ALL-WAVE RADIO

OCTOBER • 1936

FIRST ANNIVERSARY ISSUE

FOREIGN STATION LISTS
broadcast and short wave

THE "X" BAND
what is it?—why is it?

"ON THE NOSE"
how chain programs are timed

25c U.S. and CANADA

THE JOURNAL of WORLD RADIO

STEPPING STONES TOWARD
"THAT TICKET"
Published by the American Radio Relay League

Universally recognized as the standard elementary guide for the prospective amateur

The 1936 edition of How to Become a Radio Amateur—features equipment which, although simple in construction, conforms in every detail to 1936 practices. The apparatus is of a thoroughly practical type capable of giving long and satisfactory service—while at the same time it can be built at a minimum of expense. The design is such that a high degree of flexibility is secured, making the various units fit into the more elaborate station layouts which inevitably result as the amateur progresses. Complete operating instructions and references to sources of detailed information on licensing procedure are given, as well as a highly absorbing narrative account of just what amateur radio is and does.

1.

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RADIO AMATEUR

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2.

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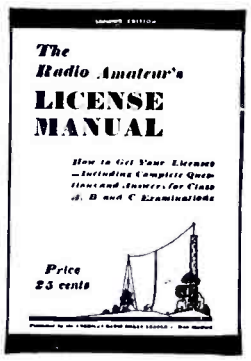

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All the dope on every phase of amateur licensing procedure, and, of course, the complete text of the new regulations and pertinent extracts from the basic radio law.

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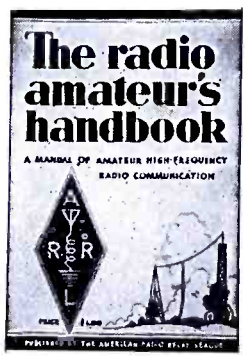
500 illustrations, 480 pages.



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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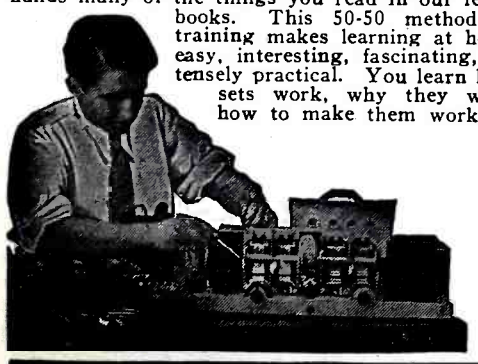

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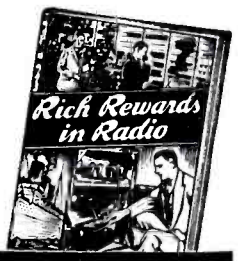

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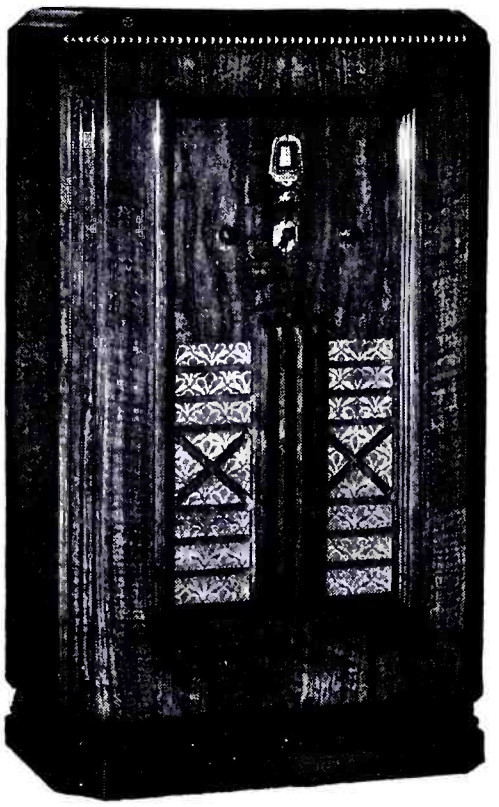
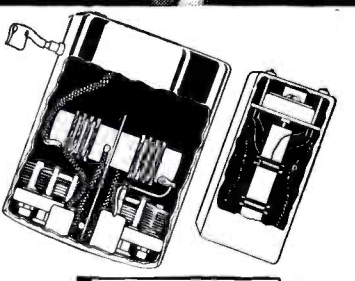


Why the SCOTT *Full Fidelity Radio* Gets More Stations with Finer Tone-

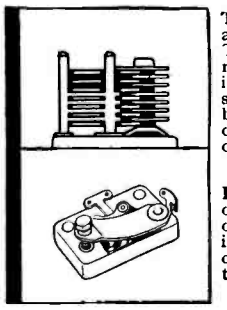


SCOTT I.F. Transformer (left) and production radio's transformer (right) in true comparative sizes.

At right—5-inch SCOTT I. F. Transformer designed in SCOTT Laboratories and used exclusively in SCOTT 23-Tube Full Fidelity Radio. Large shield three times size of shield on transformer of production type radios—Five of these powerful Transformers in every SCOTT.

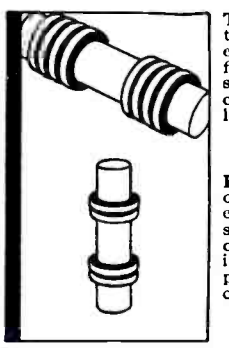
HERE IS THE SECRET OF WHY THE SCOTT ALONE GETS ALL THE BEAUTY OF THE PROGRAM—ALL THE GLORIOUS HIGHS AND OVERTONES ON THE AIR.

Far right—Three such small transformers used in mass production radios. Holes in shield let in dust and moisture. Cramped shield prevents full amplification of program signal.



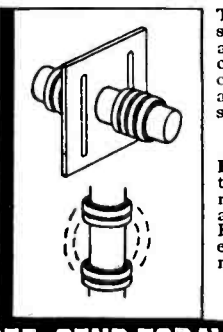
Top—SCOTT 8 segment air condensers in I.F. Transformers of SCOTT radios. Each segment does its share in capturing full signal. No dust can settle between segments to cut down sensitiveness or damage tone quality.

Bottom—Semi-fixed condensers in production radios. Less ability to pull in distant stations. Dust collects. Makes hiss in tone.



Top—SCOTT 8 section transformer coils. Higher efficiency. Permanently fixed on bakelite tube. No shifting of space between coils. Sharper station selection.

Bottom—2 section coils of ordinary radio. Mounted vertically. Wood dowell shrinks in dry climate—coils slip down. Expands in wet climate — compresses wires, causes short circuit.



Top—SCOTT brass shield between primary and secondary coils. Increases sensitivity which can be built into set. Enables you to get more stations.

Bottom—No shield between coils in ordinary radio. Signals jump back and forth, making howl. Factory cuts sensitivity to end howl—thus you miss many stations.

We have long made unmistakable claims for the marvelous tone and incredible distance performance of the 23-tube SCOTT. Here you see the proof—proof that backs these claims! You find the same superior engineering and custom-building throughout *every detail* of the SCOTT—*just as demonstrated here with the* I. F. Transformers. As a SCOTT owner you receive the positive guarantee that if your SCOTT does not bring in more foreign and domestic stations with more startlingly true, beautiful tone, with less noise and greater undistorted volume—you may return it anytime within 30 days if you live in the U. S. A. and your money will be refunded without question.

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Put the SCOTT in your own home for 30 days—in a side by side comparison test with any other radio, regardless of price. Get the glorious domestic short wave programs from the east—*the pick of American popular music—of finest concert music—music in the morning!* Programs directed at Europe — yet your SCOTT pulls them in with a truth and beauty of tone which is unbelievably real.

Turn up the SCOTT Variable Selectivity—you can aim it so sharply that you get WOR—jammed between WGN and WLW.

Get Germany, Australia, Italy, England, Spain, Holland—the news and music of all the world from the lands of their exciting origins. Compare your results with those on any other radio.

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The only radio—by test of national High Fidelity radio station*—which gives you all the radiant, vital high fidelity overtones up to 16,000 cycles, wherein lies the greatest beauty of all music.

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*Name upon request.

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BUILDERS OF THE WORLD'S FINEST CUSTOM-BUILT RADIOS

Edited by M. L. Muhleman

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COVER

Transmitter building and tower of station WJR, Detroit, with overlay symbolic of the radiation of radio waves.

(Photo courtesy Western Electric Co.)

FEATURES

DEPARTMENTS

ALL-WAVE RADIO

Reg. U. S. Pat. Off.

VOLUME 2 • NUMBER 9

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"ON THE

Chain Program Timing

BY RAY S. LYON

Development Engineer, WOR

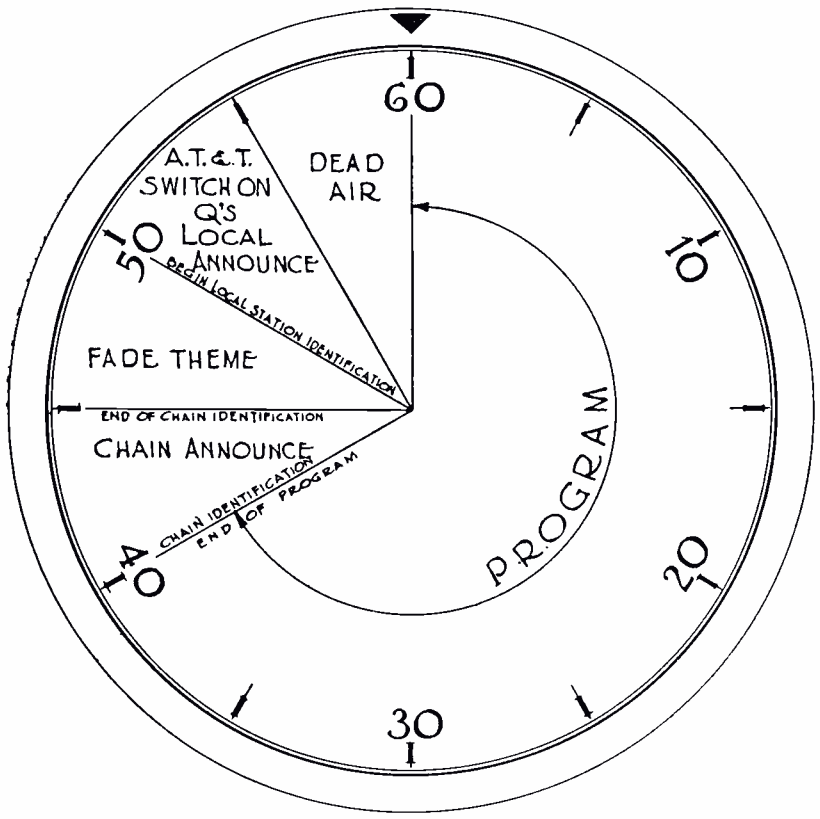


Fig. 1. Chart illustrating the last minute of a chain program and the operations that take place during the last twenty seconds.

BEFORE commercial radio broadcasting became a serious business of selling time on the air, discrepancies of a few seconds or even several minutes did not cause much concern on the part of the broadcasting station. Although an effort was made to begin and end a program on scheduled time, running short or running over time was not uncommon on individually operated stations. When a program ran short, a player-piano or a phonograph record was used to fill in the balance of time and if it ran over, the radio audience felt that it had received more than it was expecting and rejoiced.

Chain Links

Network, or chain operation, however, is a different matter. A series of several stations scattered geographically over many hundred miles all receiving programs simultaneously over special telephone lines calls for precise time co-ordination in order to prevent "dead air," gaps and overlapping of program periods. The use of long telephone lines to connect the radio stations is made possible only through the use of amplifiers or repeaters to reinforce the program as it passes through them. Located at various points along the lines, these repeaters together with elaborate and complicated switching facilities developed by the American Telephone & Telegraph Company, make it possible to broadcast a single program or a presidential speech simultaneously to the entire nation or to both continents. The various switching operations that are required to connect or disconnect the several stations as the occasion may require, must be done with dispatch and accuracy. The complications that would follow as a result of announcements or programs being sent out over stations for which they are not intended are obvious.

Split-Ups

An example of the problems of switching may be illustrated by a typical case: Ten stations may be taking one program simultaneously, but after the close of that program, three of them may take a different program and the other seven stations may be split up between three other programs. The complexity of such operation, which is very commonplace in present-day practice, may be easily realized. Such procedure calls for accurate timing, as mistakes in switching a commercial program might prove costly to the broadcasting station or to the telephone company, depending, of course, on where the mistake was made. If a commercial program fails to go on at the scheduled time or is cut off too soon the sponsor usually demands and justly receives a rebate.

The Cue

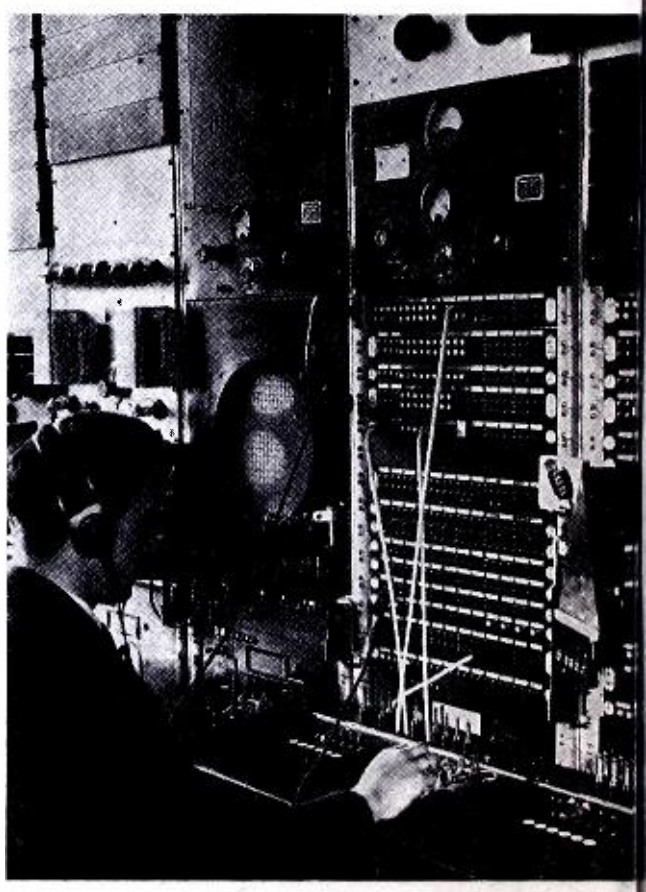
At first, the broadcasting chains resorted to telegraphic channels for communications between stations. A telegraph loop connected all stations on the chain and cues for local station announcements and switching were tapped out in Morse code signals. This system was fairly accurate but altogether too slow. The spoken word cue and chime cue were made adjunctory to telegraph communication with good results. A pre-arranged and mutually-agreed-upon series of words or chime notes sent out at a certain number of seconds before the end of a program to the entire network served as a cue to the repeater station operators as well as to operating staffs of the affiliated stations. In that way the stations were more closely co-ordinated and the starting and ending of programs within a few seconds of the scheduled time became a process to be taken for granted.

Precise Timing

Broadcasting time sold commercially must be so regulated that the sponsors who pay large sums of money to carry their sales messages via radio to the entire country, or even a section of the country, get their full allotment and are not "short-weighted" by having as much as a syllable of their announcements cut off. Such discrepancies are carefully guarded against by representatives of the client or agency handling the sponsored

Part of the control equipment for delivering programs simultaneously by long-distance telephone wire to scores of broadcasting stations.

(Photo courtesy A. T. & T.)



NOSE"

And Coordination

(Photo courtesy Western Electric Co.)

A candid camera shot, by R. Schwerin, of Bob Emery directing his "Rainbow House" program.

radio program in co-operation with the broadcast station management. A production man, as he is called, is in complete charge of the show from the beginning of rehearsals and casting to the final "sign off" announcement. So precise has this technique of timing become that it is common for a full hour air show to start and end within a fraction of a second of scheduled time. When this happens the program is said to end "on the nose."

The stop-watch plays an important part in radio broadcast program production. It is invaluable for checking the diversified component parts of a complete radio program, such as announcements, theme music, solos, dramatic skits, orchestral selections, etc. A radio show of one hour's duration may sometimes require as much as five or six hours' rehearsal to get it in shape for final production on the air. Actors' lines are read and re-read and carefully timed, scripts are "cut" if too long, or "padded" if too short so as to fit into the allotted time; musical scores are revamped, choruses are added or cut out and the time consumed by each jotted down on the script. Stop watches used are the same in design and construction as those used for years to time races and athletic events. A large hand makes one revolution per minute over a dial calibrated in seconds. A small hand tallies the number of minutes the watch is in operation. By depressing the winding stem the watch is started—it is stopped instantly by again depressing the stem. A small button near the stem is pressed to reset the minute and second hands to zero.

Building a Program

Once the performers have the pace set for them at rehearsal and the scripts are in final form, the "show" is ready for the air. Usually in a radio studio there is a signal light which appears when the studio is "on the air." The production man from his desk in the Studio Control booth watches for this signal. When it is lighted the show starts and he sets his stop-watch in operation. He follows the script, line for line, noting carefully the time consumed by each portion of the program as it progresses. If the show begins to lag according to the timing notations on his script, he signals to the performers to speed it up a bit. This is usually done by an upward swoop of his hands. Actors reading lines skillfully speed up the action and the listening audience seldom, if ever, notices any change. If it is the orchestra, the conductor speeds up the tempo of the music to make up time. This procedure is more obvious to the listener, of course, and is seldom resorted to excepting at or near the closing of the program. If, on the other hand, the program is "running away" the production man signals again—this time as if he were grasping a thin rubber band between the thumbs and forefingers of both hands and stretching it out horizontally from the center. Radio performers always interpret this to mean "slow it down" and react accordingly. Thus a skilled production man can guide a difficult program sequence to a successful ending within merely a few seconds of its scheduled ending time. Sometimes when a good job of timing has been done by all, he signals his satisfaction or enthusiasm to the cast by placing his index finger squarely on his nose, and is answered in like manner by the announcer or whoever feels so inclined. It's just a radio ritual that symbolizes the appreciation of perfect co-operation of producer and performers—a program delivered "on the nose."

The "Round Robin"

Because several stations affiliated with it are affiliated with other chains and also often operate independently of any affiliation, the Mutual network, which at present includes stations located from New England to the mid-west and which will in the near future include stations on the Pacific coast, requires a mistake-proof system of time co-ordination by which all stations can start and end programs, do the necessary switching and give station identification with accuracy and dispatch. Such a system has been carefully worked out and is extremely simple in operation. Program "test" is continually fed to all stations over what is known as a "Round Robin." This "Round Robin" is a circuit that connects basic member stations together and at the same time, by proper switching, permits any station to originate or receive a program, or, on cues, to break in on a program being received and superimpose local announcements. This standard procedure is followed on all programs in order that a cue will be available at the start of a program which may originate from some point from which the network is not regularly fed and which requires a switch before service can be originated from that point. By referring to the chart in Fig. 1, which shows how the last minute of every program period is divided, it will be seen that all programs start exactly on the hour, quarter hour, one half hour or three quarter hour point. All programs finish with a word cue at twenty seconds before the corresponding hour point. At ten seconds before the hour point, the A.T. & T. starts the switching of lines and repeaters, and at five seconds before the hour, the switching is completed. There is then a five-second gap of "dead air" before

the start of the following program. For illustration:

9:00:00—Program starts
9:29:40—Announcer says "This is the Mutual Broadcasting System"
9:29:50—American Telephone & Telegraph Company starts switching—local station identification given
9:29:55—American Telephone & Telegraph Company completes switches
9:30:00—Next program starts.

Thus, if a network program is scheduled to originate in the studios of a station in Pittsburgh from 9:00 to 9:30 P.M., a cue is required by the A. T. & T. at 8:59:40 as their signal to switch the circuits so as to allow the Pittsburgh station to feed program material out over the network. This program material is fed around the complete "Round Robin" network and the network is finally "dead-ended" at the Pittsburgh test room of the A. T. & T. from whence it originated. Now and then a station of the network wishes to join for only a part of a thirty-minute program. At such time it becomes necessary for the originating station to give a cue during the course of the program, usually at the fifteen-minute point. Sometimes these cues are fed to both the originating station and the network, and sometimes they are fed from a separate studio to the network only.

Ten-Second Overhang

A standard procedure has been established through an arrangement with the A. T. & T. whereby all switching of lines is done on what is known as a "ten second delayed basis." Under this arrangement the theme music of a program continues for ten seconds after the cue is given by the announcer at the station from which the program is originating. The theme music is faded out to a minimum at the time the switch is made. The member stations of the network may superimpose their local announcements on this theme if they so desire. It is an established practice that all switching between member stations of the Mutual Broadcasting System shall be done on a three second basis. This type of switching does not involve any operation on the part of the A. T. & T. as it is confined entirely to the Master Control Rooms of the member stations through the use of the "Round Robin" circuit and switching equipment located at each station.

Provision must be made against the complications that would inevitably arise as the result of a sustaining program running over-time when the following period is commercially sponsored. In order to protect commercial time, it has been found necessary in establishing switching cues, to establish also a priority with regard to various programs. Thus, if a sustaining program should by any circumstance run over at a time when it is followed by a commercial program, preference must of necessity be given to the commercial program and the sustaining program must be cut. A complete and comprehensive understanding of such priority requirements is a part of the operating procedure of the Mutual Network. Through the medium of the teletypewriter all communications of a special nature such as last-minute program changes or special feature arrangements are quickly transmitted to and acknowledged by network stations.

Synchronized Clock

For the guidance of artists, announcers and control operators, each studio at WOR is equipped with a Western Union synchronized clock of a special design. The Western Union clocks formerly used were equipped with aluminum dials, black hands and a small second hand. Although in use for a long time it was always difficult to read the time accurately to the second, even over short distances, in the studio. WOR engineers were in a measure responsible for the development by Western Union of a new type of clock as far as outward appearance is concerned. This new clock which has a yellow dial, black hour and minute hands and a large red second hand is easily read from a considerable distance. Clocks are mounted on studio walls in a position where they can be readily seen by the announcer, production man, and engineer. These clocks are self-winding and are corrected periodically by electrical impulses sent over special telegraph wires directly from the Naval Observatory at Arlington, Virginia. This time service being accurate to within a small fraction of a second is entirely adequate for broadcasting network co-ordination.

Transcribed Programs

Accuracy of timing is also a necessity to the successful playing of an electrically transcribed program. Many of the commercially sponsored electrically-transcribed programs are complete on one face of a recording disc which requires from three to fifteen minutes' playing time. Such a recording usually includes the opening and closing announcements. Sometimes the client may desire to have either the opening or closing announcement, or both, changed and read by the studio announcer. This requires that the record be checked for time and the local announcer's continuity timed to fit smoothly within the same period of time as the recorded announcement. In playing such a recording the operator must watch the playing time carefully and must follow the program continuity with an attentive ear. The announcer's microphone must be turned on and the record cut off so skillfully that the whole will appear to be a continuous performance. Then there is the recorded commercial program which is not complete on one disc but is "built up" from as many as six different discs. The theme may be on one disc, the announcement or commercial "plug" may be made by the studio announcer followed by music from the theme record, the body of the program on another disc, incidental or "bridge" music from still another disc and so on. It is obvious that perfect co-ordination of the several records requires accurate timing and "rehearsal" in order that the illusion of uninterrupted continuity may be created. When on the air the studio operator changes discs, fades in the microphone for the announcer and the entire program runs along smoothly without a hitch. The result on the air is the same as a complete recording on one disc.

