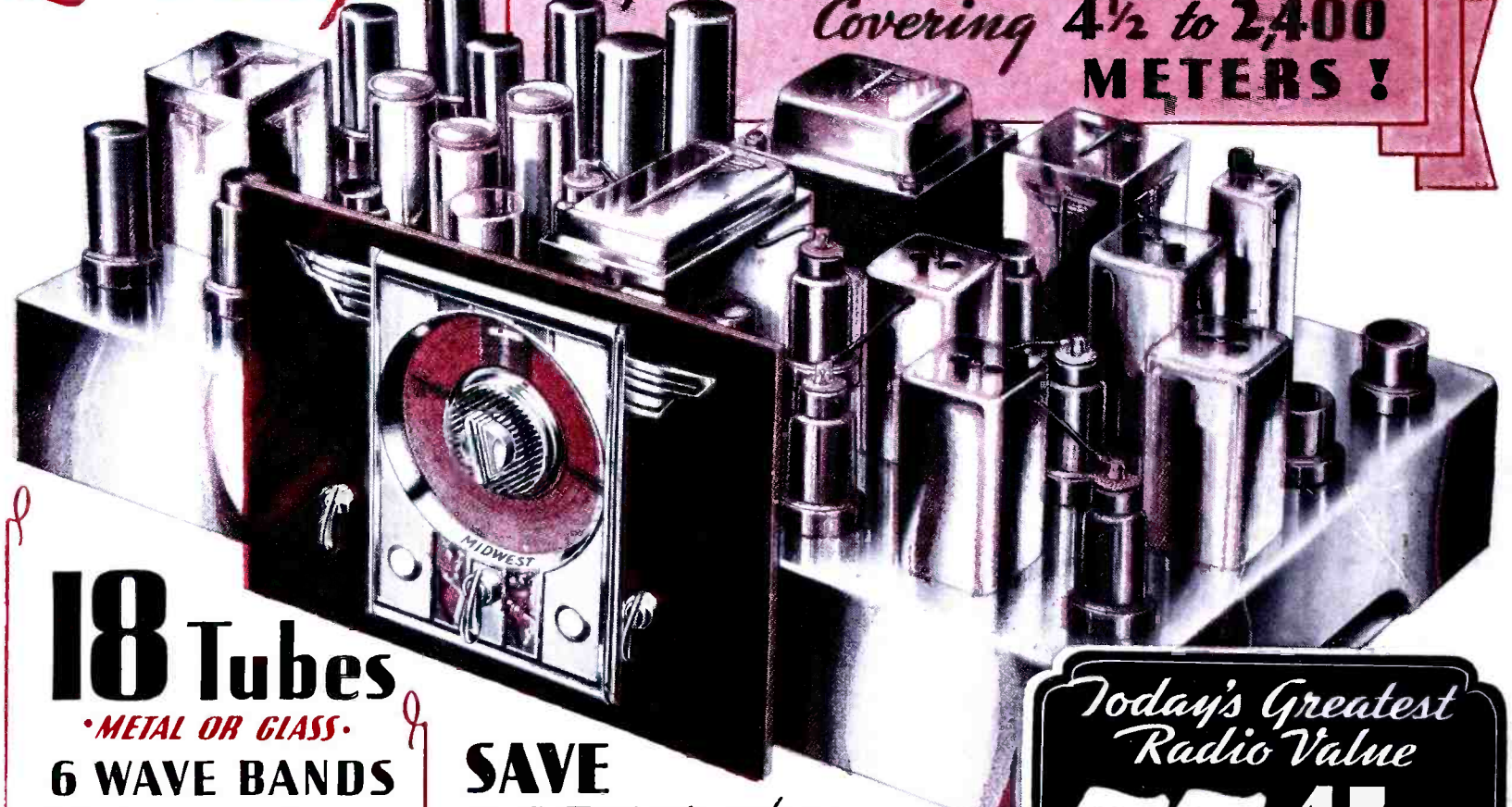

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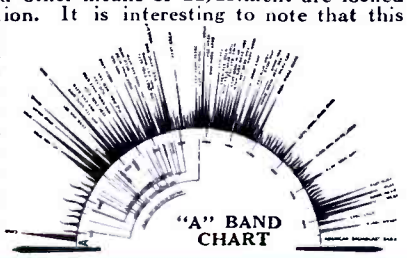

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