Special Timing Clock

Up until recently, stop-watches were used at WOR to check the playing time of recorded programs. Due to the fact that the operator was obliged to hold the stop-watch in his hand and to change records and adjust the volume controls and switching quickly at the same time, the need was felt for a device that would combine the starting, stopping and re-set features of a stop-watch with the accuracy and ruggedness of a synchronous electric clock. Such a clock could be permanently mounted on or near record-playing apparatus within easy reach of the operator thus leaving his hands free to change records and operate the various controls. A stop-clock fulfilling all these requirements was recently developed and placed on the market. It is electrically operated from the alternating current in the same manner as the more familiar electric time clocks in general use. The one large hand indicates the number of seconds elapsed and the smaller hand totals the number of minutes. An ingenious arrangement of three push buttons located on the front of the clock provides the means for starting, stopping and re-setting the pointer to zero. Stop-clocks of this type have been installed in all studios of WOR as a convenience to production men for timing rehearsals and air shows. A specially designed fitting permits the clocks to be mounted permanently on the production man's desk in the Studio Control booth. This fitting is in the form of a swivel which allows the clock to be swung through an arc of ninety degrees. Thus it is available to either the production man or operator as the occasion may require.

[*Continued on page 476*]

(Photo courtesy Libbey-Owens-Ford Glass Co.)
The air pilot "lives" on weather. Typical shot illustrating use of Western Electric two-way radio.

THE "X" BAND

UP IN WAVELENGTH WHERE THE WEATHER BEGINS

By Pat J. Harney

In these days of "all-wave" radio, hitherto unknown bands in the spectra of frequencies are fast being explored. Much of the new interest is of course centered in the short-wave foreign stations which give 'DXing" a purpose as well as a pleasure in these exciting times. But as we look around at the various possibilities of many of the new sets, we come to the band marked "X." Too few of us know its secrets, but why only use the lower end of the dial? How many have seriously considered what lies beyond the top of the dial where 550 marks the place the knob comes to a stop?

What It Is

The justification for this article then is to explain this "X" Band, prove its usefulness and perhaps even show that the salesman was not overly enthusiastic if he stressed it as one of the features of your set. Remember, he mentioned Government weather broadcasts among other things such as European stations? Well, there's where the "X" Band comes in. It generally covers the longer wavelengths from 750 to 1500 meters, that is, from about 400 kc down to 200 kc. You may have thought on these old "wireless" wavelengths only code was used. While that is true for message traffic in this region, with the advent of the Department of Commerce Airways Radio System phone is now in use at these frequencies.

To make a long story short, the government in setting up radio aids for aviation picked these longer wavelengths for use in establishing a line of radio beacon stations paralleling our airways. Incidentally, these radio highways of the air have become the pattern for world-wide duplication. Technically it is sufficient to say here that most of the present types transmit a specially coded signal with a directional effect that enables a pilot with a special receiver tuned to it, to tell whether he is to the left or to the right or on the airway route. That explains also why the same beacon station sounds differently in various locations in the adjacent country.

Why It Is

But to get to the phone and weather "dope." With this set-up along the routes which the pilots fly, it is obviously advantageous to periodically transmit weather reports from intermediate fields along the airway. And so a schedule for broadcasting weather reports has been established by the U. S. Department of Commerce with the help of the U. S. Department of Agriculture Weather Bureau. These reports are gathered over the airway teletype circuit and from local radio circuits and generally consist of observations taken simultaneously a short time before at regular stations along the route, all grouped together in sequence form.

Hence these sequences give a picture of the weather as it is at the time along fixed cross-sections of the country and therein lies its value. Since these routes often parallel highways and other transportation facilities, such reports are of value to many more travellers than the pilot for whose benefit they were originated. Farmers whose lands lie in adjacent territory stand to make particularly good use of them. And since we are all interested in the weather, it may be of use to us now that we know such information is available.

The accompanying table shows stations, locations, and frequencies with a note about the sequence given by the broadcast and time scheduled.

Radio ground station of Eastern Air Lines at Atlanta, Ga. *(Photo courtesy Western Electric Co.)*

How It Works

Suppose we tune one in. Turning to a local station which will be broadcasting its own weather report at 30 minutes past the hour, we pick up the steady drone of the beacon station. Considering the aeronautical background we can expect the report to be short and snappy with a language all its own,—but there it is, the beacon has shut off and a clear voice breaks in, "KCT Los Angeles, California. 9:30 observation. Burbank, Burbank, broken clouds, ceiling estimated 2000 feet, ceiling estimated 2000 feet, visibility 5 miles, hazy, temperature 64, dew point 59, wind southeast 5, barometer 29-98, few cumulus over the mountains east, KCT Los Angeles, California."—click, he's gone and the beacon resumes its monotonous drone. This drone, by the way, breaks every 12 seconds and for the above station the code - . . . . . - is heard. This identifies it as the beacon for the Burbank airport. It will be interrupted at intervals again for broadcasting the "wx" (weather) sequences for the routes emanating from the home station, as noted in the table. A few checks of these broadcasts will enable the listener to become familiar with the weather report stations and a good road map will show their location. Since intermediate landing fields are not always near centers of population, some close examination of the territory may be in order. However, this is one advantage in that their observations are not influenced by

[*Continued on page 477*]

DEPARTMENT OF COMMERCE AIRWAY RADIO WEATHER BROADCASTS

THE *accompanying list of stations comprises those Airway Radio stations listed by the Bureau of Air Commerce as broadcasting weather reports. Changes are published in* Weekly Notices to Airmen *currently posted at all airports. Many other stations may be heard but they will probably be straight beacon stations.*

A station's identification signal is transmitted in code. As an example, the identifying signal AZ of station WWAH, at Albany, N. Y., is broadcast in the Morse characters for the letters A and Z, as follows: .- --.. Readers wishing to decipher these signals are referred to the complete radio code, on page 214 of the May 1936 issue of ALL-WAVE RADIO.

Location	*Call*	*Freq.*	*Code Signal*	*Broadcast Schedule (minutes after the hour)*
Albany, N. Y.	WWAH	365	AZ	:10 to Buffalo-Cleveland; New York to Montreal; :15 to Boston; :30 local.
Albuquerque, N. Mex.	KCAF	230	AB	:0 to Amarillo; to Pueblo. :5 to Winslow-Kingman; to El Paso. :30 local.
Amarillo, Tex.	KCAG	248	AQ	:0 to Wichita-Kansas City; to Tulsa. :5 to Albuquerque. :15 to Dallas. :30 local.
Atlanta, Ga.	WHZ	266	H	:15 to Birmingham-Jackson. :30 local. :50 to Jacksonville - Titusville; to Mobile-New Orleans; :55 to Spartanburg-Greensboro; to Murfreesboro - Louisville.
Bellefonte, Pa.	WWQ	224	BF	:5 Pittsburgh to Camden; Columbus to New York. :30 local. :55 Cleveland to New York.
Big Springs, Texas	KCAP	326	BZ	:10 El Paso to Dallas. :30 local.
Birmingham, Ala.	WWAT	224	BH	:10 Jackson to Atlanta. :30 local.
Boise, Ida.	KCR	350	BE	:30 local. :55 Pendleton
Boston, Mass.	WSX	266	BW	to Salt Lake. :0 to Bangor; to Montreal (when available). :15 to New York; to Albany. :30 local.
Buffalo, N. Y.	WWAB	266	BJ	:10 to Elmira - New York. :15 Cleveland to Albany. :30 to Detroit.
Butte, Mont.	KCAC	284	BT	:0 Spokane to Billings-Miles City. :15 Idaho Falls to Great Falls. :30 local.
Charleston, S. C.	WWAW	332	K	:30 local. :55 Jacksonville to Richmond.
Chattanooga, Tenn.	WWHS	338	I	:30 local. :50 Atlanta to Murfreesboro.
Cheyenne, Wyo.	KSG	326	CX	:5 to Pueblo. :10 to Billings. :30 local :50 to Rock Springs-Salt Lake. :55 to North Platte-Omaha.
Chicago, Ill.	KDA	350	F	:0 to La Crosse-Twin Cities. :10 to St. Louis-Lafayette, Indianapolis, Milroy and Cincinnati. :30 local. :50 to Iowa City-Omaha; to Burlington-Kansas City; to Nashville. :55 to Helmer-Cleveland and Detroit.
Cincinnati, Ohio	WWAS	332	CC	:0 St. Louis to Louisville. :10 to Washington; Nashville to Cleveland. :15 to Chicago. :30 local.
Cleveland, Ohio	WWO	344	CV	:5 to Pittsburgh-Washington. :10 to Buffalo-Albany. :15 to Louisville. :30 local. :50 to Bellefonte - New York. :55 Vickery, Toledo, Archbold, Detroit, Jackson and Chicago.
Davenport, Iowa	KCCU	224	V	:30 local. :55 Omaha to Chicago; Kansas City to Chicago.
Detroit, Mich.	WWHU	230	W	:5 to Cincinnati. :30 to Buffalo. :50 to Cleveland; to South Bend.
Elizabeth, N. J.	WWU	338	H	:0 N. Y. to Harrisburg-Pittsburgh. :10 N. Y. to Boston; N. Y. to Elmira-Buffalo. :15 N. Y. to Albany - Montreal. :30 Newark. :50 N. Y. to Kylertown - Cleveland. :55 N. Y. to Washington - Richmond, Lakehurst and Atlantic City.

Elko, Nev.	KOJ	391	EL	:30 local. :50 Reno to Salt Lake.
Elmira, N. Y.	WWIF	385	EA	:15 Buffalo to New York. :30 local.
El Paso, Texas	KCAO	242	EO	:0 to Albuquerque. :10 Big Springs to Douglas-Tucson. :15 to Big Springs. :30 local.
Fargo, N. D.	KCAN	365	FO	:0 Butte to Twin Cities. :30 local.
Fort Worth, Texas	KKJ	365	FV	:10 to Shreveport; to Amarillo; to Little Rock; :15 to Big Spring; to Houston and San Antonio. :30 local :55 to Oklahoma City.
Goshen, Ind.	WWIE	320	G	:30 local. :50 Cleveland to Chicago.
Greensboro, N. C.	WRW	365	D	:30 local. :55 Atlanta to Richmond.
Harrisburg, Pa.	WWHP	242	HX	:5 New York to Columbus. :30 local.
Houston, Texas	KCAU	332	HU	:15 Brownsville to Dallas-Galveston; San Antonio to New Orleans-Shreveport. :30 local.
Idaho Falls, Idaho	KCAD	359	IF	:10 Salt Lake to Butte. :30 local.
Jackson, Miss.	WWAQ	260	JA	:10 to Shreveport-Dallas. :15 New Orleans to Memphis; to Birmingham-Atlanta. :30 local.
Jacksonville, Fla.	WWAV	344	W	:30 local. :50 to Charleston-Raleigh. :55 Miami to Atlanta.
Kansas City, Mo.	KRC	359	KC	:5 to Wichita-Waynoka; to St. Louis; to Omaha. :30 local. :50 to Burlington-Chicago; to Tulsa-Dallas, Fort Worth and Oklahoma City.
Key West, Fla.	WBP	332	I	:30 local (6:30 A.M. to 5:30 P.M.) :55 Havana to Miami-Titusville, (6:55 A.M. to 4:55 P.M.)
Kingman, Ariz.	KCAH	350	KI	:5 Los Angeles to Winslow. :10 Phoenix to Los Angeles. :30 local.
La Crosse, Wis.	WSG	371	LC	:5 Chicago to Twin Cities. :30 local.
Little Rock, Ark.	KCAJ	272	LI	:15 Fort Worth to Memphis. :30 local.
Los Angeles, Calif.	KCT	260	BU	:0 to Kingman-Winslow. :10 to Milford-Salt Lake. :15 to Phoenix. :30 local. :50 San Diego to Fresno-Oakland.
Medford, Ore.	KCX	266	MF	:30 local. :50 Oakland to Portland.
Memphis, Tenn.	WWAU	371	PS	:10 to Jackson; to Little Rock. :15 to Nashville-Murfreesboro; to St. Louis. :30 local.
Miami, Fla.	WWAF	272	MM	:30 local. :55 Key West to Jacksonville.
Milford, Utah	KCAT	320	MD	:15 Los Angeles to Salt Lake. :30 local.
Minneapolis, Minn.	KCAQ	266	MP	:0 St. Paul to Chicago. :5 St. Paul to Fargo-Butte. :10 St. Paul to Sioux City-Omaha. :30 Minneapolis.
Mobile, Ala.	WWBF	248	F	:30 local. :55 New Orleans to Atlanta.
Nashville, Tenn.	WWAC	388	NA	:10 Cincinnati to Memphis; to Washington. :30 Murfreesboro. :55 Atlanta to Chicago via Louisville.
New Orleans, La.	WWAG	338	S	:10 to Jackson-Memphis; to Houston. :30 local. :50 to Mobile-Atlanta.
North Platte, Neb.	KVM	284	NQ	:30 local. :50 Cheyenne to Omaha.
Oakland, Calif.	KCV	242	OA	:30 local. :50 to Fresno-Los Angeles to Reno. :55 to Medford.
Oklahoma City, Okla.	KCCA	350	OL	:5 Amarillo to Tulsa-Wichita Falls. :30 local. :55 Fort Worth to Wichita.
Omaha, Neb.	KJF	320	OH	:15 to Watertown. :30 local. :50 to Iowa City-Chicago; to Kansas City. :55 to North Platte-Cheyenne, Lincoln, Big Springs and Sidney.
Pendleton, Ore.	KCDU	344	PO	:30 local. :50 to Boise-Salt Lake. :55 to Spokane.
Pittsburgh, Pa.	WWAP	254	PT	:0 to Harrisburg-Camden; Cleveland to Washington. :5 to Columbus. :30 local.
Portland, Ore.	KCY	332	PD	:30 local. :50 to Pendleton-Spokane. :55 Seattle to Medford.
Pueblo, Colo.	KCAR	302	PU	:0 to Cheyenne. :5 to Albuquerque. :30 local.
Raleigh, N. C.	WWBI	350	U	:30 local. :50 Jacksonville to Richmond.
Reno, Nev.	KLK	254	RP	:30 local. :55 Oakland to Elko.
Richmond, Va.	WNR	260	RW	:30 local. :50 to Greensboro-Spartanburg. :55 to Raleigh-Charleston; to Washington-Newark; to Norfolk.
Rock Springs, Wyo.	KDN	290	RT	:30 local. :55 Salt Lake to Cheyenne.
Salt Lake City, Utah	KGD	338	SL	:10 to Milford-Las Vegas. :15 to Idaho Falls. :30 local. :50 Rock Springs to Boise. :55 to Elko.
San Antonio, Texas	KCAW	254	ZN	:10 to Houston-New Orleans. :15 Brownsville to Dallas. :30 local.
Seattle, Wash.	KCZ	260	SA	:0 to Spokane. :30 local. :50 Portland.
Shreveport, La.	KCAK	230	ZH	:15 Fort Worth to Jackson; Houston. :30 local.
Spartanburg, S. C.	WFT	248	S	:30 local. :50 Atlanta to Richmond.
Spokane, Wash.	KCAS	365	SM	:0 Seattle to Butte. :30 local. :50 to Pendleton-Portland.
Springfield, Mo.	KCAV	254	ZF	:5 Tulsa to St. Louis. :30 local.
St. Louis, Mo.	KCQ	209	LS	:0 to Kansas City; to Springfield-Tulsa. :5 to Louisville - Columbus. :15 to Memphis-Jackson; to Chicago. :30 local.
Titusville, Fla.	WWBC	254	TI	:30 local. :50 Miami to Atlanta.
Tucson, Ariz.	KCAM	338	TZ	:15 Phoenix to El Paso. :30 local.
Tulsa, Okla.	KCAA	296	TS	:5 to Springfield-St. Louis; to Oklahoma City. :30 local. :50 Kansas City to Oklahoma City-Fort Worth.
Waco, Texas	KCDT	385	WC	:10 Fort Worth to Houston-Galveston (when available); to San Antonio. :30 local.
Washington, D. C.	WWX	272	WA	:5 to Pittsburgh-Cleveland. :15 to Nashville; to Cincinnati. :30 local. :50 Richmond to New York.
Wichita, Kans.	WEK	332	WD	:5 Amarillo to Kansas City. :30 local. :50 to Oklahoma City-Fort Worth.
Winslow, Ariz.	KCAE	266	WO	:0 Kingman to Albuquerque. :30 local.

Globe Girdling

By J. B. L. Hinds

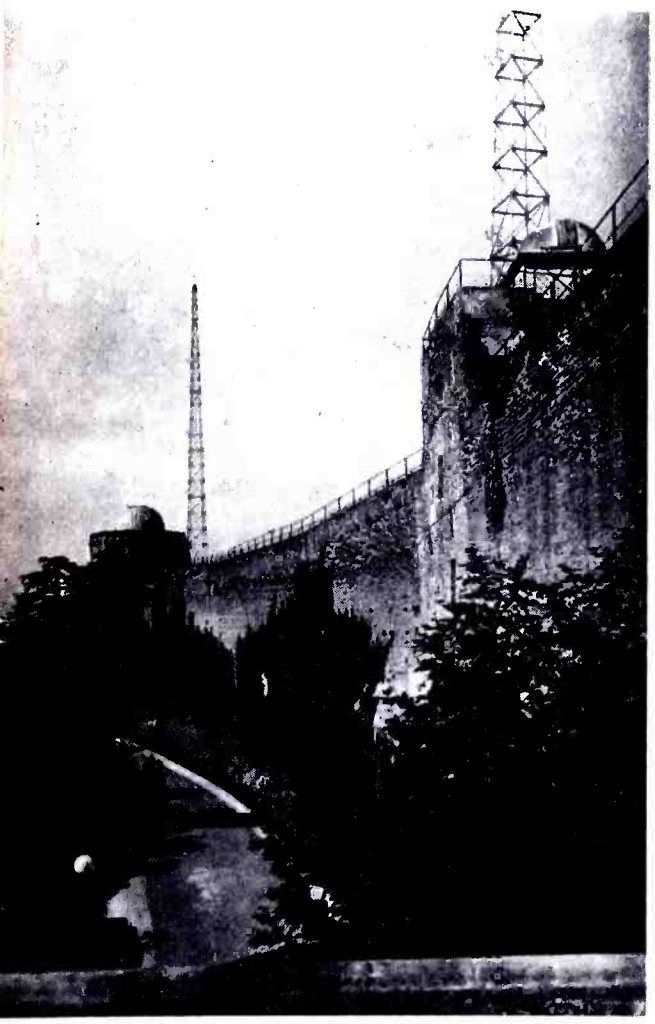
west coast reports . . . NRH resurrected . . . rome's interval signal . . . netherlands indies chain . . . reporting ham fones . . . g.e. program

LAST spring the writer commented on reception conditions and what we might expect during the coming months.

We have gone through periods of heat and changeable weather conditions, and those who have stuck to their receivers throughout it are still of the opinion that *power* in radio transmitters is a great factor in reception which was much better than previous years on account of this fact. The static level was no higher than in former years but signals in general were much more consistent due to the higher power employed.

We are coming into cooler weather and look forward to good reception conditions, and with the present stations and new ones coming on in different sections of the world, we anticipate a pleasant period before us in the months to come. So check over your receiver and aerial and get into the swim with your fellow dxers.

The towers of HVJ—"Stazione Radio, Citta del Vaticano."



Question Marks

Many changes have been made in the station lists appearing in this issue and many more are under consideration, according to reports received from listeners, who advise hearing TIEP and TIPG on 9550 kc, HJ3ABF on 6073 and 9588 kc, HJ1ABB on 9560 kc, HCJB on 8950 kc, HJ1ABJ on 9520 kc, HJ1-ABG on 9583 kc, XGOX on 6850 kc and CQN on 9666 and other frequencies. These reportings are being published so that all listeners may have the information available and will know the situation. It is hoped that all will report their findings to this department. It might be said that as fast as these changes are received, we are laying the matter before the stations involved with a view of ascertaining the actual facts.

The following changes are taken into consideration in this issue:

NEW STATIONS

KC	*Meters*	*Call*	*Location*
10230	29.33	CED	Antofagasta, Chile
9750	30.77	COCQ	Havana, Cuba
9670	31.02	TI4NRH	Heredia, Costa Rica
4355	68.88	IAC	Pisa, Italy
3040	98.68	YDA	Batavia, Java

STATION CHANGES

New Frequency	*Call*	*Old Frequency*
15280	LRU	15290
13635	SPW	13653
12795	IAC	12800
11860	YDB	11875
9610	YDB	9650
9575	HJ2ABC	5970
9500	HJ1ABE	6115
8515	IAC	8380
6796	HIH	6814
6030	HJ4ABP	6135
6018	ZHI	6010
3750	HCK	5885

No Stations Deleted

Non-Authenticated Stations

The listing below is based upon information received from various sources and is given solely as a matter of information to the listeners for their use and to save them the trouble of running through back copies of the magazine. Where details were listed in previous issues of ALL-WAVE RADIO, the month in which the reporting was made in "Globe Girdling," is shown in parenthesis following the item. When not so indicated the information did not appear, but was received from other sources.

Listeners will please report the reception of any of these stations to this department, furnishing as much information as possible. As stations are authenticated they will be added to the station list and dropped from this block.

Frequency	*Call*	*Location*
15795	XOJ	Shanghai, China
15600	HS8PJ	Bangkok, Siam
15230	Podebrady	Prague, Czechoslovakia (Oct.)
14000	PZ1AA	Paramaribo, Dutch Guiana
11760	Podebrady	Prague, Czechoslovakia (Oct.)
11710	————	Stockholm, Sweden (Oct.)
10370	EAJ ?	Tenerife, Canary Islands
9590	VK6ME	Perth, W. Aus. (May) (Aug.)
9540	CB954	Santiago, Chile
9527	FCR2	Saigon, Indo China
9520	F3ICD	Saigon, Indo China (July)
9380	CSW	Lisbon, Portugal (Oct.)
9350	HS8PJ	Bangkok, Siam
8710	KBD	Manila, P. I. (July)
6330	YV13RV	Valencia, Venezuela (March)
6270	YV14RC	Caracas, Venezuela (August)
6240	CO9RY	Malanzas, Cuba (August)
6150	HJ4ABU	Periera, Colombia
6130	KZEG	Manila, P. I. (August)
6120	HP5Z	Panama City, Panama (July)
6115	Podebrady	Prague, Czechoslovakia (Oct.)
5910	YV15RC	Valencia, Venezuela (August)
Various		8 Costa Rican Stations (July)

West Coast Reports

Referring to the subject of sectional reports outlined briefly in our article in September ALL-WAVE RADIO—we are very grateful to Mr. Lyle Nelson, Yamhill, Oregon; J. Wendell Partner, Tacoma, Washington; Byron Silvius, Hollywood, California; H. Biesheuvel, Bellingham, Washington; Norman L. MacLeod, Pasadena, California; E. H. Clark and Bill Brittingham, Hollister, California, for their reports and valuable assistance. As it is the main desire of those on the West Coast to know just what stations are being received in their locality, it is thought that it will not be necessary at this time to again list the

stations being received on the East Coast.

Very little data was received from the Middle West but it is assumed that they will run very close to the lists of the East.

The lists following indicate that certain stations in China, Japan, Africa, Philippines and certain other ones in the Far East are being received quite consistently on the West Coast and but occasionally in the East. The Eastern reports would indicate that many low-powered stations in South America and surrounding islands, such as the Dominican Republic, etc., are being consistently received in the East and not in the West. Further reportings may develop the situation more clearly.

It will not be necessary to show the signal strength, quality and fading in reports, but a general statement might be made as to whether the reception is excellent, good, fair or poor. These reportings may develop a useful plan for information of value to the listeners and your further reports, comments and criticisms would be greatly appreciated.

In making up subsequent lists, please make them on separate sheets rather than embody them in the letter to this department.

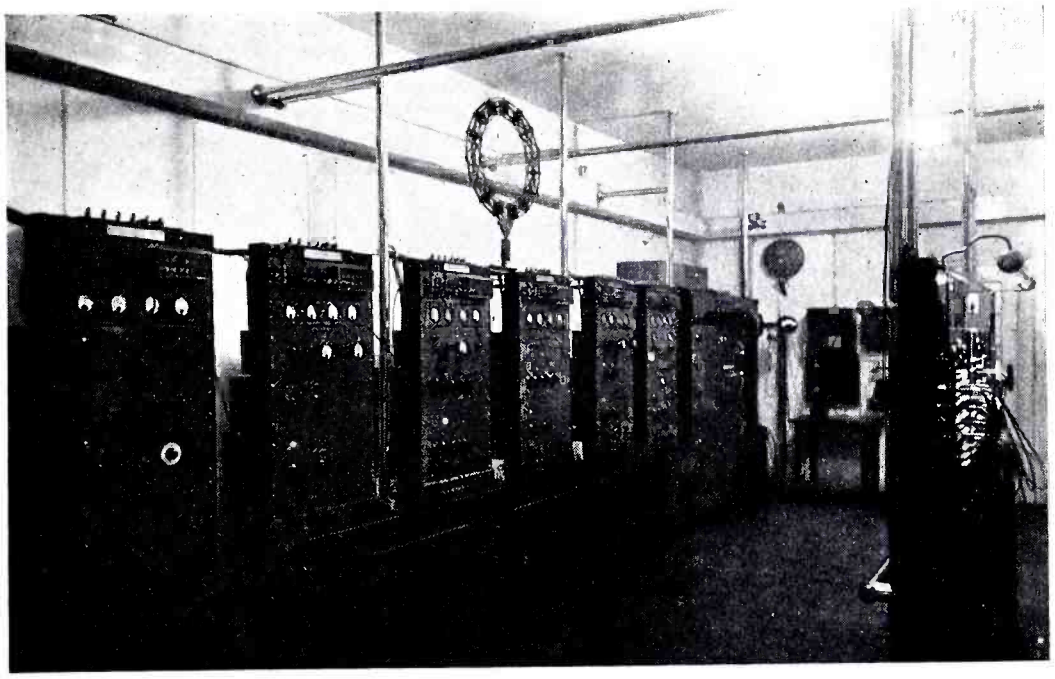
In compiling the list appearing below it will be noted that it has been set up in order of frequency, and divided between broadcast stations and other than broadcast, which will enable those interested to easily analyze and determine by comparison with the station list the situation as it really appears.

Broadcast

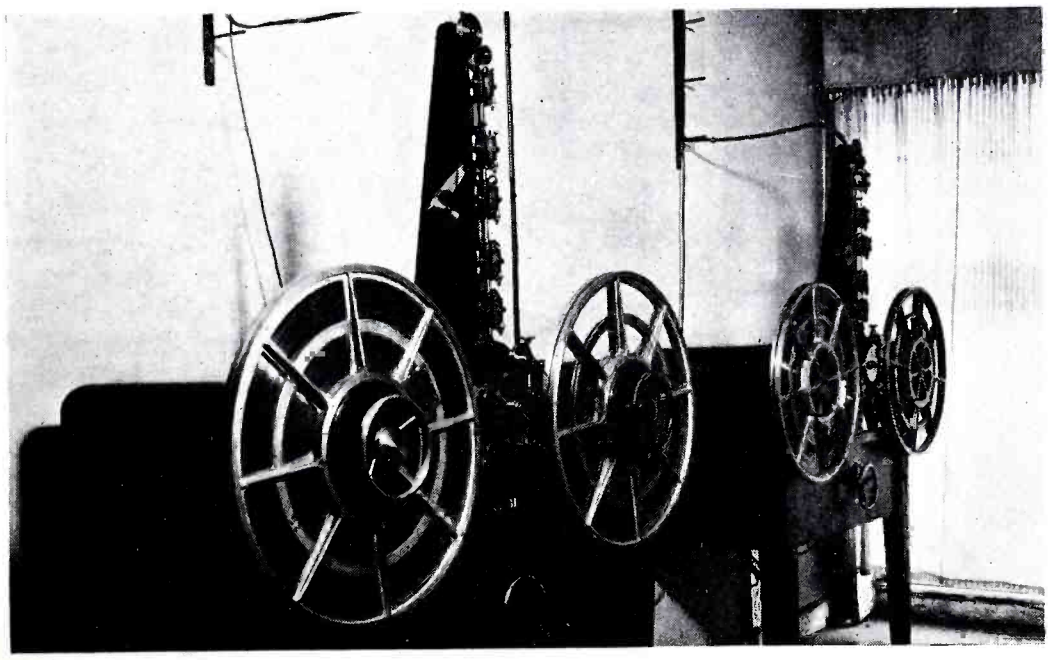
Frequency	*Call*	*Frequency*	*Call*
21470	GSH	15280	LRU
17790	GSG	15280	DJQ
17780	W3XAL	15270	W2XE
15370	HAS3	15243	TPA2
15340	DJR	15210	W8XK
15330	W2XAD	15183	RV96
15145	RKI	10350	LSX
15200	DJB	10290	DZC
15140	GSF	10042	DZB
15121	HVJ	9860	EAQ
15110	DJL	9750	COCQ
14970	LZA	9675	DZA
14600	JVH	9660	LRX
13635	SPW	9600	HJ1ABP
13100	VPD	9600	CB960
12235	TFJ	9595	HBL
11900	XEWI	9590	VK2ME
11885	TPA3	9590	PCJ
11860	YDB	9580	GSC
11870	W8XK	9580	VK3LR
11830	W2XE	9570	W1XK
11830	W9XAA	9560	DJA
11810	2RO4	9553	CQN
11770	DJD	9540	DJN
11750	GSD	9530	W2XAF
11720	CJRX	9520	RAN
11720	TPA4	9510	GSB
10955	HS8PJ	9510	VK3ME
10740	JVM	9510	HJU
10670	CEC	9500	XGOX
10660	JVN	9500	HJ1ABE
9428	COCH	6000	XEBT
8750	ZBW	5950	HJN
8665	CO9JQ	5940	TG2X
7380	XECR	5875	HRN
6710	TIEP	5850	YV5RMO
6618	Prado	5800	YV2RC
6410	TIPG	4273	RV15
6280	CO9WR		
6235	HRD		
6230	OAX4G		
6150	CJRO		
6150	YV3RC		
6150	COKG		
6140	W8XK		
6131	HIX		
6130	COCD		
6120	W2XE		
6100	W3XAL		
6100	W9XF		
6090	CRCX		
6085	HJ5ABD		
6080	W9XAA		
6070	YV7RMO		
6060	W8XAL		
6060	W3XAU		
6050	HJ3ABD		
6043	HJ1ABG		
6040	W1XAL		
6030	VE9CA		
6020	XEUW		
6010	COCO		

Other Than Broadcast Stations

20040	OPL
18910	JVA
18910	JVD
18890	ZSS
16030	KKP
15505	CMA3
13280	SUX
11770	KKU
11760	Podebrady
15230	Podebrady
11490	PLO
11000	PLP
10620	XGW
10530	JIB
10260	PMN
9890	LSN3
9415	PLV
9350	HS8PJ
8120	KTP
7520	KKH
6115	Podebrady



Speech amplifiers in the station at Warsaw, Poland.



The steel tape recorders used for "canning" programs, at the Warsaw station.

Identifications

Station HH2S, Port-au-Prince, Haiti, 5910 kc, begin and terminate their programs each evening with "The Swan" by Camille-Saint-Saens, recorded on Victor record by Pablo Casals. The signals given each quarter hour consist of four tones on the Standard Gong.

Station HIT, Ciudad, Trujillo, are now opening and closing their programs with the selection "Anchors Aweigh."

The call letters TIPG, San Jose, Costa Rica, on 6410 kc, represent the following "TI"—the assigned letters for Costa Rica, "PG"—Perry Girton, the owner and operator.

COCH, operated by the General Electric Company of Cuba, on 9428 kc, are now operating their new transmitter with 10,000 watts power. "Maria My Own" is the title of the opening and closing selection.

EAQ, Madrid, Spain, open their programs with a few bars of "La Verbena de la Paloma" and close each program with the national hymn "Himno de Reigo." Transmission No. 2, from 7:00 to 7:30 P. M. daily is for English-speaking listeners.

Veries

YV9RC styled "Emisora Ondas Populares," Caracas, Venezuela, on 6400 kc, are sending out their very attractive veri cards in blue and white.

The new veri cards of XEWI with white background, blue and black lettering, with call letters in dark red with black border line, are being distributed.

"Emisora Philco" Radiodifusora HJ4ABP has a very attractive card done in white, blue and black.

CFCX Montreal, Quebec, Canada, are already mailing their new cards with yellow background, black lettering and with call letters in large red type.

The new photograph veri card of HVJ Radio Vaticano with its winding road and beautiful shrubbery alongside the Vatican wall and picturing the towering aerials of the Vatican station atop the wall, is a veri worth striving for.

HRD, La Ceiba, Honduras, is putting out a neat veri card with a pink background.

Station Notes

From advice received from Chile, Station CEC, Santiago, on 10,670 kc is now only broadcasting program material from 7 to 7:20 P.M. each day except Saturday and Sunday. These broadcasts are also being retransmitted experimentally by their radiophone station CED, located at Antofagasta, Chile, which operates on 10,230 kc. This accounts for reports on reception of CEC on 10,230 kc, which indicates that some listeners received a new station and were not aware of the fact.

Cia Internacional de Radio Santiago, Chile, operators of CEC and CED, would especially appreciate reports on the quality of retransmission by CED which they advise are being picked up from the air by that station which is located about 1000 kilometers from Santiago.

It will also be noted from station lists that stations CB960 and CB615 on 9,600 and 6,150 kc respectively, have changed their schedule of time on the air.

COCQ, Havana, Cuba, is being tentatively listed at 9750 kc, although official advice of the exact frequency on which the station is operating has not been received. It is understood that the General Electric Company of Cuba operates both COCH and COCQ.

Through its station, The Icelandic State Broadcasting Service, TFJ, Reykjavik, Iceland, are now broadcasting their excellent musical program each Sunday from 1:40 to 2:30 P.M. on 12,235 kc.

Station SPW, Polskie Radjo, Mazowiecka 5, Warsaw, Poland, writes to explain that their recent report of the frequency of station as 13,653 kc was a misprint and that the exact frequency is 13,635 kc or 22.00 meters. They are at present working with a directional aerial for South America and Japan. The SPW station is the property of the Ministry of Posts and Telegraphs and was constructed for the purpose of telegraphic service but is being used also at present for broadcast purposes on Mondays, Wednesdays and Fridays, 11:30 A.M. to 12:30 P.M.

A new aerial directed to North America is about completed and it is hoped their programs will be heard with better signal strength as a result. It is also the intention to install a special radiophone station to care for that branch of service.

Estacion Radio Emisora HRD, called "La Voz de Atlantida," on 6235 kc, at La Ceiba, Honduras, opens each program with a marimba fox trot "Solo Tuyo"—("Yours Only") and closes with the pretty Intermezzo No. 1 by Luis Calvo. For the information of those listeners who have made inquiry, the gifted pianist who gives a 15-minute piano recital each evening before closing is a gentleman artist, Senor Tito del Moral. His rendition of Ted Lewis' "Good-night Melody" just a moment before eleven each evening, with all its frills, is well worth listening to.

XEWI, Mexico City, is at present broadcasting only on 11,900 kc. Our September issue advised they intended to broadcast on 6,000 and 11,900 kc, the authorized frequencies. They now advise they found the 6,000 band too crowded and are endeavoring to secure a change in frequency to 6,015 kc. Until a change in frequency is effected they will transmit only on 11,900 kc as above stated.

"Little NRH"

The familiar bugle call followed by the announcement of TI4NRH Heredia, Costa Rica, brings to the memory of many "Little NRH" with its 7½ watts power of days gone by. Senor Amando Cespedes Marin since severing connections with TIRCC at San Jose is again operating his own station, and from letters received from him, he is very happy back at the old site, Heredia, and already receiving many reports as far away as England with his newly installed transmitter of 100 watts power. He comments that his crystal shows him to be on 9,670 kc and further states that new colored veri cards are being printed and will be forwarded to all listeners as promptly as possible after being received. His time on the air is shown complete in station list. He will read letters from listeners each week, from 11:30 P.M. Saturday to 2:00 A.M. Sunday. The writer extends greetings and best wishes.

The frequencies of Centro Coltano Radio, Pisa, Italy, are revised in this issue, all frequencies having the call IAC. They advise that occasional musical broadcasts are made on 17,750 kc, 17,699 kc, 12,865 kc, 8,515 kc and 4,355 kc which usually occur between 4:30 and 6:30 P.M., E.S. Time.

LRU, Buenos Aires, 15,280 kc, is now operating 7 A.M. to 3:45 P.M. and LRX on 9,660 kc between 8 and 9 P.M.—experimentally for the time being on the last frequency. All announcements for both stations are broadcast in Spanish except for announcements in English on

A veri printed in red and blue, from Mexico.

opening and closing the transmissions, which are made for the benefit of listeners in other countries who do not speak Spanish.

Radio "Del Estado" HCK, Quito, Ecuador, has moved from 5,885 kc to 3,750 kc or 80.00 meters, and will broadcast regularly on Monday evenings 8:30 to 10:30 P.M. with occasional special transmissions at odd times.

Rome's Interval Signal

Station 2RO, Rome, advises that the interval signal used by them between programs, while the carrier is on the air and no program is in operation, is an electrical device imitating the song of the "capinera" or "black-cap" bird. It is also employed before the American Hour and Latin-American programs to assist listeners to tune in properly. After so many reports being published as to the species of the feathered biped represented, the writer became curious and requested the information. The record which is played before all programs of the Rome stations is the "Campane di Roma" or "Bells of Rome." The record played at the end of their programs includes the Italian Royal March and the Fascist Anthem "Giovinezzi" (meaning "Youth").

The regular announcement made by the Italian stations (in Italian) is "Ente Italiano Andizioni Radiofonice, E.I.A. R.", which translated more or less literally, means the Italian Radiofonic Auditions Organization, or more simply, the Italian Broadcasting System.

As a matter of information it might be said that all programs from Rome will be heard for the rest of the summer and early fall on 11,810 kc or 25.40 meters. If not heard on this frequency, as in cases of emergency or operating reasons, they will be found on 9635 kc or 31.13 meters.

The programs from Australia's Radio Ship *Kanimbla* are broadcast on two frequencies, namely, 6010 and 11710 kc or 49.917 and 25.619 meters, respectively, and transmits on about 200 watts power in the aerial.

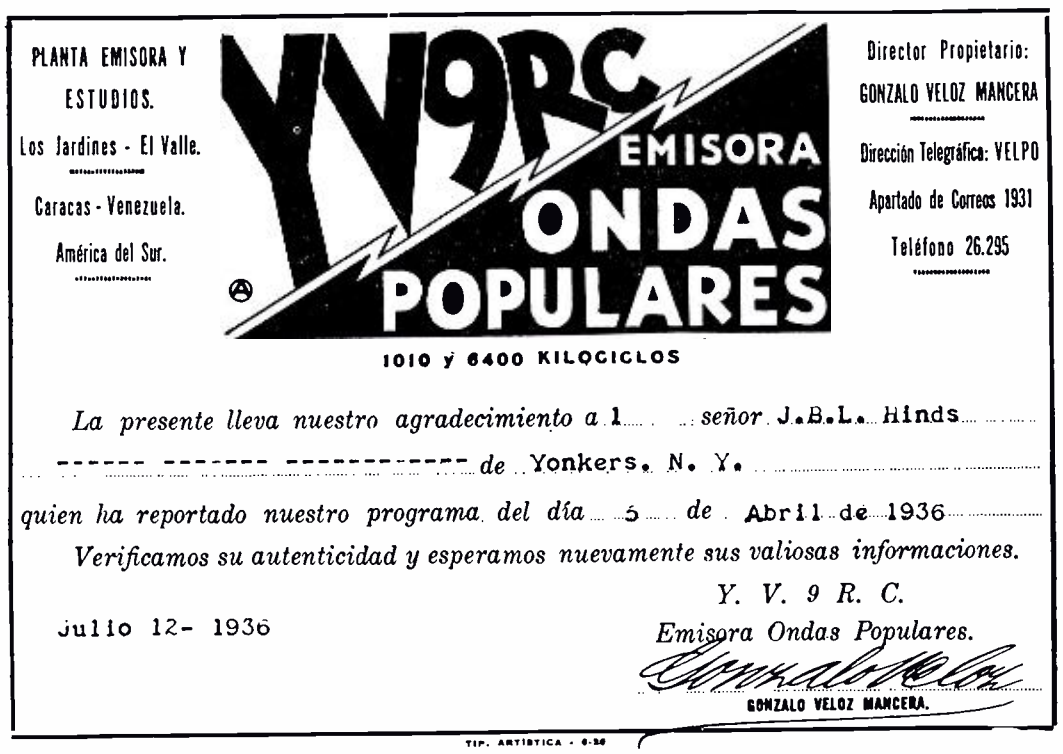
It is reported that Stockholm, Sweden, has a short-wave broadcast transmitter on 11710 kc or 25.63 meters and said to be on the air every Wednesday evening between 5 and 6 P.M., E.S. Time, broadcasting to the United States and Canada. It is also said to operate most afternoons between 12 and 4 P.M., E.S. Time. Reports are welcomed and should be sent to "The Technical University of Sweden" at Stockholm.

Special G. E. Program

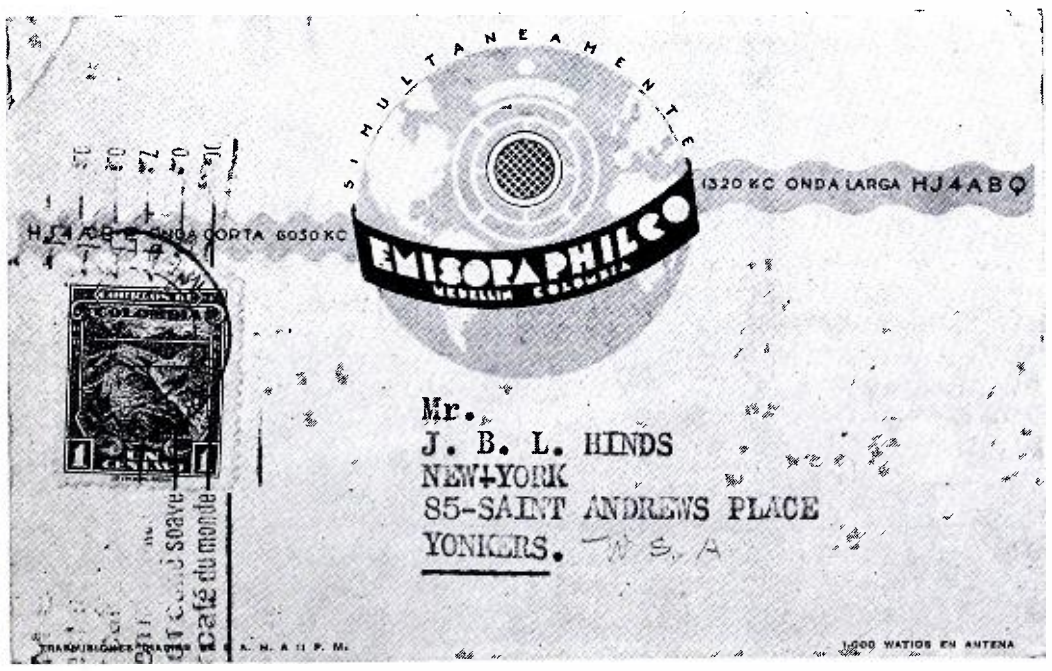
W2XAF, 9530 kc, and W2XAD, 15330 kc, will dedicate a one-hour program on November 20, 1936, from 3 to 4 P.M., E.S. Time, to the foreign members of the Newark News Radio Club. All foreign listeners are invited to tune in and report reception of these stations to General Electric Company, 1 River Road, Schenectady, New York, U. S. A., who will gladly verify all reports.

Mr. H. Francis Shea, East Machias, Maine, reports hearing a broadcast about 7 P.M. from CSW, Lisbon, Portgual, on about 9380 kc. Have any other listeners heard this station?

Late advice received from short-wave broadcasting station CR6AA, Lobito, Angola, Portuguese West Africa, shown in station list at 7177 kc, is that they began broadcasting on July 31st on 9660 kc. This station now broadcasts with 500 watts power on Wednesdays and Saturdays, 3:45 to 5:30 P.M., E.S. Time. They give information that their identification signal is three notes on the piano. When it gets colder listen for the three notes, although the writer cannot tell you which three notes are used. (?)



A whopper from Caracas—the original card measures 5½ x 7½ inches.



In black and blue, from HJ4ABQ.

Radio Podebrady

Radio Podebrady, Czechoslovakia, is testing out preparatory to regular broadcasting and a great many reports have been received of their being heard. In their announcements they stated they were operating on 15230, 11760 and 6115 kc and were heard on all three frequencies with good power and modulation. Announcements were made in English "Radio Podebrady", Czechoslovakia. It is understood that the address is Prague. No call letters were given. Power announced is 35 kw. In their first 12-hour test they alternated each 30 minutes on the three frequencies above mentioned and were heard apparently in all sections of the United States.

HJ1ABE, Cartagena, has evidently

settled with their new transmitter on 9500 kc.

Erlanger and Galinger, Inc., Importers, Manila, P. I., are now operating long-wave station KZRM, at Manila. They have also been testing out on several high frequencies with musical test programs and have been reported by many. It is understood that a new short-wave transmitter is contemplated, and to be the most powerful in the Far East. It will be erected if the government continues a subsidy.

Station YV5RMO, Maracaibo, Venezuela, mentioned in this section in September, have changed their time schedule which appears in this issue. They wish the writer to state they will gladly verify the reports of listeners from all parts of the world. Their address has been changed to P.O. Box 37. You can easily tell YV5RMO as they now play the familiar "Strike Up the Band" at both the opening and closing.

Prettier than you'd imagine—a yellow card with call in red and the rest in black.

Netherlands Indies Chain

A complete outline of The Netherlands Indies Broadcasting Company, Ltd. —NIROM—has been received.

It is noted there are twenty-two stations in the chain, all of them operating below 200 meters. Owing to unfavorable atmospherics existing in the tropics, no wavelength above 200 meters can be used. The long distance stations are YDA, 3040 and 6040 kc; YDB, 9610 and 11860 kc; PMN, 10260 kc and PLP, 11000 kc. The remaining 18 stations are all low-powered transmitters and used in local program work and transmitting with 15 to 150 watts power.

The writer was of the opinion heretofore that stations PMN and PLP were under the jurisdiction of Mr. J. Sanders, Chief Engineer, Bandoeng, Java. It will be our endeavor to later list the Java Wireless Stations.

Reports of reception of NIROM stations should be sent to The Netherlands Indies Broadcasting Company, Ltd., Mr. A. H. K. Mulder, General Manager, Batavia, Java.

Amateur Phone Stations

There follows a list of 20-meter amateur phone stations received as listed in late reports: LU4BH, LU4EH—Argentina; VK2UP-IQ-NO-JV-LV-HO, VK3JU—Australia; VP9R— Bermuda; VP1BG, VP1CD—British Honduras; VP3BG—British Guiana; PY2EJ, PY2AB, PY7AA—Brazil; ON4PA, ON4MY — Belgium; HJ1ABH, HK1S—Colombia; CO2JM-CH - KY - SV - LL - WW-RA-JV-RN, CO5RY, CO7CX, CO7HF, CO8RQ, CO8YB—Cuba; TI2EA, TI2FG—Costa Rica; HI60, HI2K, HI7G, HI6F, HI2T—Dominican Republic; G2FL, G5TZ, G5XQ, G5OT, G6GF, G6SI, G6AX—England; HC1FG—Ecuador; F8BU, F8PK, F8PU—France; OX2Z—Greenland; K6FLV — Hawaii; HH2B, HH5PH—Haiti; XE2AH, XE1G, XE2N, XE1AI, XE1V—Mexico; LA1G—Norway; VO1J, VO4Y—Newfoundland; CT1TB, CT1BG—Portugal; K4SA, K4DDH—Porto Rico; HP1H—Panama; EA3BQ, EA3AR, EA1AM — Spain; G6NX — Scotland; HB9B—Switzerland; YV4RC—Venezuela.

The stations from the majority of countries listed were received from 5 to 9 and 10 P.M. with the exception of those in Australia and Hawaii, which were received between midnight and dawn.

We are indebted to Mr. Howard Wilson, Ithaca, New York; David H. Stone, Brooklyn, New York; E. H. Clark and Bill Brittingham, Hollister, California; John Carothers, Lincoln, Nebraska; Raymond S. Swenson, Rockford, Illinois; and Charles Hausenbauer, Farmingdale, New York, for the information.

Further reports from listeners would be gratefully received. I might say in this connection that we have been reporting on 20-meter phones since the April issue. It is noted that the same stations in many cases have been reported each month. We have eliminated from this report those stations which have previously been reported, it being assumed that it is the desire of those following such stations to ascertain those not reported.

It would be most helpful to receive comments on the plan and suggestions for its improvement, so that we may learn your wishes in the matter. Though we had considered it quite important to furnish the frequencies of stations received we have given up the idea due to the difficulty in reading off such close frequencies on receivers other than the communications type. Instead you may report each station below 14150 kc as on the low-frequency side of American Amateur phone band and those above 14250 kc as on the high-frequency side of the band. This is sufficient. Your reports may simply read "LF" or "HF" as the case may be. The *time* received is *very* important and in making up your lists please list the call, location, time of receiving, and whether "LF" or "HF" side.

In making subsequent lists please make the list on separate sheet of paper apart from the letter which accompanies the reporting.

Slow Stations

We must continue to report the following stations as still being slow in verifying reports of reception: HJN, HKV, HJ1ABB, HJ3ABF, HJ4ABD, HJ4ABB — Colombia; HC2CW, HC2ETC—Ecuador; XBJQ—Mexico; HRN—Honduras; YNVA—Nicaragua; CB960—Chile; HI2D, HI4V, HI5N, HI7P, HI9B—Dominican Republic.

In Appreciation

It again affords me pleasure to acknowledge reports and letters from the following: Wilbur Britting, Los Angeles, California; Bill Brittingham, Hollister, California; J. W. Brauner, Williamsville, New York; Bob Beadles, Salt Lake City, Utah; Edward Beazley, Palmer, New York; E. G. Collister, Baldwin, New York; Michael M. Elliott, Minneapolis, Minnesota; E. Mack Friedl, Port Arthur, Texas; Charles Hausenbauer, Farmingdale, New York; Kenneth P. Nichols, Medera, California; H. Francis Shea, East Machias, Maine; Byron Sil-

[*Continued on page 477*]

Channel Echoes

By Zeh Bouck

short-wave commercials . . . programmar . . . old timers' guessing bee

C. M. WHELAN, of Denver, Colorado, suggests that the next time we comment on radio advertising we point out the fact that surcease from box tops, labels, cartons, wrappers and reasonably good facsimiles thereof can be found on the short waves. Indeed, this is an old theme of ours, and, to our mind, it is the best sales argument for all-wave receivers. Unfortunately, the higher-frequency spectrum is not a complete Utopia in respect to blurb-burps. The megacycle region is contaminated by the short-wave replicas of the very programs from which one has fled downward!

There seems to us no adequate reason why commercial programs should be radiated in the short-wave channels unless the sponsor has paid for all-wave coverage. At the same time, the facilities of short-wave broadcasting should be denied any advertiser whose product is not internationally distributed. Aside from inflicting upon short-wave enthusiasts a wholly undesired type of fare (they can listen to it on the long waves if they want to), there is absolutely no sense in internationally advertising a soap powder or tooth paste that can be purchased only in the U. S. A. As a matter of fact, there are many products that should not be so advertised even though they *are* sold in foreign markets. One can, if they have money enough, buy Lucky Strike cigarettes almost anywhere in the world. But the price is prohibitive for consistent consumption. They are purchased largely by travelling Americans who are habituated to this brand, and the sale is altogether uninfluenced by the short-wave broadcast of the Lucky Strike Hit Parade. We feel that short-wave commercials should be strictly limited to products having a genuine foreign market—a market in which a large percentage of the purchasers are natives, rather than peregrinating Yankees looking for their favorite brands. To accomplish this, it may be necessary to extend the Federal Communications Commission's rulings on "public convenience and necessity" to include programs as well as the fundamental right to broadcast.

We can hardly see justification for W2XAD (one of the s-w outlets of WGY, Schenectady, N. Y.) exhorting the citizens of a dozen different nations to buy furniture from Breslau Brothers (no down payment and a free refrigerator in exchange for your old ice box) when distribution is limited to within a few miles of Schenectady. There also exists an esthetic consideration. Typical of most spot programs, the Breslau Brothers opus is on an artistic level that couldn't be reached with a ten mile shaft. To put it mildly, the program is rank, and is hardly the sort of material to be chosen for international representation.

There are plenty of good sustaining programs that can be piped to our short-wave stations to keep America on the international ether while our low-frequency channels are infested with local commercial plugs for the benefit of those who care to listen.

The U. S. A., however, is by no means the only offender in this respect. The South American stations go us several better. The average Spik plug makes Major Bowes' amateur ballyhoo seem like reticence itself. The advertising is less offensive only because distance lends enchantment and the fact that the plugging is in a tongue foreign to most of us. Typical interpolations in Latin American programs sing the praises of Señora Perez, a charming midwife of incomparable efficiency and extol the virtues of Señor Lopez, an undertaker,

[*Continued on page 469*]

Put on your guessing cap . . . remember this male duo? They were better known than Amos 'n' Andy in their time.

Night-Owl Hoots

By Ray La Rocque

special dx contest . . . time table of dx programs . . . world broadcast list . . . re-allocation hearing . . . stations of the month

A queer type of bird indeed is this Night Owl. While all the other birds begin to frown and seek a warmer clime ere the nights begin to grow longer and the autumn breezes commence to blow, the Night Owl creeps out from a summer's hibernation so to speak and looks forward with a beaming countenance to the coming of colder weather. Yes sir, he's a queer bird, this Night Owl—but you never hear him complain for he knows what the other birds are missing and you can see him smile as he says, "It's fun to be a Night Owl."

World Broadcast List

While all the Night Owls have been "hibernating" ALL-WAVE RADIO has been busy with plans to make the new season the best ever for all of its readers. The Chief Night Owl wants to assure you that we are leaving no stone unturned in an effort to give you the utmost in broadcast band news and to make your DXing more enjoyable. Last month we included a list of United States Stations, and in this month's issue you will find a complete list of Broadcast Stations of the World. It has been compiled from authoritative sources and is up-to-date in every respect. For their assistance in compiling this list we wish to publicly thank the following individuals and organizations: The Canadian DX Relay, The Globe Circlers DX Club, The Quixote Radio Club, Joe Miller of Brooklyn, Station CB118 and the Dept. of Electrical Services of Chile, the Federal Communications Commission, the Department of Commerce, and the various departments in charge of radio broadcasting in many countries.

ALL-WAVE RADIO's
Time Table of DX Programs
(All time is given in Eastern Standard Time)

Specials

THURSDAY MORNING, SEPT. 17
KPDN 1310 Pampas, Texas
3:00-4:00

SATURDAY MORNING, SEPT. 26
WORL 920 Boston, Mass.
(GCDXC) 2:00-3:00

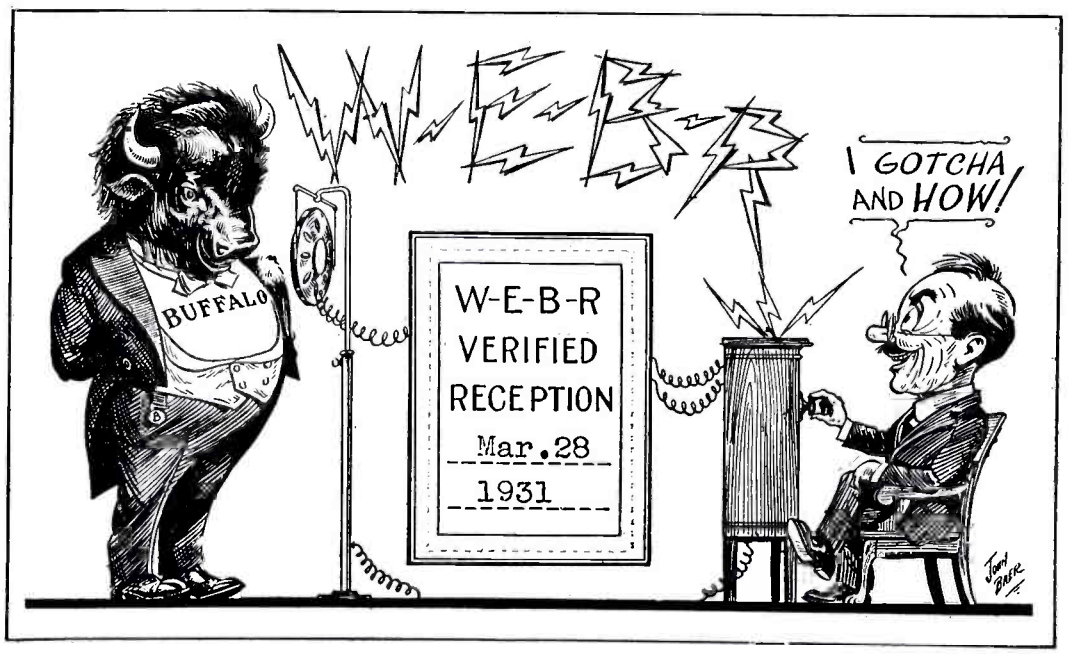
SATURDAY MORNING, OCTOBER 3
KPDN 1310 Pampas, Texas
3:00-4:00

SATURDAY MORNING, OCTOBER 17
KPDN 1310 Pampas, Texas
3:00-4:00

Regulars

EVERY SUNDAY MORNING
TGW 1210 Guatemala City, Guat. 12:00-5:00
XEOO 1150 Mexico City, Mex. 2:00-4:00

EVERY FRIDAY MORNING
XEL 1100 Mexico City, Mex. 12:00-4:00
CFCN 1030 Calgary, Alberta 1:00-2:00



An old but interesting veri, shuffled out of Buffalo in 1931.

The station lists are by no means the only new additions to our Broadcast Band Department. Included in this issue and in every issue throughout the DX season you will find a time-table of DX programs.

Last, but by no means least, of the new features for the coming season is something which we feel sure will interest every DXer from those boasting a log of hundreds of stations right down to the beginner. A contest has been devised for broadcast band listeners to ascertain the champion DXer of the 1936-37 season. In planning the contest we gave particular attention to arranging a means of scoring which would give each contestant an equal opportunity to win regardless of his locality. The contest will be conducted in this column and ALL-WAVE RADIO has promised the Chief Night Owl that worthwhile prizes will be awarded the winners. The rules follow:

Championship Contest

Participants are required to send reports on stations located in the band 500 to 1600 kc heard during each month to Ray La Rocque at 135 Highland Street, Worcester, Mass. Reports must be in accordance with the following rules:

1.—*Eligibility:* Any person able to twist a dial is eligible to participate in this contest, employees of ALL-WAVE RADIO excepted.

2.—*Reportable stations:* Reports will be allowed only on programs listed in ALL-WAVE RADIO's monthly time-table unless the station is located outside the United States and Canada in which case reports are permissible on reception of any program.

3.—*Reports:* Each report must contain all of the following information: Station call and location, time heard in Eastern Standard Time, musical selection or

other verifiable material heard, signal strength, quality, fading, static, interference (state nature), temperature and weather conditions, receiver used, the name and address of the reporter. Each report must be on a separate slip of paper or card, and writing should be on one side only. Reports should be typed or written in ink. No pencil reports allowed.

4.—*Scoring:* Based on the assumption that the station heard by the least number of DXers during the month is the best catch, the scoring will be as follows: The number of points to be awarded for each station heard is 100 points, to be divided equally among those DXers reporting that station. The scoring will run like this:

For the only report on a station during the month.....100.

For two reports on a station during the month.....50 to each DXer reporting and so on. The greater the number of reports the lesser the score for each DXer reporting that particular station.

For convenience all fractions will be dropped.

5.—*Time:* The contest begins immediately and will close on May 1, 1937. Points will be totaled on the first of each month and totals will be published regularly in this department. All the reports that reach the Chief Night Owl before October 1 will count in the first scoring. Scores for each month thereafter will be totaled from the reports *received* during the month. No report on reception previous to September 1, 1936, will be accepted.

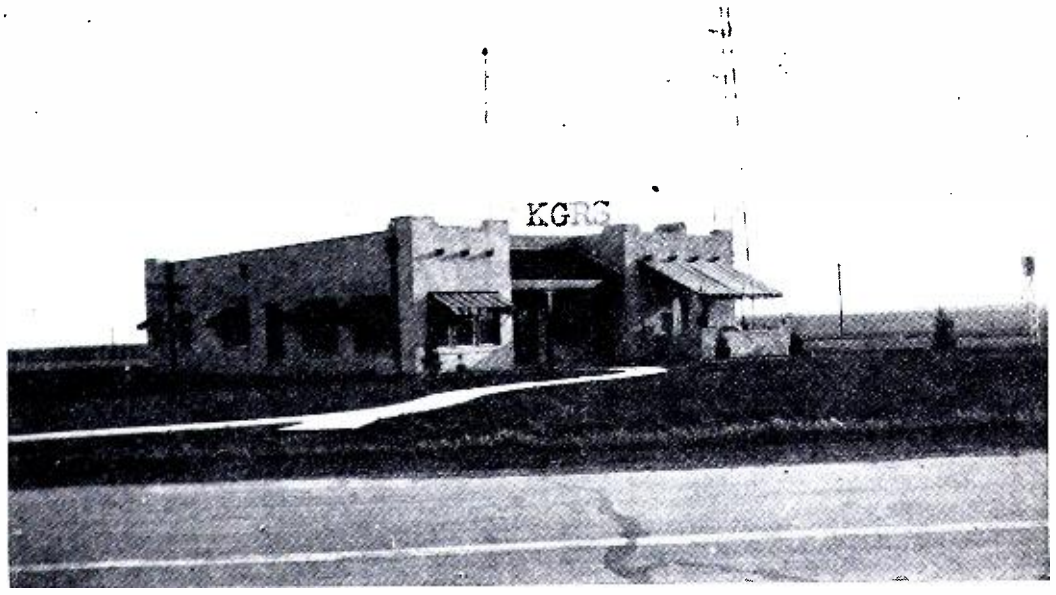
6.—*Judges:* The rules are made as simple as possible and must be adhered to in every respect by entrants in the contest. From time to time certain controversies may arise and in all cases the decision of the only judge in the contest, the Chief Night Owl, will be final.

7.—*Prizes:* The winner will be pronounced the DX champion of the 1936-37 season and ALL-WAVE RADIO has promised to secure a worthwhile prize for him as well as for others finishing near the top in the scoring. These will be announced next month.

So there you are boys—and girls. Go to it. The sooner started the higher your score will be.

Twelve More Stations

Just as we were beginning to think that the FCC had slackened the dizzy pace which it has been setting in the authorization of new stations, press releases began to pour in from Washington and at the time of writing the number of applications for new stations granted during the month is twelve—a new record we believe! So you can add the following to the United States station list published last month. Power in italics means daytime only.



Picture postcard veri from KGRS, Amarillo, Texas.

Kc	*Call*	*Location*	*Power*
1370	KBHB	Rapid City, S. D.	100
1370	KTEM	Temple, Tex.	*100*
1370	WEXP	Clarksburg, W. Va.	*100*
1370	——	Mayaguez, P. R.	100
1310	KHUB	Watsonville, Cal.	*250*
1310	KROY	Sacramento, Cal.	*100*
1210	KGLO	Mason City, Iowa	100
1210	KOCA	Kilgore, Tex.	100
1210	——	Carlsbad, N. Mex.	100
1200	KVEC	San Luis Obispo, Cal.	*250*
1200	WOLS	Florence, S. C.	*100*
1040	KYOS	Merced, Cal.	*250*

The activity of the Commission did not stop with the granting of new stations. Other changes which have been authorized are listed in the following paragraph and you may make the necessary corrections in the station list.

KGFK (1500 kc) to change to KDAL, and WPFB (1370 kc) to WFOR. WLMU is the call for the new Middlesboro, Ky. station on 1210 kc. KOVC is assigned to the new one in Valley City, N. D. on 1500 kc. KCRJ goes from unlimited time to daytime only. WTAG to increase to 1000 watts as well as WMCA, WDBO, WIRE, and WEAN. KGCX to move from 1310 to 1410 kc and will have the daytime restriction cancelled from its license, along with a jump in power to 500 watts. KFRO will change from daytime to unlimited by moving from 1370 to 1210 kc. KGBZ, which was deleted a short time ago, has been temporarily reinstated on 930 kc with 1000 watts to share time with KMA pending the decision of the Court of Appeals. WQDM will move from 1370 to 1390 and increase power to 1000 watts—we can remember when they used only 5 watts! WMEX succeeded in its application for a change from 1500 to 1470 kc with an increase to 5000 watts. WSIX will pack up and move to Nashville, Tenn. from Springfield. WOL also will have an increase in power to 1000 watts and will change from 1310 to 1230 kc. WLBF to move from 1420 to 1310 kc. WILL goes to 580 kc when their new antenna is completed.

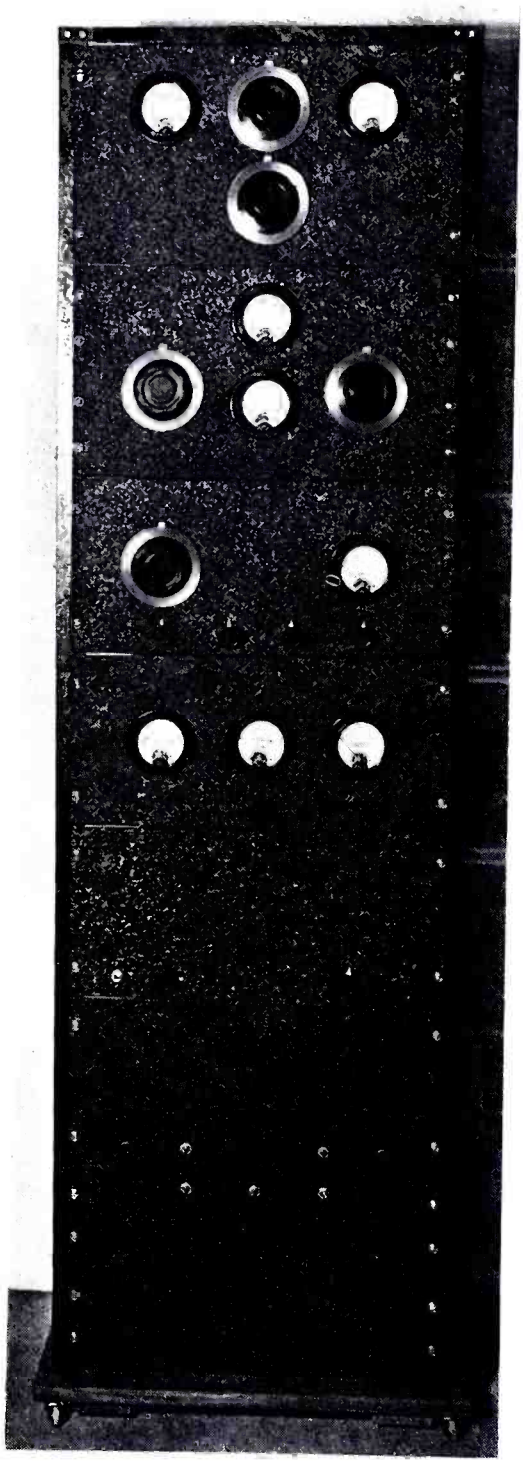
Re-Allocation Hearing

The Federal Communications Commission has given notice of an informal hearing before the Broadcast Division to be held in the offices of the FCC at Washington beginning at 10 A.M. on October 5, 1936, for the purpose of determining what principles should guide the Commission in matters relating to or affecting the allocations of frequencies and the prevention of interference in the band 550-1600 kc, and in particular, what changes, if any, should be made in the Commission's existing regulations or in the standards heretofore applied by it and its Engineering Department, in order to give effect to those principles. The list of subjects to be discussed is very long and some are unimportant to DXers. The most important are: 1.—Number of stations to be permitted to operate simultaneously on frequencies of each class. 2.—Possibility of duplicated use of a frequency by two 50-kw stations separated by a substantial distance. 3.—Increases in power above 50 kw on any class of frequency. 4.—Effect internationally of any proposals regarding the use of the band 550-1600 kc by other countries in North and Central America. 5.—Effect of any proposals upon future use of frequencies in the band 6000-30,000 kc and in the band above 30,000 kc for broadcasting.

Kilocycling Around

Just after last month's announcement of the CDXR convention went to press, we received information that the convention had been cancelled. The future status of the Canadian DX Relay is rather shaky at present. Fred Bisset, president and editor of the bulletin in the past finds himself unable to continue

[*Continued on page 479*]



The final job—front view.

THE AWR 2-3

Final Dope On

BY WILLARD BOHLEN, W2CPA,

WHEN the AWR 2-3 Crystal Transmitter, described in the April issue, was originally conceived, it was for but one purpose—to provide the simplest crystal-controlled job for 10-meter operation having a really useful output. As long as a 40-meter crystal was being used, operation on 20 and 40 meters was also possible and accordingly coils for these bands were wound up. This made a nice little rig that would give a good account of itself on the three amateur DX bands.

This was followed by a 15-watt modulator unit, described in the July issue, that would fully modulate the AWR 2-3 Transmitter. Since the peculiar conditions prevailing on 10 meters require no large amount of power for DX work when the band is open, since QRM problems are practically nil on this band at the present time, and since only a Class B license is necessary, this transmitter has provided the newcomer an opportunity to snare himself a little c.w. and fone DX.

Designed for Relay Rack

The three units comprising the low-power fone transmitter were constructed on standard chassis and relay rack panels so that they could be mounted on a standard rack or cabinet, and used with other standard-built units to form any desired type of higher powered transmitter. The 25-watt output of the r-f exciter unit is sufficient to drive a final amplifier having an output of up to 200 watts, and the modulator unit used as a speech amplifier, will adequately drive a Class B modulator having several hundred watts output.

A suitable high-power r-f amplifier to work with the three original units was described in the September issue. This amplifier uses the new RCA 805 tube which will, when used with the 1200-volt power supply described, provide a fone carrier of approximately 150 watts and a c-w output of about 175 watts, depending, of course, on operating conditions. These amounts of power are sufficient to go places when desired, even in the presence of plenty of QRM.

There is perhaps one feature of this final amplifier that was not mentioned last month. As the 805 is of the "zero bias" class the plate current of this tube will drop to a safe value of less than 100 ma when the excitation is accidentally removed. This obviates the use of a separate bias supply for the amplifier, making possible the use of the much simpler grid-leak system of bias.

High-Voltage Supply

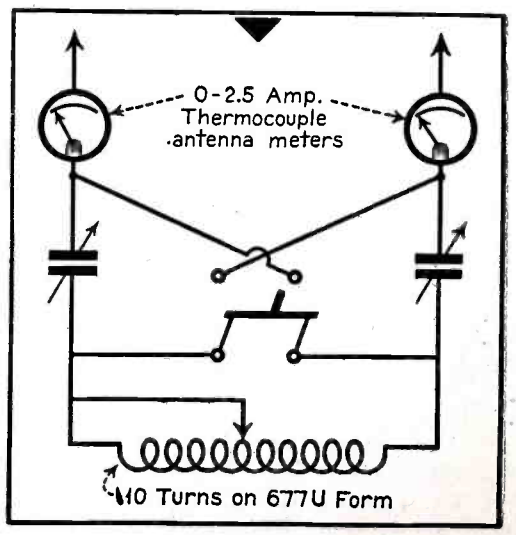
The high-voltage power supply will provide 400 ma for continuous operation. This leaves a reserve of power, even when operating on fone with full input. The filter uses a pair of heavy duty 500-ma chokes, the first one being of the swinging type for good voltage regulation. The output filter condenser has a capacity of 4 mfd which takes care of the peak power demands for 100% modulation. The two resistors comprising the bleeder are not shown in the fotos but are mounted on brackets underneath the power-supply chassis.

Probably the most important feature of this power supply is the provision made for instantaneous voltage change. The particular power transformer used was chosen because it had two separate primaries. Connecting these primaries in parallel in the "110-volt connection" provides half output voltage. Connecting them in series in the "220-volt connection" gives the maximum voltage. This change is accomplished by the voltage change toggle switch which is mounted in the center of the panel, which keeps one's hands out of the high-voltage equipment.

Using the full secondary, as shown, the output voltages are 600 and 1200. If desired the taps on the secondary can be used, for output voltages of 500 and 1000. This instantaneous voltage-change feature is advantageous in two ways. When tuning up, the low voltage can be used so that the 805 tube does not run hot when out of resonance. Also this voltage change permits instant QRP to one quarter of the full output of the transmitter. This is because the plate current of the final stage halves when the voltage halves. Thus needless QRM is prevented when conditions permit of a good signal with the lower power. The electric light bill will also be materially lessened if low power is used when possible.

The High-Power Modulator

For fone operation, the input to the final stage will run a little over 200

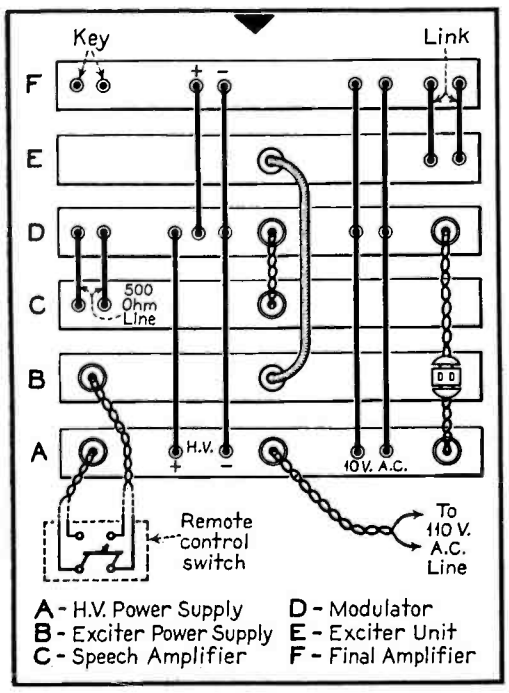


Circuit of antenna tuning unit.

TRANSMITTER

Completed Job

AND CHESTER WATZEL, W2AIF



The chassis-to-chassis relay rack connections.

watts, requiring an audio output from the modulator of slightly over 100 watts for 100% modulation. Various combinations of smaller tubes will, when pushed, take care of this but the quality will suffer as a result. The RK-31's used in the high-power modulator will, with 1200 volts on the plate, provide approximately 130 watts of audio power, which is quite a bit more than is necessary. These tubes have one nice feature which sets them apart from other tubes of the same approximate rating. They, like the 805, are of the "zero bias" class, doing away with the troublesome bias batteries or expensive bias supply required for Class B tubes not of this class. And a good bias supply for a Class B modulator stage costs almost as much as the plate supply required.

A 500-ohm input is provided for the modulator so that the speech amplifier may be located some distance away from the transmitter, if this should be necessary. In such a case the speech amplifier should be located at the operating position, together with the remote-control plate switch, rather than extend the microphone cable a long distance. The speech amplifier will fit in the same type of cabinet used for the AWR-6 receiver, described in the July issue, when such remote operation is necessary. The output transformer originally specified for the speech amplifier should be replaced with a Thordarson Type T-6754 which will provide the proper 500-ohm output connections.

Special Output Transformer

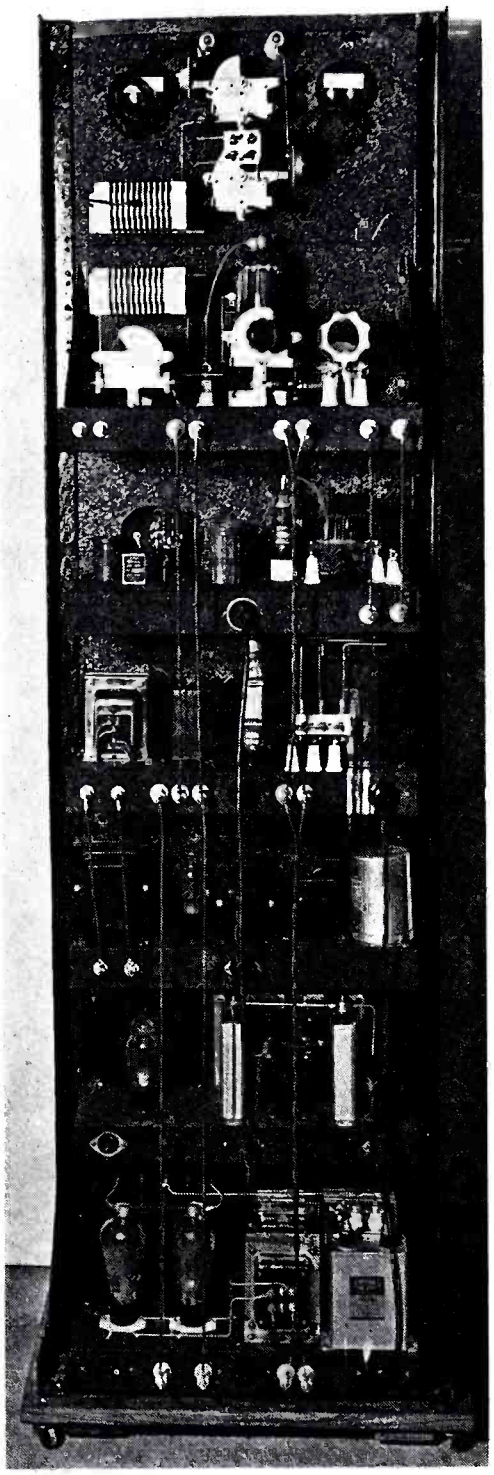
The Class B output transformer is the other pride and joy of this modulator. It is one of the new UTC Varimatch type and will match any Class B tube impedance of 2000 to 22,000 ohms to a load impedance of 250 to 29,800 ohms. The VM-4 model used will handle up to 300 watts and was picked because tests with various modulator tubes were contemplated. The VM-3 model will save a few dollars in cost and will be entirely satisfactory, being rated at 125 watts maximum.

The filament voltmeters for both the modulator tubes and the 805 are mounted on the modulator panel. The rheostat on the modulator panel controls the RK-31 filament transformer, the rheostat for the 805 filament transformer being mounted on the high-voltage power supply panel, although this is not shown in the photos.

Antenna Tuning Panel

The antenna tuning panel will match to any type of tuned antenna, whether or not the feeders are tuned. The antenna coupling coil can be swung up and down to effect variable inductive coupling, while the inductance of the coil is varied by shorting out turns. The switch throws the antenna tuning condensers from a series connection when open, to a parallel connection when closed. The two thermocouple meters are useful in balancing a two-wire feed system and in measuring comparative output. These meters are actually d-c meters, the thermocouples being mounted externally, and can be placed directly on the metal panel with negligible losses.

The condensers are insulated from the panel with the type 430 standoffs, these being used in place of the metal standoffs that are furnished with the condensers. The coupling coil has a pair of small angle brackets in place of the usual plugs. A corresponding pair of brackets are mounted on the standoff insulators.

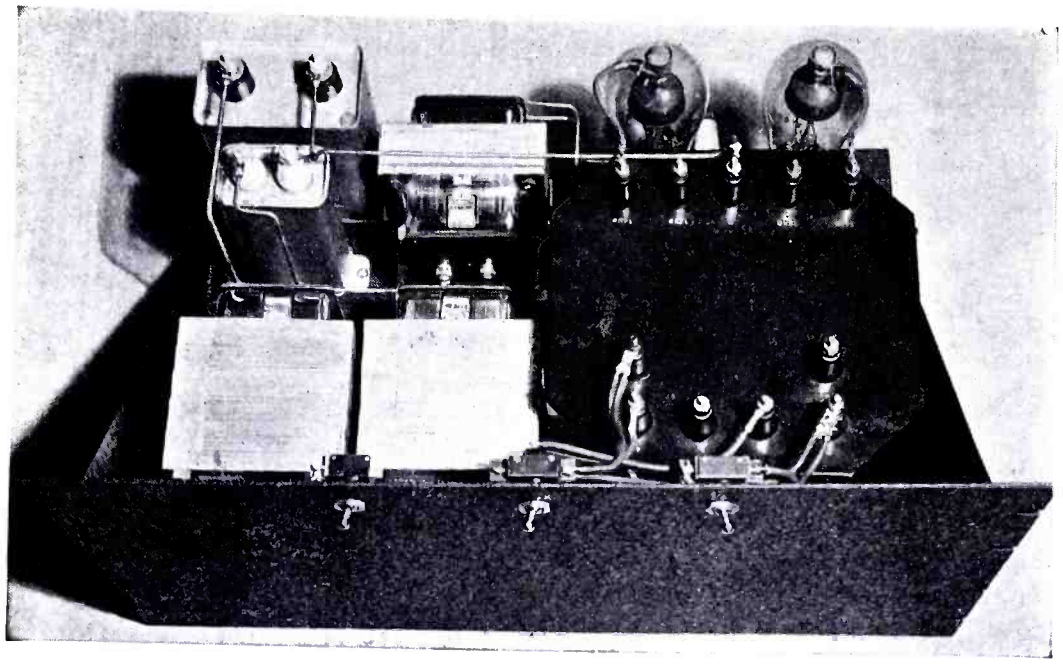


Rear of complete AWR 2-3.

Another pair of bolts, lock washers and thumbnuts serve to lock the coil in any desired position.

Chassis Interconnections

A sketch of the complete interconnections is given and is self-explanatory. The a.c. socket at the right of the high-voltage power supply (rear view) supplies a.c. to the other units, so that the filament switch on the high-voltage power supply controls the entire transmitter. The a.c. socket in the center of the modulator is wired in parallel to the one at the right end and is used to provide a.c. for the speech amplifier, which had its a.c. socket previously mounted in the center position. The remote control plate a.c. sockets at the left side of the two power-supply chassis should *not* be hooked directly together but rather



The husky high-voltage power supply unit.

should each have their separate connections to the remote-control switch, as shown in the sketch. These four wires may be conveniently run in a four-wire cable to the operating position. The two keying wires may be added to this cable, if desired, making a six-wire control cable. The 500-ohm audio line should be run in a separate two-wire cable, preferably shielded.

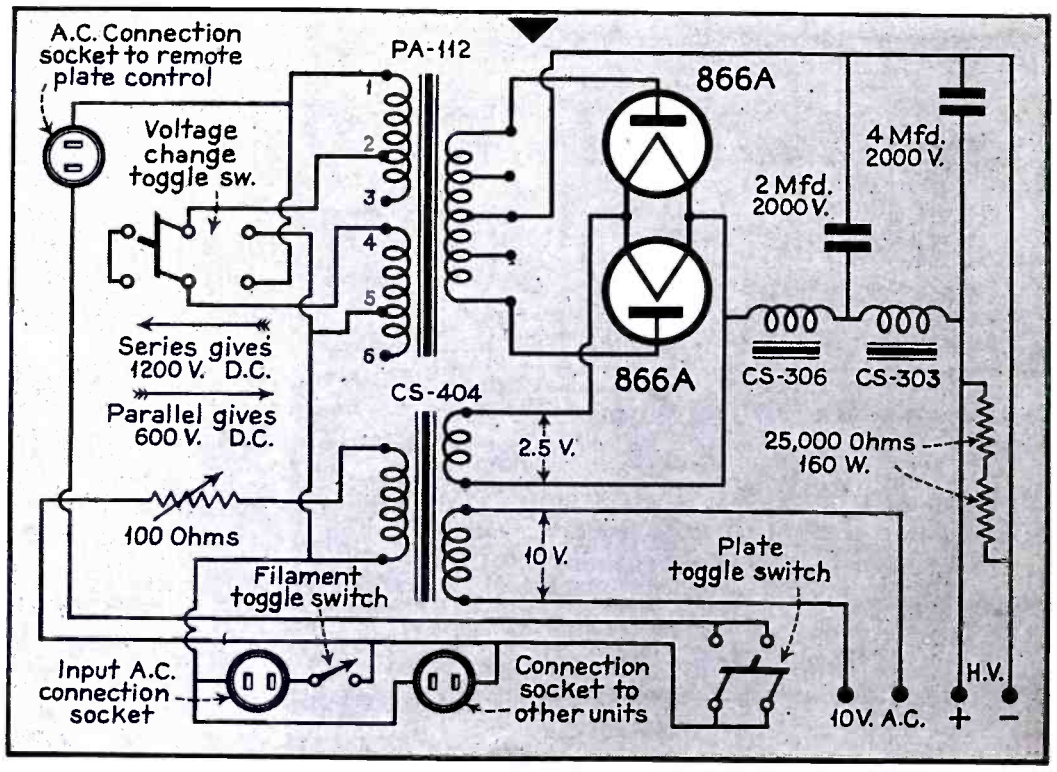
The Relay Rack

The rack is a standard drilled job. No base comes with the rack, this being merely a piece of redwood an inch thick and a little larger than the bottom of the rack. Ordinary casters are screwed underneath this base, one at each corner. The two side pieces of the rack are screwed down to the base. The diagonal iron cross braces furnished with the rack are cut shorter, with one fastened across the rack at the front, and the other at the back. These braces are just the right height to support the weight of the power supply directly. This is an aid when placing this supply in the rack.

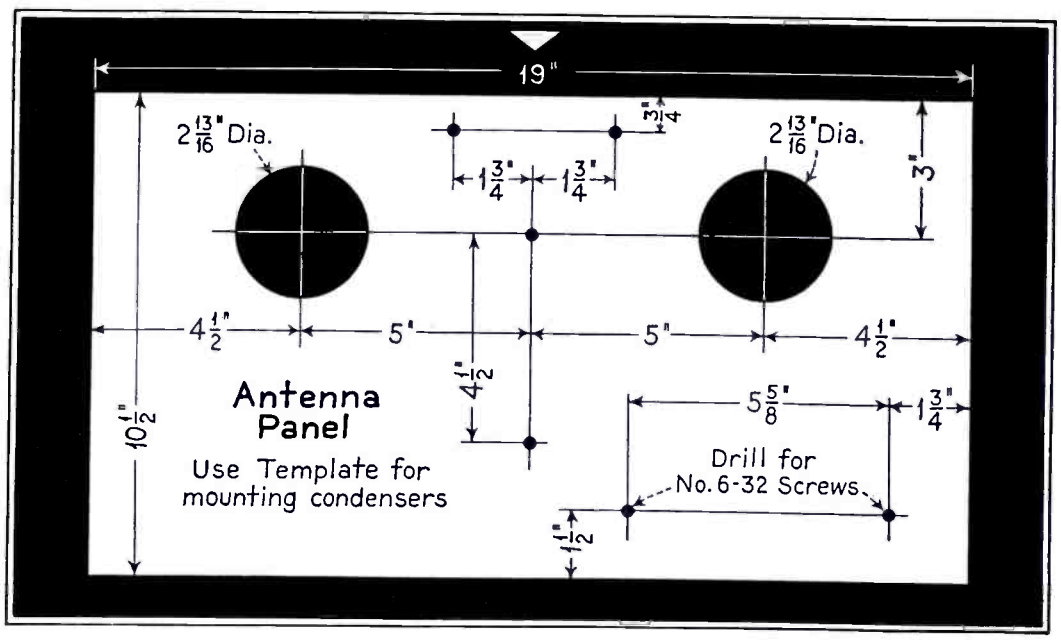
A careful comparison of the original AWR 2-3 article and the photos of the transmitter will show that this original job is not being used for the exciter. The one actually in the transmitter is a slightly different model of the AWR 2-3, but has the same fundamental circuit and gives exactly the same output. The connections on the back edge of the chassis are identical with the original. Actually the only difference is that band switching is used in the exciter and a larger size meter and dial are used.

Tuning Up

In tuning up for fone operation the same procedure should be followed as described last month. The final stage should be neutralized with the antenna disconnected. Once the final is neutralized the link between this stage and the RK-25 should be adjusted so that, with the antenna disconnected, plate voltage off the final and all circuits tuned to



The circuit diagram of the high-voltage power supply.



Details of panel for antenna unit shown across the way.

resonance, the grid current on the final will be about 50 ma. Then, with the large power supply switched over to give 600 volts, the antenna should be coupled so that the plate current on the final will rise to 80 to 90 ma with the plate tank and the antenna tuned right to resonance. Switching over to 1200 volts will then give a plate current of close to 175 ma on the final, which is the proper figure for fone operation at this plate voltage. The input to the final will then be 210 watts, with an actual carrier of about 150 watts, depending upon the efficiency of the final stage. With the voltage switched back to 600 volts the input will run 50 to 60 watts, with a carrier of about 35 to 40 watts.

These adjustments should be carried out with the switch on the modulator unit set in the "CW" position. This shorts the modulation transformer secondary and opens the high-voltage lead

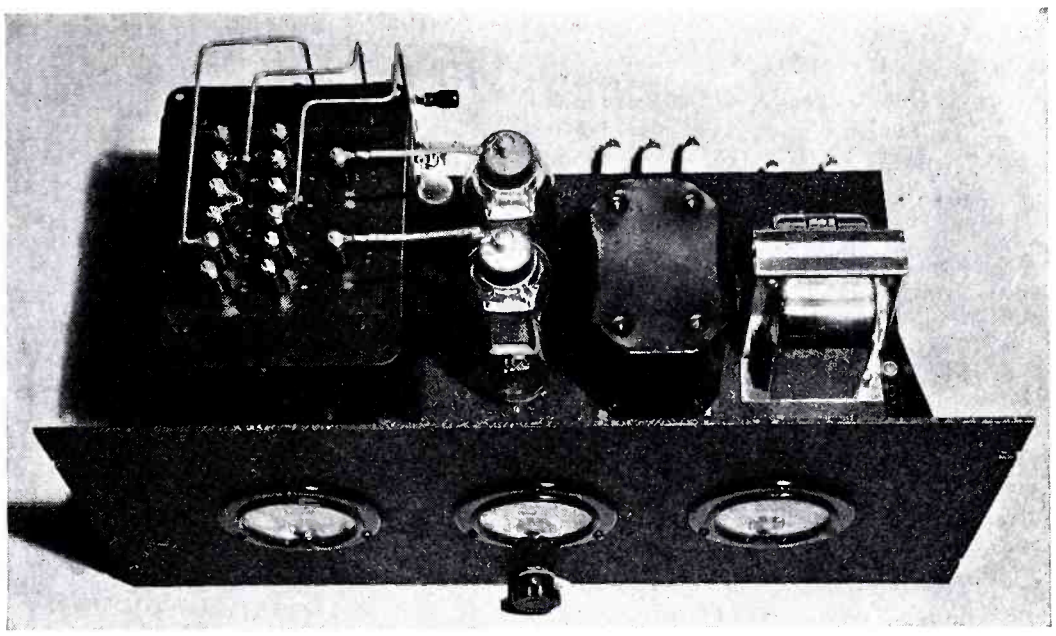
to the plates of the RK-31's. After these adjustments to the r-f section of the transmitter are completed this switch can be thrown to the "fone" position, the speech amplifier turned on, and the transmitter is ready to go on fone. With the power supply switched over to 1200 volts the gain control on the speech amplifier is adjusted until the meter on the Class B modulator swings up to around 200 ma during speech. The transmitter is then completely adjusted for fone operation and can go on the air.

Modulation Readings

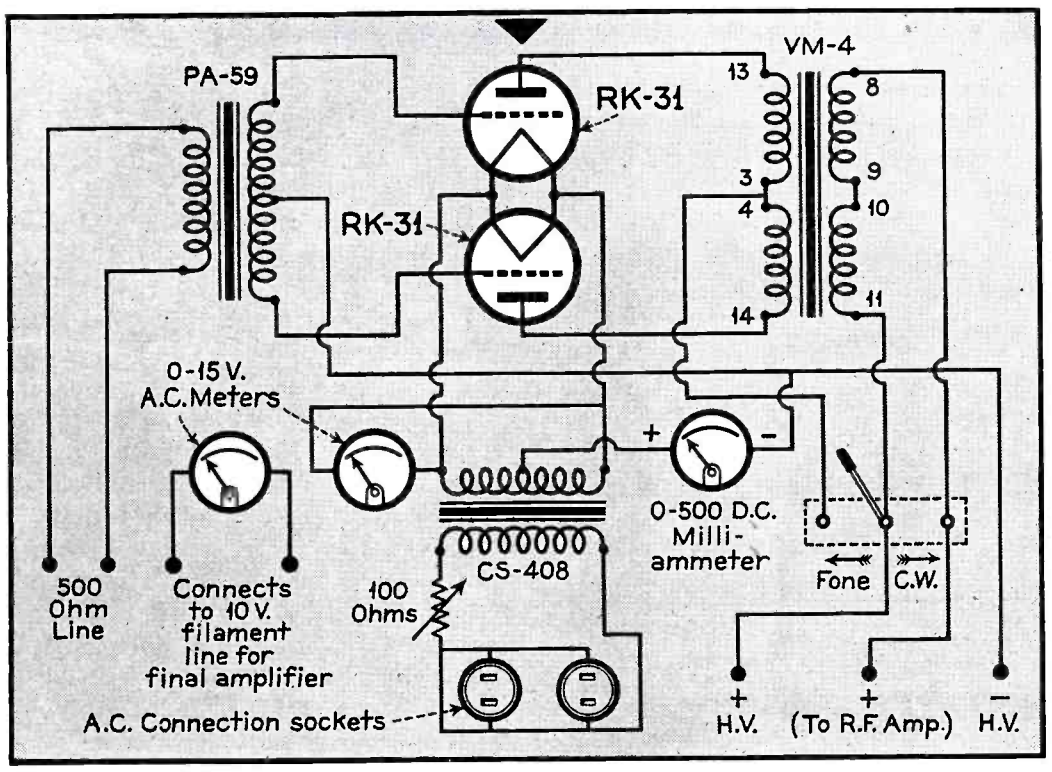
Care should be taken that the final amplifier is not overmodulated, and some device that will indicate overmodulation, such as an oscilloscope or other suitable apparatus, should be used for the preliminary adjustments. Once the proper swing of the modulation meter is noted for 100% modulation the oscilloscope can be returned to the owner, if you do not own one yourself, and the gain on the speech amplifier kept at the point which will prevent the modulation meter from swinging higher than the point which is known to give 100% modulation. In fact, it is a good idea to keep below this point to make sure of not overmodulating, unless an oscilloscope or other device is used for continuous monitoring of the modulation percentage. It is also a good idea to check the meter swing for 100% modulation for the 600-volt operation.

If the output transformer connections shown on the modulator diagram are followed the impedance match between the 805 and the RK-31's will be exactly right for a plate current of 175 ma and plate voltage of 1200 on the 805. If a VM-3 output transformer is used, the data sheet accompanying the transformer should be consulted for proper connections. When switching to 600 volts the load impedance of the r-f stage will remain the same as for 1200-volt operation but this impedance will be about twice as high as necessary for optimum operation of the RK-31's. This will, however, result in a theoretical decrease in distortion, although in actual operation the voltage can be switched from 1200 to 600, or vice versa, without even touching the gain control. The convenience of this instantaneous change in output from 35 to 150 watts or so cannot be overestimated.

The modulation meter reads the combined total of grid and plate current the way it is connected, but this is of no importance as it is the maximum swing of this meter under speech that is of concern, rather than the absolute value of current read. The meter should read a minimum of 30 ma with the plate voltage on the RK-31's but with no modulation.



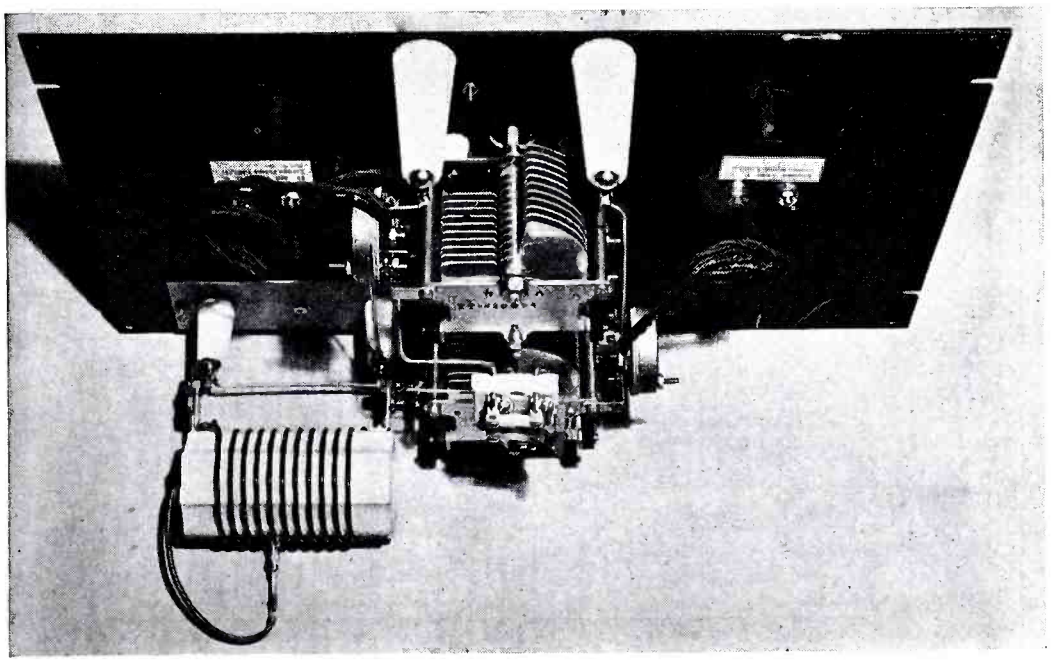
The high-power modulator for swinging the 805 final. It uses RK-31's, as shown below.



Circuit of high-power modulator.

Antenna Tuning

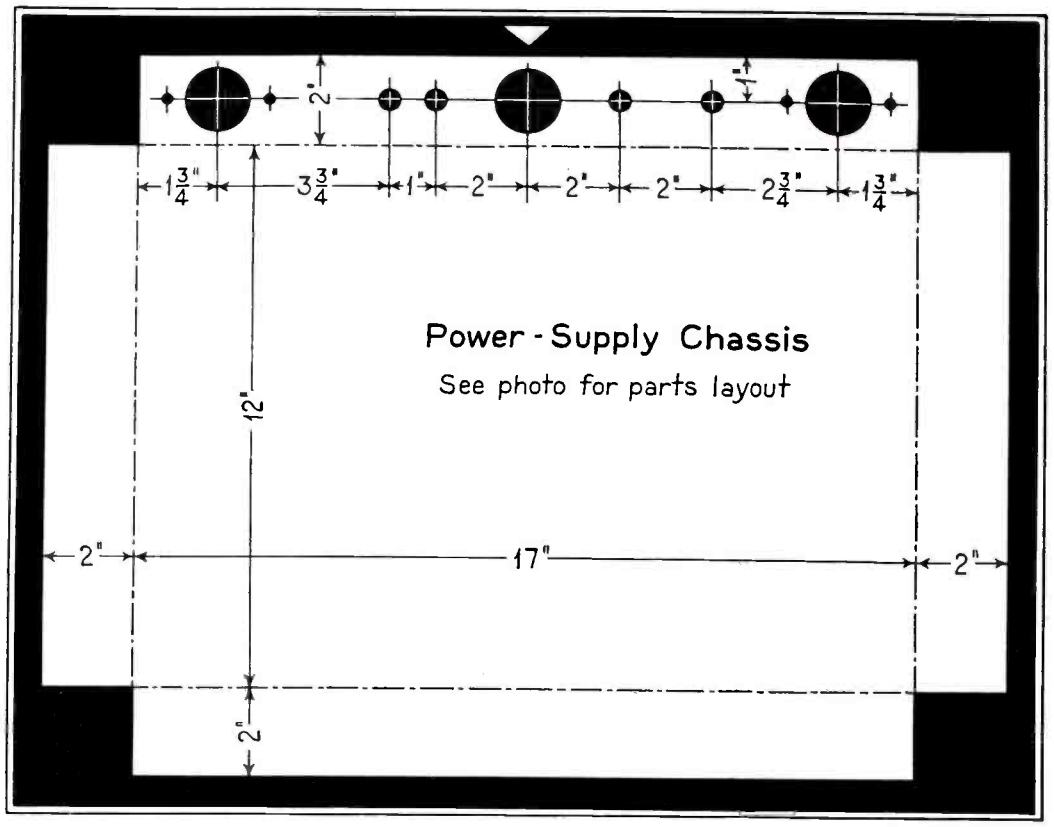
The antenna tuning unit will, as was mentioned previously, take care of practically any antenna. When used with an



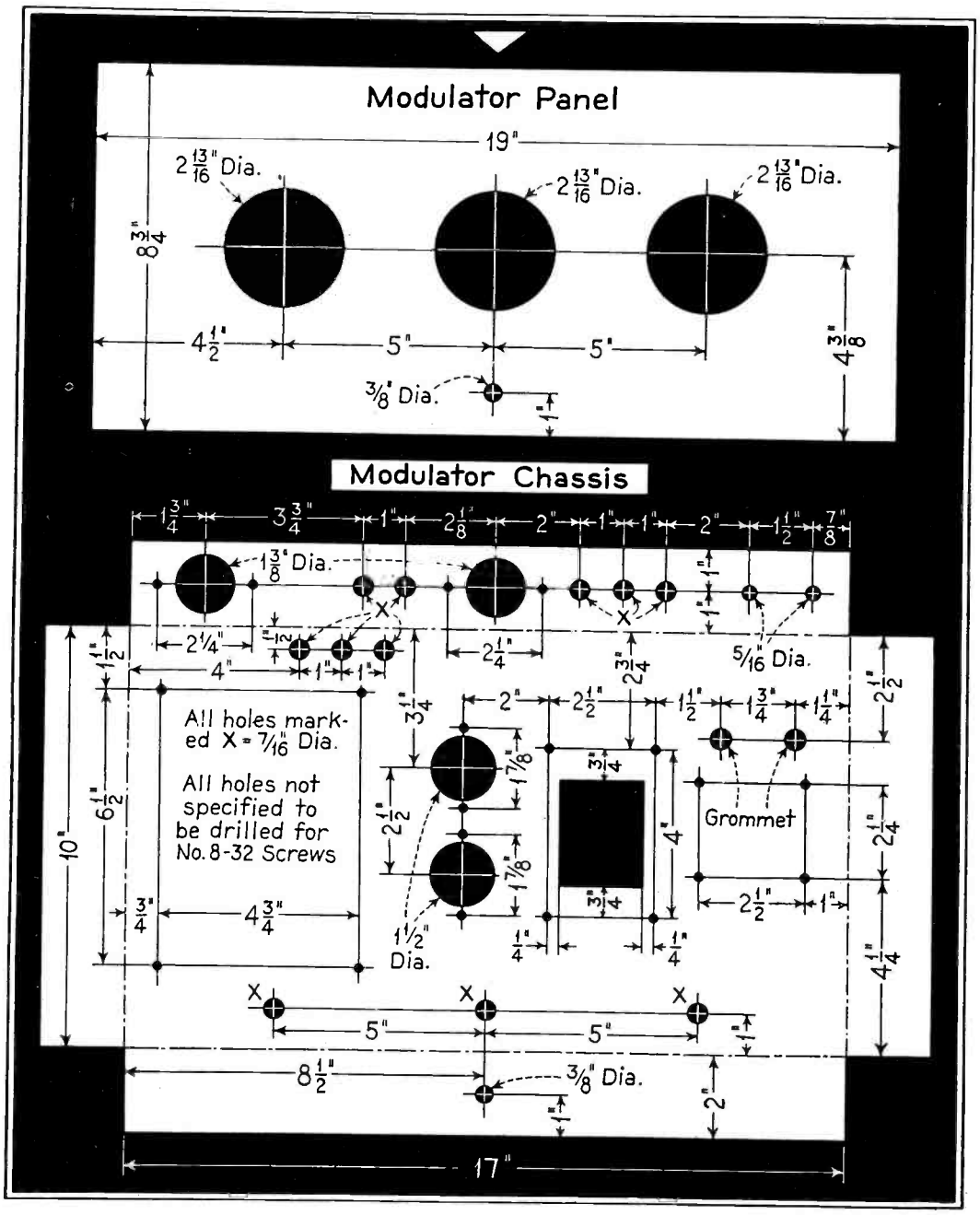
The antenna tuning unit—panel details on opposite page, circuit on page 444.

antenna having tuned feeders, such as a Zepp, various combinations of antenna coupling-coil turns should be tried while swinging the antenna condensers back and forth until the antenna can be tuned to resonance. If resonance cannot be reached with the switch thrown to the series position it should be thrown to the parallel position and the tuning process gone through again. When using the antenna condensers in the parallel connection, care should be taken in determining that the soup is going out into the antenna, as can be seen from the antenna meter readings, rather than just circulating around the closed circuit. With series tuning this condition cannot obtain and the soup must go out into the feeders when the condensers are tuned to resonance.

Once the proper antenna tuning is found the coupling coil should be swung to a position that will give the desired plate current on the 805, and then the plate tank and the antenna condensers should be retuned slightly for perfect resonance. When using a two-wire feed line to the antenna, whether or not it is of the tuned type, the readings of the two antenna meters should always be kept exactly the same.



Above: Power-supply chassis details. The layout is simple, as shown in the photo on page 446. Below: The modulator panel and chassis.



There are two methods of coupling to an untuned two-wire feed system, such as is used with twisted pair feeders or a Johnson Q type of antenna. One way is to wind three turns of rubber-insulated wire around the exact center of the amplifier tank coil and connect, through a pair of blocking condensers, of about .001 or .002 mfd, through the thermocouples of the antenna meters to the feeders. The coupling coil should be reduced a fraction of a turn at a time until the proper plate current is drawn. The other way is to clip directly to the antenna coil, ½ to 2 turns each side of center, tune the antenna condensers to resonance with the switch in the "parallel" position, and then swing the coupling coil until the correct plate current is drawn.

If a single-wire feed antenna is used the antenna switch should be thrown to the parellel position, one end of the antenna coupling coil grounded, and the feeder clipped to the proper turn of the coil which should be found by experiment. Tuning is accomplished by the same process as described for the two-wire untuned feeders. The antenna meters will be found of inestimable value when tuning up, maximum output to the antenna being indicated by maximum antenna current, as long as the frequency and input to the final is kept constant.

Test Run

No particular difficulty showed up when the transmitter was first put on the air on fone. Feedback troubles are quite common with a new transmitter, and we were gratified to find no trouble of this or any other nature.

[*Continued on page 477*]

The Ham Bands

By George B. Hart

a grand "chair warmer" . . . french fones . . . cw for morse men . . . power vs. efficiency . . . high-c in receivers

LIKE a good many hams, we are more interested in seeing what the other fellow has in his shack than in doing the thousand-and-one things the missus wants us to do. Feeling the urge the other day, we took a jaunt down to Ft. Thomas, Ky., to visit W9WSI. The day's trip of 300 miles was not in vain for Earl Ballard, who operates W9WSI, turned out to be one of the grandest guys we've ever met.

Forced to stay in bed with pulmonary tuberculosis, he works 5 meters with a 53 unity-coupled rig modulated by a pair of 2A5's in parallel, driven in turn by a 56 speech amplifier. Five-meter reception is accomplished with another unity-coupled 53; a Stromberg-Carlson converter plus the family super are used on the other bands. A 160-meter fone job is in the process of construction. When completed it will augment a Jone's "Gainer" that is also on the bench right now.

Ft. Thomas hams build most of W9WSI's equipment for him, and his signals are known throughout the Miami and Central Ohio valleys.

Incidentally, he writes swell letters; how about some of you other "chair-warmers" corresponding with him at 79 Grandview, Ft. Thomas, Ky.

✦

W4CPG AND W1CHE are saturating Detroit consistently on 20-meter fone. W4AWE of Jacksonville, Fla., is nearly as consistent.

✦

WE WERE SURPRISED the past few days to find several new French fone stations coming in with great volume. F8XN of Villefranche de Rouergue was heard on 14,140 kc at midnight (EST). XN speaks English with decided French sidebands, but his signal has never been below R8, with excellent quality. F8II of Montpelier, is another Frenchman with an R8 signal. His English is excellent. The frequency is 14,275 kc.

✦

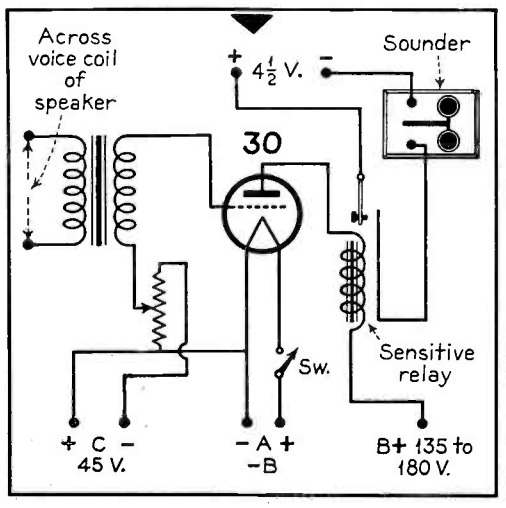
G5XG OF SURREY, England, is on 14,110 kc.; signal quality is better than most. Close on top of him is EA2BH of Jaca, Spain, with an R9 plus that literally tore the speaker off the wall.

COMING IN TO our apartment house the other night after a late session at W8AIR's we were startled to hear unmistakable telegraph signals coming from an apartment on our floor. Naturally we investigated. The result is a new gadget to keep the baby awake at night.

Our new friend turned out to be an old Morse man who likes to copy hams, but prefers to read a sounder to the sustained tones of cw. The gadget is a third stage of audio amplification added to the output of his regular all-wave receiver. This third stage, as shown in the diagram, employs a variable grid bias supply of high value. The use of the high grid bias causes this stage to act more like a detector than as an amplifier and distorts voice and music so badly it is hardly recognizable. At the same time it gives the very sharp direct current pulses necessary to operate the telegraph sounder through its relay. Any sensitive relay will work well.

✦

TOURING THROUGH the bands last night we heard W8OQF putting out one of the cleanest xtal pdc signals we have ever heard on 20 meters. His fist was one of which any commercial op could be proud, but then maybe he is or used to be one. We must confess we once pounded brass during college vacations for filthy lucre ourselves.



Trigger circuit with sounder output for Morse men with click-conscious ears.

SPEAKING OF CW, W3FFH, W5CAL and W8PXY deserve commendation this month for the fine signals and clean-cut fists they have been showing in the 40- and 80-meter bands. FB.

✦

NICE FAMILY party you had up there, W2UGY. Yep, we listened in.

✦

ONE OF THE fastest cw men we have ever heard on the ham bands is W9DEF of Kansas City, Mo. When you take everything DEF has, then you can copy, my son. We mean it. He's good.

✦

WE HEARD W7OF operating portable fone on 20. Nice signal, too. What's your power, OM?

✦

W8PSA, DETROIT, is using 90 watts input to his 160-meter fone, but is open to conviction if you can prove the advantage of higher power.

Personally, we wonder if there is any advantage. We have cards in front of us now from New Zealand, Canary Islands, and all ham districts that were earned with less than 20 watts *input*. It has always seemed to us that low-powered *efficiency* was the answer to the crowded ham bands. With this in mind we hope to sell the boss on letting us write a series of stories showing how we achieved efficiency at low cost and with conditions no more favorable than those encountered by any other ham who has to live in a large apartment building.

Would you be interested? Write us and tell us what hurts.

✦

WE HAVE USED every kind of receiver since 1920 from a crystal set on up through the various stages of Ham Radio, and though we now own a swell super, we still believe that the great majority of hams use standard regenerative sets. After all, crystal control and superheterodynes do cost money.

Most hams use low C in these receivers when if they would use fairly high C, up to 250 mmfd, they would achieve

[*Continued on page 479*]

"BARB" AND "ERNEST"—

The Coil And

From Ernest

Dear Gerald:

We haven't very much to write to you about this time, because we've been away on a vacation and in addition it's been pretty hot weather, so we haven't done as much as we should have. However, we're still up to about 13 wpm and I should say that in a month or so we would be ready to take the code examination and pass.

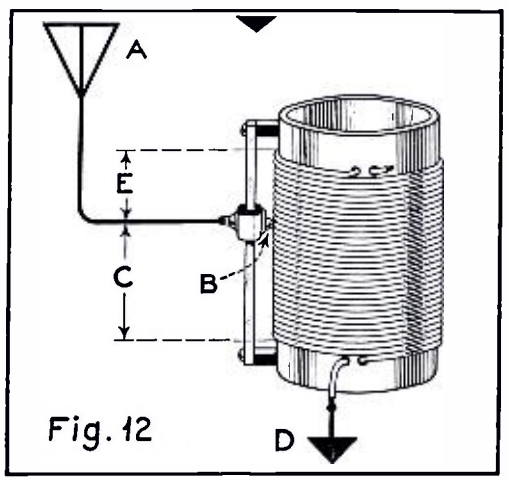
You might be interested in knowing that the lady of the house is a little better on code than the man of the house, but I'm sure the man of the house will pass just as well as she will.

We've started studying the book that Mr. Candler sent us, "The Beginner's Story of Radio," and we find it is going to help us a lot in learning the various terms that are used in Radio, but I'm afraid I'm a very poor teacher, because I just can't seem to make any impression on Barbara and think it's a good deal of a mental hazard with her. She thinks that she can't get it, so she can't. But I guess she'd better tell you that herself.

I've been wondering whether it might help both Barb and me if, in your next letter you'd give us a few simple diagrams and show us what happens to the good old juice when it rambles around in the set and where it goes when it comes out. The circuits shown in the handbooks are very pretty but not very descriptive. A little help on this line will be greatly appreciated.

I wonder whether it would be possible in the next month or so if we could have a little time with you personally. I think we're at a point now when a little concentrated study will teach us more than all we might learn from handbooks.

Ernest.



One of many ways to tune a coil . . . the aerial is connected to a sliding contact.

From Barb

Dear Gerald:

I've just read over Ernest's letter to you and he tells all in no uncertain terms. I am afflicted with the definite assurance that I'll never learn the technical part of this radio thing.

I'm not so bad on code, and I'm very sure that I'll pass the examination with no trouble at all with about a month's practice, but the other part is just too much.

Ernest, bless his heart, does his best to explain the book to me, but after his explanation the whole thing's just as clear as mud. Maybe the best way would be to open up my skull just before the examination and pour it in to my brain with a funnel. It would have to be just before the examination, because I'm afraid it would leak out very quickly.

You said, when you spoke about studying in the first place, that you could teach me the fundamentals and I'm still waiting to learn. Your two letters have helped a little, but that's all. I guess as Ernest said, we'd better have some conversation with you direct. You know the old story, that a husband can't teach a wife anything. I guess it's right.

I'll be looking forward to your next letter with interest.

Barb.

To Barb and Ernest

Dear Barb and Ernest:

It's queer the way things work out; at the outset Barb was sure she would never learn the code, whereas your confidence was supreme—and now it comes out that the "boss of the house" is the real wizz. Yet I hear that you are running a close second.

But, keep up the code practice. Polish up the rough spots and try attaining greater speed. After all, there's nothing like a margin of safety.

I've already told you that the FCC has jacked up the code speed requirements from 10 to 13 words per minute. (Receiving and sending). I know it isn't going to bother Barb and yourself, but it's a tough break for the fellow who started in with the idea that a receiving speed of 10 words per minute would be sufficient. Oh, well, what's three extra words per minute to a feller who is intent on becoming a ham? Once you hit a good ten per, an extra three comes rather easily.

Anyway, it looks as though you two have the code licked, so it's time to commence worrying about radio fundamentals, which seem to be what Barb has been worrying about ever since she got rid of her fears of the code. If Barb runs to form, she may also turn out to be a technical wizzard, which would be a laugh on you, Ernest.

We'll get around to a bit of personal instruction right soon. In the meantime, I've arranged to have the two of you visit a ham station where you will get a good idea as to what the various dinguses are, what they look like, and what makes them do what they do.

I'd be glad to start unravelling the mysteries of the circuit diagram if I thought it were the right time, which I don't. I'd be much happier if you first knew something about the components used in radio circuits. Otherwise I'm afraid you'll get all tangled up mentally. So, suppose we cover that subject first.

There are three things a radio circuit is just overflowing with—coils, condensers and resistors. As a matter of fact, if you ignore the vacuum tubes, coils, condensers and resistors in one form or another are about all there is to a radio.

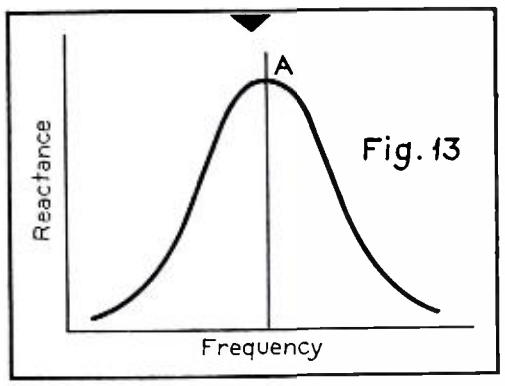
"Let's Take Coils"

Let's take coils. They're just a bunch of wire wound 'round and 'round on some sort of form such as a tubing made of insulating material, or on an iron core. It all depends what sort of a coil it is and what it is supposed to do.

Now, maybe you'd never believe it, but a coil of wire wound in circular fashion like a spring develops some amazing properties, the most interesting one being the property of the coil to resonate electrically at some particular frequency or wavelength, depending on the number of turns. This isn't difficult to understand if you'll just stop to consider the different size pipes in an organ. Each pipe resonates at some particular tone or audible frequency with the result that when you push air through it you get that sound. If the air space inside

EMBRYO RADIO HAMS

Its Properties



The resonance curve of a hypothetical coil, showing that its reactance is maximum at a critical frequency.

the pipe is made smaller, the tone will be higher in pitch; if the air space is made larger, the tone will be lower in pitch.

It's much the same with a coil. If the amount of wire or the number of turns is made small, the coil will resonate at a high frequency; if the number of turns is made large, the coil will resonate at a low frequency. About the only difference is that in the first case we are dealing with mechanical resonance while in the second case we are dealing with electrical resonance.

Tuning The Coil

Now carry this a step further and consider ye olde trombone. It's got a sliding dingus which the player moves back and forth to produce tones of different pitch or frequency. Thus, by making it possible to vary the air space in the trombone, a wide range of tones can be produced. Likewise, if we had a coil with an arrangement by which we could vary the number of turns, one coil could be made to cover a wide range of frequencies or wavelengths. This can be done very easily by using a coil with a slider arrangement that can make contact with one turn of the coil at a time, as shown in Fig. 12. Since an electrical current always takes the path of least resistance, (or the shortest, most direct path to ground, which is much the same thing) the current produced by the radio wave will flow from the aerial, A, through the sliding contact, B, thence through the coil turns, C, and finally to the ground connection, D. The unused turns, E, are not in this circuit and are therefore not effective. In all, cases, then, the number of *effective* turns is dependent upon the position of the sliding contact on the coil.

Thus, by varying the number of *effective* turns on the coil by means of the sliding contact, we can "tune" the coil to just one of a number of different wavelengths or frequencies, just as we can "tune" a trombone to a certain frequency or tone. The coil is therefore *selective* in that it can be made to respond to the wavelength of the station it is desired to receive.

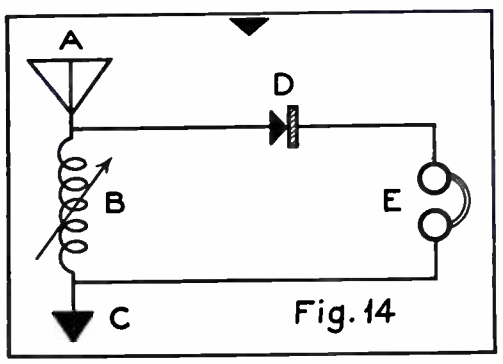
This crude form of tuning is no longer used. There are more appropriate methods of tuning coils which we shall cover later.

Resistance and Reactance

Now let's get on with the properties of a coil by first considering a straight length of copper wire. Such a piece of wire will exert a certain amount of resistance to the flow of an electrical current, irrespective of whether the current is direct or alternating. The longer the wire, of course, the greater the resistance, but in any event, if the wire is copper, the resistance will be fairly small.

But, watch what happens when the length of wire is made into a coil . . . the inherent resistance of the wire to the flow of either a direct or an alternating current remains the same, but a different type of resistance presents itself to the flow of an alternating current that is *not* presented to the flow of a direct current. It is called *reactance* to differentiate it from pure resistance.

Whereas the resistance of a coil to the flow of a direct current might be only a matter of a fraction of an ohm, the reactance of the same coil to the flow of an alternating current might be hundreds of thousands of ohms, or the value might approach infinity, in which case the coil would block the flow of alternating current but still have little effect on the flow of a direct current.



A simple receiver circuit with a tuned coil, B.

It is obvious from the foregoing that a direct current has but one retarding force to contend with when flowing through a coil, and that is pure resistance, whereas an alternating current has *two* retarding forces with which to deal—pure resistance *and* reactance. Both resistance and reactance are measured in ohms, and since the ohm is the unit of measure of the retarding force in an electrical circuit, 100 ohms would indicate a retarding force much greater than 1 ohm.

Impedance

Now let's assume that the pure resistance of a given coil of wire is 1 ohm. That would mean that the coil had a retarding force inherent in the wire alone of 1 ohm to the flow of either a direct or an alternating current. Let's assume further that the same coil has a reactance of 100 ohms. This value does not apply to the flow of a direct current, but only to that of an alternating current. The sum total retarding force of the coil to a direct current is then only 1 ohm, but the sum total retarding force to an alternating current is the resistance plus the reactance, or 101 ohms. Since both retarding forces are always present to the flow of an alternating current through a coil, a third term is used to express this total. The term is *impedance*. And the impedance of a coil is always the pure resistance in ohms plus the reactance in ohms, so that in our case the impedance of the coil to a flow of alternating current is 101 ohms.

Now let's get back to the odd retarding force a coil presents to an alternating current, namely, reactance. The current in one turn of the coil tends to oppose the current in the adjacent turn, due to the creation of opposing electrical fields surrounding the wire. The degree of opposition or retardation is dependent on two factors; the inductance of the coil or the number of turns, and the frequency of the current. A coil of a given number of turns or given value of inductance will have a greater reactance or retarding force to a high-

[*Continued on page 480*]

Queries

choosing a radio . . . chemical grounds . . . tracing noise

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.

Question Number 14

"I am planning to buy a new radio before winter, and should like advice on how to go about it, so's to be sure that I am getting my money's worth. I know nothing about radio from a technical point of view. Are there not some simple criteria by which the layman can pick out a really good receiver?—*J. C., Milwaukee, Wis.*

Answer

This question will have to be answered in a general way, as J. C. fails to tell us just what he expects from a receiver and how much he wants to pay for it. As a preliminary move, we suggest that he read the article by G. S. Granger, entitled "The Radio You Buy," which appeared in the January, 1936, issue of ALL-WAVE RADIO.

If the prospective purchaser has a friend who is expert in things radio, this friend can be of considerable assistance in making a choice. However, many friends are radio experts only in their own minds. A licensed amateur operator is almost invariably a good radio man. The serviceman who services your present equipment can usually be depended upon for sound impartial advice in the purchase of a new set.

The various receivers described in the ALL-WAVE RADIO "Proving Post" are always excellent sets, returning full value for the money spent. Also, there are consumers organizations, such as Consumers Union, which make a practice of testing radio receivers and supplying their members or subscribers with comparative and honest data on competitive makes.

In any event, if in doubt, buy a well-known brand of receiver. Practically all of the nationally advertised receivers are good sets and reasonably priced. Purchase your receiver at retail rather than wholesale, unless you buy through the mail. The cash saved in buying wholesale rarely compensates the lowered allowance (if any) on your old set, the extra cost of installation, and the limitations of guarantee and "come-back." Most dealers selling at retail will install the set in your home for a reasonable test period—from ten to thirty days. Within this time you will have no difficulty in determining whether your new set performs the way it should in comparison with those of your neighboring fans. After all, the best criteria of any receiver is what the owner is capable of doing with it and the satisfaction he derives from it. Such considerations as ease of adjustment and tuning, satisfactory tone, and DX characteristics are all factors that enter into the equation. As for arbitrary standards, comparison with the receivers of a few friends are, from the owner's point of view, as good as laboratory tests in a shielded room.

Buy the set from a reputable dealer—from the point of view of service, and the fact that he will probably have an expert on hand who can answer truthfully a few simple questions. If you are buying a set for around $50, it should have no less than seven tubes. It should have one stage of preselection on all bands. There are good sets with less tubes selling for lower prices, but if the buyer can afford it, the stipulation outlined above should be observed. The purchaser should expect eight tubes for $75 and nine or more for $100—with two stages of tuned r.f. at prices above $100. As a general rule, more tubes mean better performance, and two stages of r-f preselection virtually assure the elimination of image-frequency interference.

Question Number 15

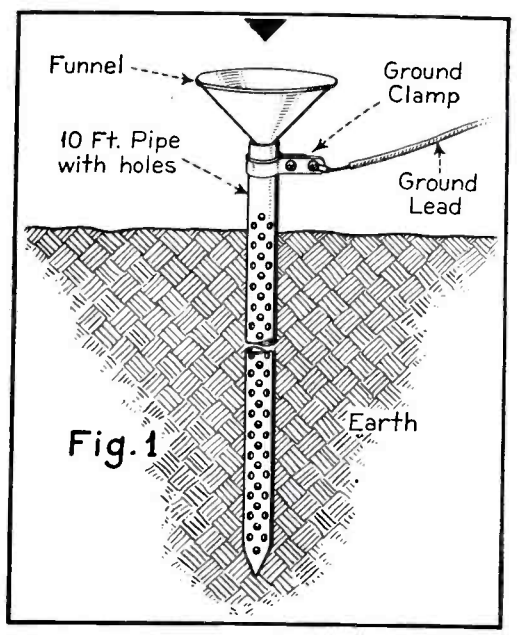
"How effective is a $CuSO_4$ ground? I am using a 10-foot iron pipe driven into the ground which has been saturated with $CuSO_4$. How much of the chemical should be used, and how often?—*C. M. W., Denver, Colo.*"

Answer

These grounds are quite effective in dry and arid territories, and consist of a metal pipe or plate embedded in the soil which is then wetted with a solution of copper sulphate in water (blue vitriol) the chemical formula for which is $CuSO_4$. About five pounds of $CuSO_4$ to a ten-quart pail of water is the usual concentration. Rock salt can be substituted for the copper sulphate where it is more readily available and cheaper—mixing it in the same proportion.

The period between treatments will vary with the dryness of the climate. Symptoms of a poor ground are the best indication of when the $CuSO_4$ treatment should be repeated. However, after several doses of copper sulphate or common salt, plain water may be used quite a number of times before the chemical is completely dissipated. It is a good idea to alternate the chemical with plain water until the ground has had three or four chemical treatments—then two water soakings to each chemical soak. After a total of six chemical soaks, follow with one chemical treatment to three water treatments. This will keep the

[*Continued on page 479*]



Details of a chemical ground. Data in answer to Question 15.

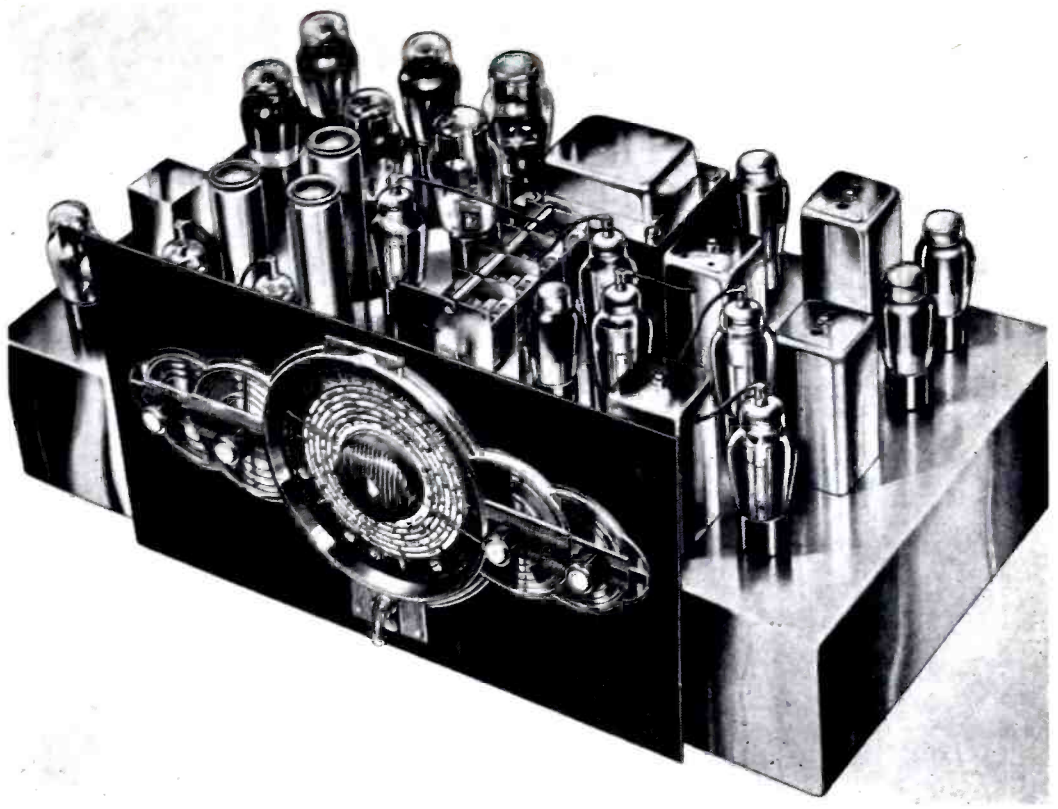


Fig. 1. Chassis using the new dual-channel audio amplifier system.

NEW TWO-WAY AUDIO SYSTEM WITH MIXER-AMPLIFIER

MIDWEST Laboratories incorporate in their latest 18-tube model, their newest invention which is called "The Dual-Channel-Audio, Fidel-A-Stat Program Expander."

The operation of the former Fidel-A-Stat has been increased to control a dual-channel audio amplifier and to expand or extend the bass frequency response. This extended bass response development takes advantage of the new dual-grid tubes, such as the 6L7, now available. In these tubes one grid has a relatively low amplification factor and the other grid a much higher amplification factor. In this new circuit the middle and high register signals are fed into the low-gain grid. The low-frequency portion of the signal is separately fed into the high-gain grid. These two separated bands of audio frequency are then again mixed in their modified proportions in the electron stream and appear in the plate circuit of the tube. The amount of modification is brought to the listener's control by the Fidel-A-Stat mounted on the panel. A picture of the chassis using this circuit is shown in Fig. 1.

Division of Frequencies

Fig. 2 illustrates how the audio spectrum is divided. The middle and high-registered tones are impressed on the low-mu grid and amplified by it. The low-frequency tones are separated and impressed upon the high-mu grid and amplified to a much greater extent by it. The Fidel-A-Stat control on the panel, controls the amount of these low- and high-frequency tones to suit the listener. These two separated bands of audio frequency are then mixed in the electron stream of the tube and appear in the output as a modified reproduction of the original input.

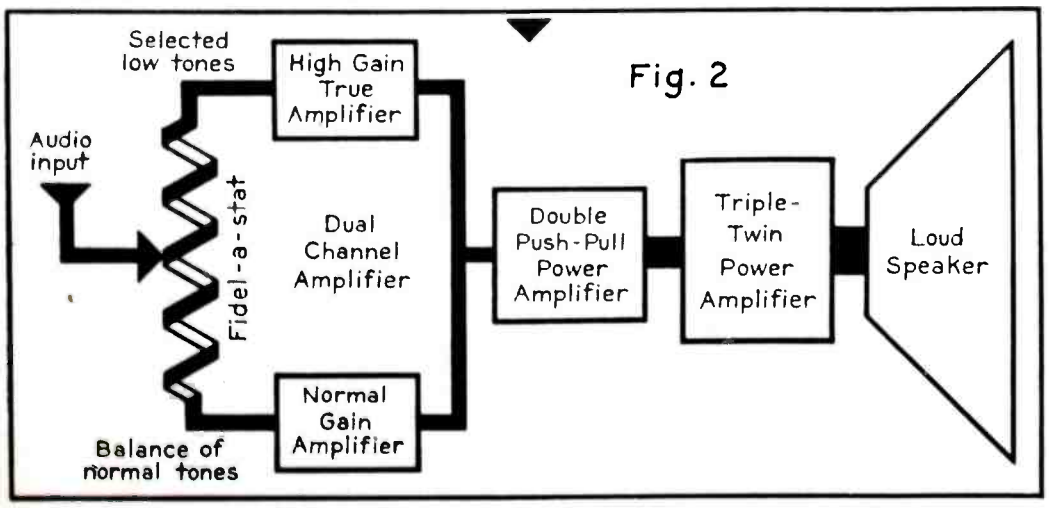


Fig. 2

Resurrecting the Bass

The need of this modification has long been recognized. The average listener prefers a presence of the true tones of the very low bass. Since the system corrects any discrepancies in the characteristics of the program transmission, the original balance between low and high audio frequencies may be regained.

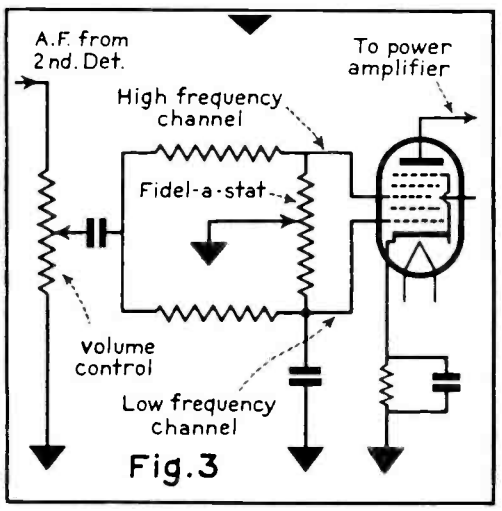


Fig.3

Left: Block diagram of dual-channel amplifier. Above: The circuit diagram of mixer-amplifier.

Attempts have been made to correct these deficiencies by artificial means, and this has often resulted in improper response and hangover, contributing a boominess or barrel tone in reproduction. In this system the low tones are recreated by actual amplification and not by any false means of boosting.

[*Continued on page 457*]

RADIO PROVING POST

THE RCA VICTOR MODEL 10-T

Its Technical Characteristics Compared With 1936 Model

THE following review of the 1937 RCA Victor Model 10-T Radio is somewhat of a departure from our usual form of receiver report. We have foregone air tests this once in favor of the more technical and accurate laboratory tests, for the express purpose of drawing a comparison between the typical receiver of 1936 and its 1937 counterpart. By this means we will endeavor to illustrate the degree of engineering advancement made this past year in the design of radio receivers, and to show that, on the whole, there is more value per dollar in the 1937 radio than in a comparable receiver of last year.

Comparisons were made between the RCA Victor Model T-10-1 Radio, reviewed in the February issue of ALL-WAVE RADIO, and the latest model 10-T. Both receivers are table models, employ the same number of tubes, were produced to sell at approximately the same price and were designed to fulfill the same general reception requirements. Therefore, these specific models are open to direct comparison.

Frequency Range

The 1936 Model T-10-1 is shown in Fig. 1, and the 1937 Model 10-T is shown in Fig. 2. Aside from the fact that the Model 10-T is more distinctive in appearance, it is evident from these illustrations that both sets embody much the same mechanical design. However, the Model 10-T has an electron-ray tuning indicator and an improved dial mechanism. Moreover, whereas the 1936 Model T-10-1 had a band coverage from 540 to 18,000 kilocycles, the new Model 10-T has an "X" Band, from 150 to 410 kc, and a continuous coverage from 530 to 60,000 kilocycles, or well over three times the frequency range of the former receiver. A better conception of the comparative frequency range of each model may be had from the following tabulation:

Band	*1936 Model*	*1937 Model*
X	None	150-410
A	540-1800	530-1800
B	1800-6000	1800-6400
C	6000-18000	6400-23000
D	None	23000-60000

The 1937 Model 10-T also has provisions for electric phonograph operation, whereas the Model T-10-1 had not. The former has two stages of intermediate-frequency amplification whereas the latter had but one.

The addition of these services to the Model 10-T Radio would in themselves offset the ten-dollar price differential of the earlier model, but overall improvement in operation of the 1937 set more than compensates for the slight increase in cost without a consideration to the additional features.

Improved Tuning Control

The new dial on the Model 10-T is a distinct improvement. The proper scale for each of the five separate wavebands covered by the receiver is brought into position by the action of the waveband selector switch. The scale in use is traversed by a pointer controlled by a dual tuning knob with ratios of 20 to 1 and 100 to 1.

Below the main tuning dial is a supplementary band-spreading dial scale. This scale moves past a stationary pointer, and since it provides fine readings of the main tuning scale, it permits the accurate logging of stations in the short-wave bands.

This segregation of the main and vernier tuning scales, as well as the arrangement that permits the viewing of only that scale for the wave-band in use, eliminates confusion in locating short-wave channels and in the direct reading of frequencies.

Below the dial escutcheon are the receiver controls, which are, from left to right: Music-Speech Control and Power Switch, Volume Control, Dual Tuning Control, Range Selector Switch, and

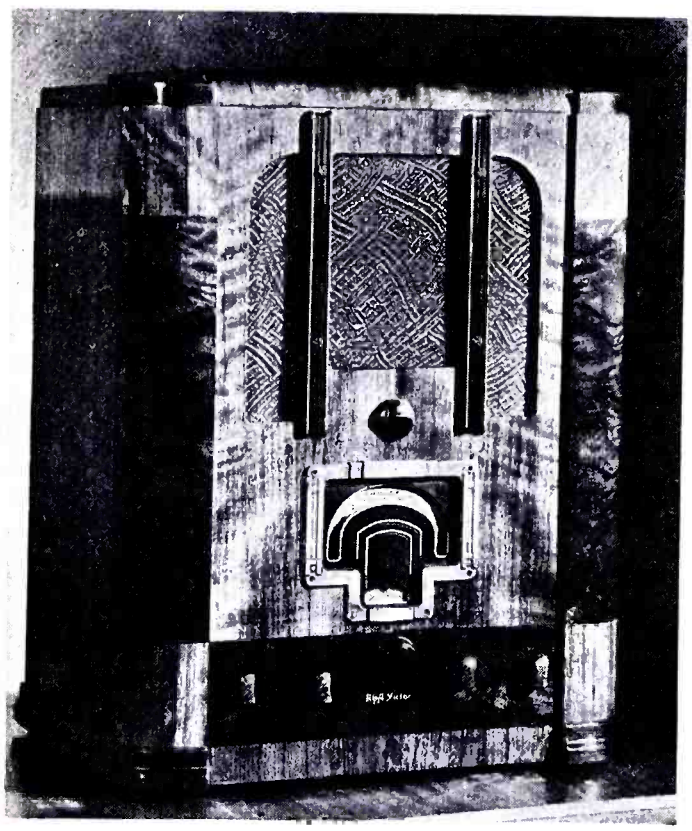


Fig. 1. Above: The 1936 RCA Victor Model T-10-1 All-Wave Receiver which has been compared with the 1937 model in the accompanying article.

Fig. 2. Left: The new 1937 RCA Victor Model 10-T All-Wave Receiver which has an improved tuning dial, electron-ray tuning indicator, 6L6 beam power output tube, and iron-core i.f.t.'s.

Tone Control. This is the same as the line-up of controls on the T-10-1, except that the Tone Control on the Model 10-T also operates a Fidelity Control Switch, a feature not included in the 1936 model.

The circuit diagram of the Model 10-T is shown in Fig. 3. The tube line-up is: 6K7 Preselector, 6L7 Converter, 6J7 Converter Oscillator, 6K7 First Intermediate Amplifier, 6K7 Second Intermediate Amplifier, 6H6 Detector and AVC, 6F5 Audio Amplifier, 6L6 Beam Power Amplifier, 6E5 Tuning Indicator, and 5Z4 High-Voltage Rectifier.

The Audio Circuit

This line-up is much the same as that of the Model T-10-1, except that the use of the new 6L6 beam power tube in the output of the Model 10-T receiver has released two of the tubes for other uses. The 1936 model used to 6F6 tubes in push-pull in the output stage, and these required a driver tube aside from the usual first audio amplifier. The 6L6 requires no driver, and one of these tubes is capable of providing much the same output as a pair of 6F6 tubes in push-pull. By this simplification in the audio circuit, two less tubes were required for almost identical results, and it was therefore possible to add another stage of intermediate amplification, and a tuning indicator, to the Model 10-T without increasing the number of tubes over those used in the Model T-10-1.

The Model T-10-1 had an output of 8.5 watts at 7.5% distortion and a maximum output of 11.5 watts, as against an output of 5 watts at 7.5% distortion and 9 watts maximum for the Model 10-T. However, the advantage in this respect of the 1936 model over that of the Model 10-T is not a large one, as a total of 8.5 watts of undistorted power is more than one would wish to use in conjunction with a table model receiver.

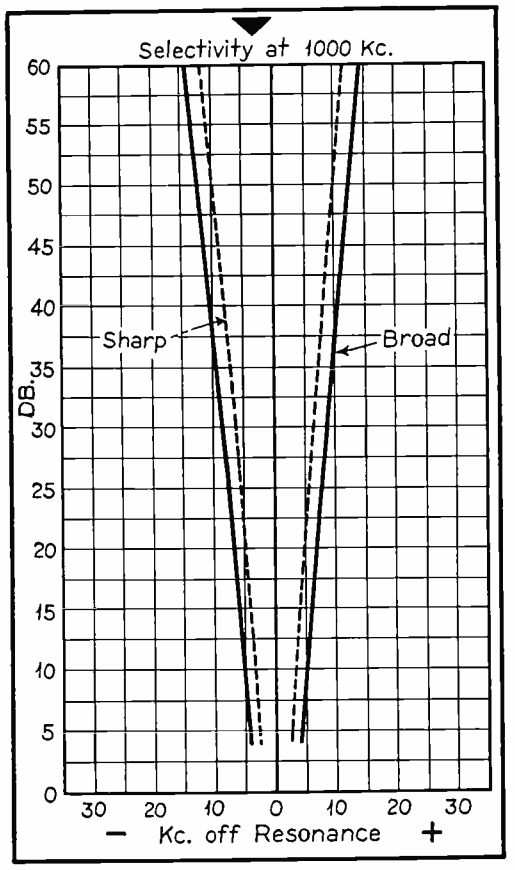


Fig. 4. The "sharp" and the "broad" selectivity curves of the Model T-10.

Moreover, the Model 10-T with its 6L6 power tube, is practically free of higher order harmonics—a characteristic of this tube—and the second harmonics are minimized by generating out-of-phase second harmonics in the first audio tube by giving this tube a high bias. It is a question, therefore, if any advantage exists for the 1936 model in this respect.

There are other points of interest in the 1937 set not to be found in last year's model. As shown in Fig. 3, the Model 10-T has a built-in antenna coupler, and a wave trap for excluding code interference from stations operating on or near the frequency of the intermediate amplifier.

New Coil-Switching System

A striking feature of the new set is the r-f coil-switching system which is isolated from both plate and grid circuits. A system of fixed coupling entirely eliminates switching in the antenna circuit and in the plate circuit of the 6K7 preselector, thereby effecting a considerable reduction in the required number of contacts and leads and eliminating a source of noise. The same advantage is gained in the plate circuit of the 6J7 converter oscillator through the use of parallel plate-voltage feed. In addition to the absence of any direct switching in these circuits, all coils and switches are also isolated from the 6K7, 6L7 and 6J7 grid circuits by means of blocking condensers. Bias is supplied to the grids of these tubes through resistors. The entire coil-switching system is there-

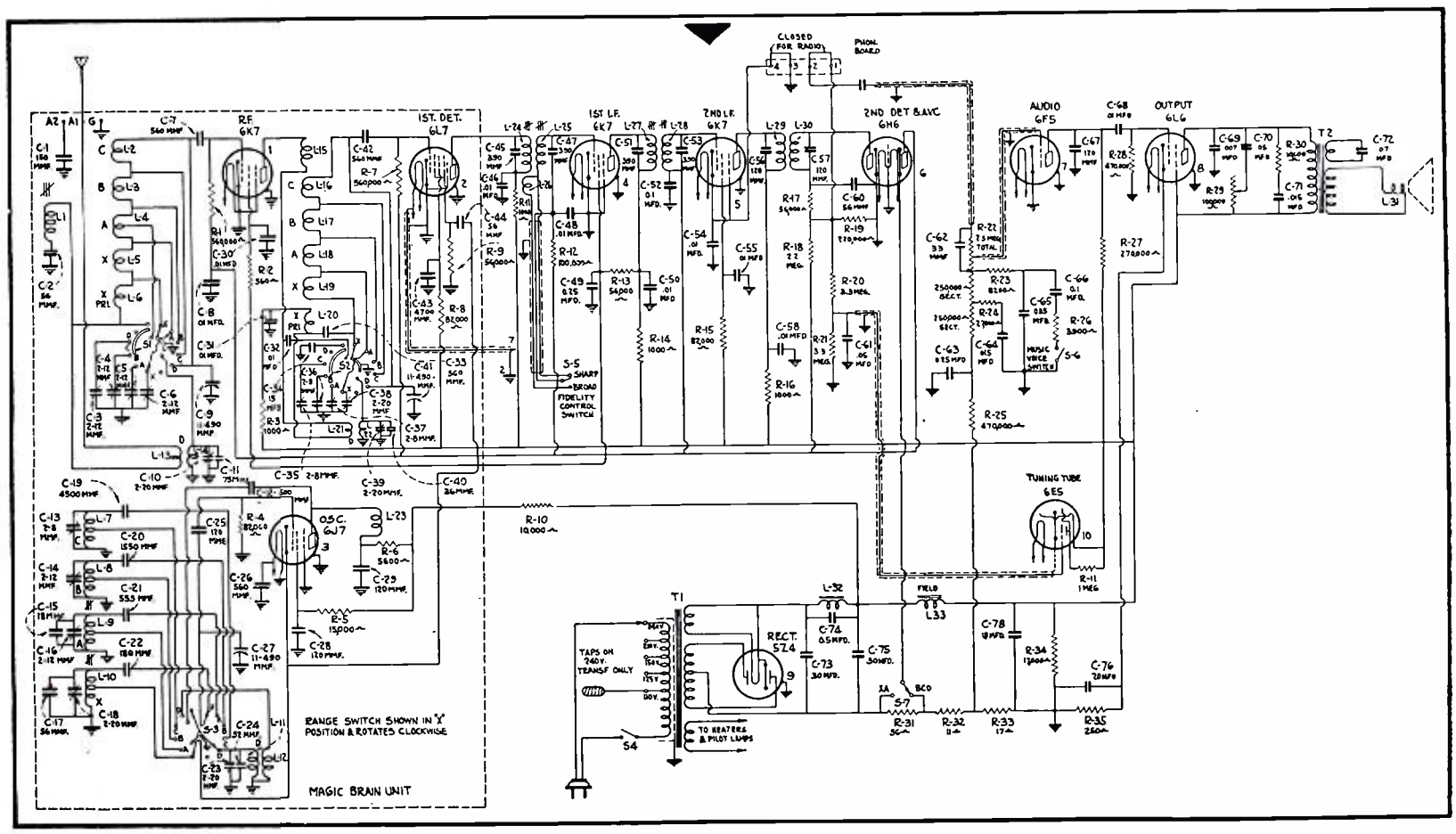


Fig. 3. Schematic diagram of the Model T-10.

fore independent of d-c circuits and does not cause interruptions in either bias or plate-voltage supplies. Therefore, switching operation cannot cause power surges since the coils and switch contacts handle r-f currents only.

A great deal of care has been exercised in the design of the r-f circuits of the Model 10-T, to eliminate difficulties from second harmonic response resulting from extremely strong signals breaking through the preselector stage. This form of interference has been reduced to a minimum through the use of low-loss coils and air trimmer condensers. The latter are of considerable importance not only in reducing losses, but also in preventing misalignment due to aging, temperature changes and varying degrees of humidity. These air condensers, used throughout the r-f circuits, are of the cylindrical type with piston thrust. The air space separating the long, concentric cylinders is sufficiently large that expansion and contraction of the metals due to changes in temperature cause negligible shifts in capacity values.

Second harmonic troubles in the "X" Band have been reduced to a satisfactory degree by reducing the oscillator voltage to the 6L7 when this band is in use. Though this expedient is somewhat of a compromise, there is sufficient sensitivity and selectivity in the preselector to have made this solution a practical one.

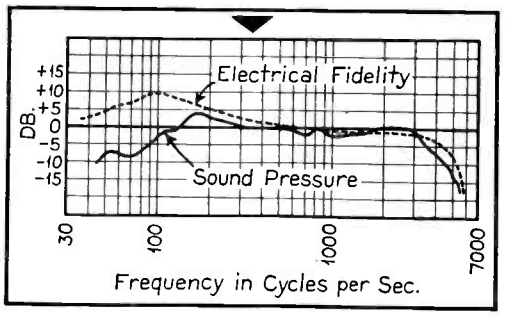


Fig. 6. The electrical fidelity and sound pressure curves of the Model 10-T, frequency plotted against db level in both cases.

In the high-frequency "D" Band, where troubles might develop from assembly leads and connections becoming partially resonant, special precautions have been taken. The shield of the 6J7 oscillator tube is grounded to the chassis with an extremely short and carefully soldered lead. The same applies to the filament and the suppressor. Since the filament leads are apt to resonate at a harmonic frequency of the oscillator, and cause considerable trouble due to the Barkhausen effect, they have been twisted. The lead from the oscillator to the converter is shielded and also properly dressed to reduce resonant effects at ultra-high frequencies.

The Intermediate Amplifier

A marked improvement has also been made in the intermediate amplifier, where gain has been increased by using two stages rather than one, and through the use of intermediate-frequency transformers with Magnetite (special iron) cores. These cores, rather than the shunt condensers, are adjustable, and provide a more accurate and permanent adjustment of the transformers than were trimmer condensers employed for this purpose. No effort has been made to sharpen the acceptance band of the intermediate amplifier beyond that of the 1936 model. On the contrary, means have been provided in the Model 10-T to broaden the acceptance band for higher fidelity reception. This is accomplished by the addition of a third winding to the primary of the first intermediate transformer. This winding is closely coupled to the secondary, and when connected in series with the primary winding by the switch, S-5, (see Fig. 3) the transformer is over-coupled. This increases the bandwidth from the "sharp" position of 5000 cycles, as shown by the dotted lines in Fig. 4, to the "broad" position with a bandwidth of 9000 cycles, as shown by the solid lines in Fig. 4. This means of expanding the frequency range or audio response of the receiver into the region of higher audio frequencies was not made available in the 1936 model. The bandwidth of this receiver was limited to 5000 cycles, or the same as the "sharp" position for the Model 10-T, as shown by the dotted lines in Fig. 4.

The Fidelity Control Switch, S-5, operates in conjunction with the Tone Control. This switch is automatically thrown to the "broad" position when the Tone Control knob is turned full to the right. Starting from its left position, the Tone Control therefore provides a gradual increase in high-frequency response from a low minimum to full expansion.

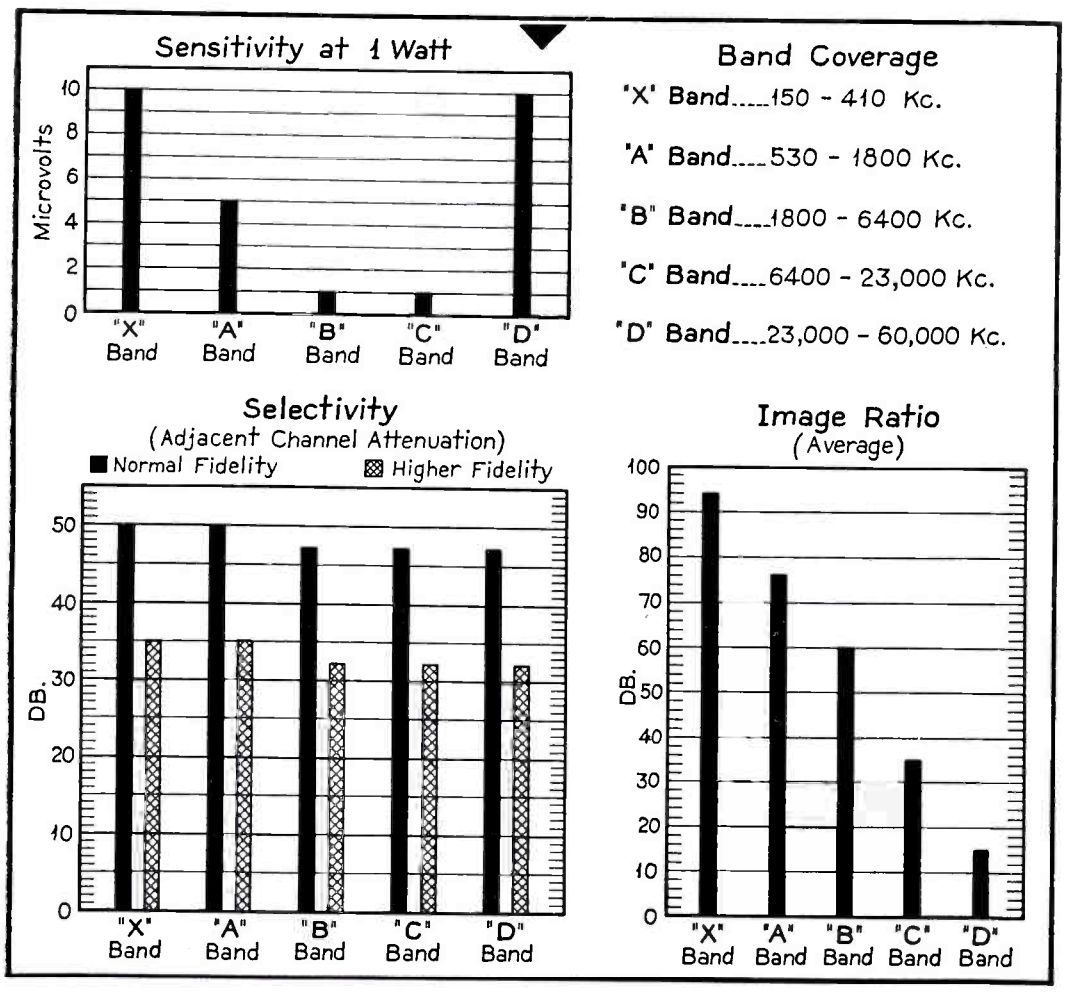


Fig. 5. The sensitivity, selectivity and image ratio values of the Model 10-T receiver. Band coverage is given in upper right corner.

Comparative Characteristics

The sensitivity, selectivity and image-ratio measurements made on the 1937 Model 10-T are given in Fig. 5. It is interesting to observe how these characteristics compare with those of the 1936 Model T-10-1.

The following tabulation provides the comparative sensitivity in microvolts of the two sets at an output of 1 watt:

Band	*1936 Model*	*1937 Model*
X	....	10
A	4.5	5
B	4.5	1
C	14.0	1
D	....	10

The above tabulation shows that, while the 1936 model had slightly better sensitivity in the "A" Band, the 1937 model has far greater sensitivity in the "B" and "C" short-wave bands where it is most required, and even has better

sensitivity in the higher frequency "D" band, from 23,000 to 60,000 kilocycles than the Model T-10-1 had in the comparatively low frequency "C" band. There is no doubt, therefore, that in the short-wave bands in particular, the Model 10-T will out-perform the Model T-10-1 under any and all conditions.

Considerable improvements have also been made in the overall selectivity of the 1937 model as compared to last year's set. With the Model 10-T adjusted for maximum selectivity—with the Fidelity Control Switch set to the "sharp" position—the adjacent channel attenuation in db down for the two models are as follows:

Band	*1936 Model*	*1937 Model*
X	..	50
A	38	50
B	31	47
C	28	47
D	..	47

Here again a marked improvement is shown for the Model 10-T over that of the T-10-1. The increased selectivity in the "B" and "C" bands is particularly advantageous, since stations operating in the channels covered by these bands are not separated by buffer frequencies as are the stations operating in the American Broadcast Band.

The degree of automatic volume control action is the same for both receivers, namely, a 40-db change in input will cause a change in output limited to from 0.5 to 1.7 watts. This standard has been maintained even though the sensitivity of the Model 10-T is greater.

The comparative image ratios, measured in db, are as follows:

Band	*1936 Model*	*1937 Model*
X	...	94
A	106	76
B	70	60
C	43	35
D	...	15

As compared with the 1937 Model 10-T, the Model T-10-1 of last year had inferior frequency response. The sound-pressure curve of the latter covered a range of only 55 to 4800 cycles and was down 15 db at the low end, 12 db at 60 cycles and 5 db at 80 cycles. The response curves of the Model 10-T, as shown in Fig. 6, indicate that sound-pressure response is down only 10 db at 45 cycles, 8 db at 60 cycles and 5 db at 90 cycles. Moreover, the response extends to a point beyond 5000 cycles in the high-frequency range. Aside from this, it may also be stated that the overall response of the Model 10-T is more uniform.

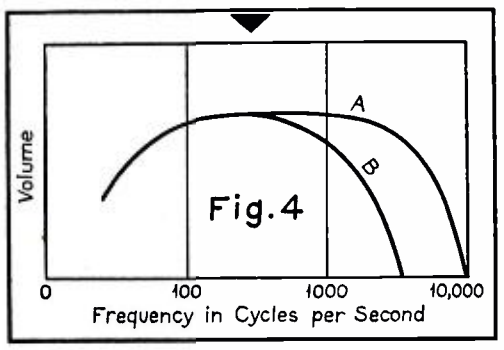
It might be added as a matter of interest that the chassis used in the Model 10-T is also used in the Model 10-K Console. However, the Model 10-K has the "Magic Voice" feature not contained in the Model 10-T.

The Magic Voice consists of a series of resonator cylinders built into the receiver cabinet. These cylinders are open at both ends and extend through the bottom of the cabinet. The sound radiated from the rear of the loudspeaker passes through these resonators and out through the bottom of the cabinet. In their passage through the resonators, the sound waves are reversed in phase so that they combine with and build up the sound waves radiated from the front of the loudspeaker. Since the series of cylinders are designed to resonate at various low frequencies, the low-frequency response of the receiver is considerably reinforced without resort to artificial methods.

To give an example of the results obtained with this system, the sound-pressure curve of the Model 10-K extends from 30 to 5000 cycles as against 45 to 5000 cycles for the Model 10-T. Where the Model 10-T is 10 db down at 45 cycles, the Model 10-K is slightly more than 1 db down at 30 cycles, 0 db at 35 cycles, 5 db up at 60 cycles and 12 db up at 90 cycles. It is 15 db up at 100 cycles where it is peaked.

Merely cutting out high audio frequencies by means of the usual tone control does not and cannot restore bass frequencies which were previously attenuated. The effect of the usual method of falsely emphasizing low-frequency response is shown in Fig. 4. Curve A shows the normal receiver frequency characteristics and Curve B the result obtained when high frequencies are reduced. The impression is gained by the listener of an increase of bass tones. However, it is merely an illusion as the curves show. The frequencies below 100 cycles which are the pleasing mellow bass, are not actually reinforced.

There is only one proper way to restore the music to its original character and that is to amplify the low frequencies separately, at a higher degree of



Curves illustrating effect on frequency response of the usual form of tone control. Bass response is emphasized by cutting out high frequencies, as shown by Curve B.

DUAL-CHANNEL MIXER-AMPLIFIER

[*Continued from page 453*]

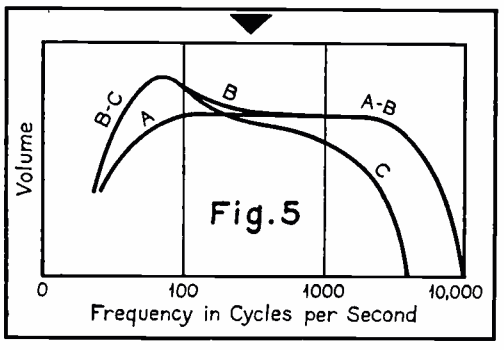
amplification than the middle and high register. In this way it is possible to regain the original balance of audible frequencies.

With the above fact in mind, Midwest engineers undertook the problem of returning the music of programs as broadcast to their original tone balance by perfecting the dual-channel audio amplifier. In the old style dual audio channel amplifier it was necessary to use two separate speakers in order to attain the full effect of separate amplification. With the new dual-grid tubes now available, it is possible to mix the frequencies from both channels perfectly and without distortion so that they may be amplified as a whole through a single final channel and speaker, thus allowing more perfect equipment and circuits without the expense of two channels and two speakers.

When tone is shaded to soften high notes, the volume is automatically increased to compensate for the apparent decrease in volume. With the use of the single control it is possible to gain a variety of tone blend variations.

Fidel-A-Stat Circuit

The schematic diagram of the dual-channel Fidel-A-Stat is shown in Fig. 3. Note that either channel may be partially or wholly grounded through the control arm of the Fidel-A-Stat potentiometer. With the arm at the lower position, and the high-mu grid grounded, the tone is normal, as indicated by the curve A-B in Fig. 5. With the arm in the center position, the bass response is increased and the middle and high register tones remain normal, as shown by curve B-C, B, A-B in Fig. 5. With the arm in the upper position, and the low-mu grid grounded, the bass response is increased and the high frequencies decreased, as indicated by the curve B-C, C in Fig. 5. Thus, any desired degree of tone shading may be had.



Response curves of receiver employing the dual-channel amplifier. Bass response is improved by increased amplification of low frequencies, not by reducing high's.

FOREIGN BROADCAST STATIONS

LIST OF FOREIGN STATIONS OPERATING IN THE U. S. BROADCAST BAND

THE stations in the accompanying list are grouped in channels of 10 kilocycles separation for the convenience of listeners accustomed to the U. S. system of station frequency allocation. Some countries have stations operating on odd or split frequencies. To find the exact frequency of these stations simply add the number in parentheses following the location to the frequency shown above it. Thus, at the beginning of the list, under "510 KC," the frequency of the station at Hamar, Austria, is 519 kilocycles.

Canadian, Mexican, Cuban, and other local stations, have their locations printed in capital letters for the sake of ease in picking them out of the list.

The number to the right of each station location is the power of the station in watts.

510 KC		
———	Hamar, Austria(9)	700
———	Insbruck, Austria(9)	1000
———	Tartu, Estonia(7)	500
520 KC		
———	Ljubljna, Yugoslavia(7)	5000
———	Vipuri, Finland(7)	———
RW34	Stalingrad, U.S.S.R.(2)	10000
530 KC		
———	Wilno, Poland(6)	16000
I-1BZ	Bolzano, Italy(6)	10000
540 KC		
CJRM	MOOSE JAW, SASK.	1000
HAL	Budapest, Hungary(6)	120000
550 KC		
———	Beremunster, Switz.(6)	100000
CFNB	FREDERICKTON, N.B.	500
RW52	Tchita, U.S.S.R.(6)	20000
2CR	Cummock, Australia	10000
560 KC		
———	Athlone, Irish F. S.(5)	60000
I-1PA	Palermo, Italy(5)	4000
MTCY	Shinkyo, Manchuokuo	100000
RW41	Syktyvkar, U.S.S.R.(3)	1200
RW42	Gorki, U.S.S.R.(5)	10000
XEAO	MEXICALI, MEXICO	250
XEFC	MERIDA, MEXICO	100
XGOH	Chengtu, China	10000
XLHB	Shanghai, China	45
ZUG	Grahamstown, U. So. Af.	10000
6WA	Minding, Australia	10000
570 KC		
———	Magnitogorsk, U.S.S.R.(1)	10000
———	Stuttgart, Germany(4)	100000
CB57	Santiago, Chile	5000
RW68	Tcheliabinsk, U.S.S.R.(7)	1500
2YA	Wellington, N. Zealand	5000
580 KC		
———	Alps-Grenoble, Fr.(3)	60000
CC58	Temuco, Chile	500
CFPR	PRINCE RUPERT, B. C.	50
CHRC	QUEBEC, P. Q.	100
CPCX	YORKTOWN, SASK.	100
CKCL	TORONTO, ONTARIO	100
CKUA	EDMONTON, ALBERTA	500
JFCK	Taichu, Formosa	1000
PRB5	Franca, Brazil	50
PRC3	Pelotas, Brazil	250
PRD6	Piracecaba, Brazil	———
PRG6	Cruzeiro, Brazil	250
PRP7	Campos, Brazil	250
RW36	Archangel, U.S.S.R.(6)	10000
XQHA	Shanghai, China	250
YLZ	Riga, Latvia(3)	15000
3WV	Horsham, Australia	10000
590 KC		
———	Vienna-Bisamburg, Aust.(2)	100000
JOAK-1	Tokyo, Japan	150000
LS-10	Buenos Aires, Argentina	6000
RW35	Astrakhan, U.S.S.R.(8)	10000
XEPN	PIEDRAS NEGRAS, MEX.(5)	50000
XHKB	Tongchow, China	100
7ZL	Hobart, Australia	1000
600 KC		
CFCF	MONTREAL, P. Q.	400
CJOR	VANCOUVER, B. C.	500
CMW	HAVANA, CUBA	1400
CNR	Rabat, Morocco(1)	2500
CRCW	WINDSOR, ONTARIO	500
FJP	Noumea, New Caledonia	500
FQN	ST. PIERRE & MIQUELON IS.	250
JONG	Miyazaki, Japan	500
PRH2	Porto Alegre, Brazil	25000
RW82	Frounze, U.S.S.R.(8)	2500
SDB	Sundsvall, Sweden(1)	10000
XMHA	Shanghai, China	1000
ZTC	Cape Town, U. So. Af.	10000
4QN	Clevedon, Australia	7000
610 KC		
CX4	Montevideo, Uruguay	1000
I-1FI	Firenze, Italy	20000
JOJK	Kanazawa, Japan	3000
RW18	Pratigorsk, U.S.S.R.	1000
RW22	Oufa, U.S.S.R.(7)	10000
RW50	Oust-Abakansk, U.S.S.R.(7)	2500
RW79	Mourmansk, U.S.S.R.	10000
XEXM	MEXICO CITY, MEX.	1000
XGSS	Tsunshi, China	15
2FC	Sydney, Australia	1000
620 KC		
———	Brussels, Belgium	1500
———	Cairo, Egypt	20000
———	Trondelag, Norway(9)	20000
CB62	Santiago, Chile	1000
CT1AA	Lisbon, Portugal(9)	20000
LV3	Cordoba, Argentina	2000
RW31	Ivanovo, U.S.S.R.	10000
XHHK	Shanghai, China	100
4ZP	Invercargill, N. Z.	500
630 KC		
CFCO	CHATHAM, ONTARIO	100
CFCY	CHARLOTTETOWN, P. E. I.	1000
CJRC	WINNIPEG, MANI.	500
CKOV	KELOWNA, B. C.	100
JOKK	Okayama, Japan	500
LS3	Buenos Aires, Argentina	5000
OKP	Praha, Czechoslovakia	120000
RW28	Vladivostok, U.S.S.R.(5)	1200
RW32	Vladivostok, U.S.S.R.(5)	10000
RW84	Oust-Abansk, U.S.S.R.(5)	1200
XEZ	MERIDA, MEXICO	500
3AR	Melbourne, Australia	4500
640 KC		
———	Shanghai, China	100
———	Lyons, France(8)	90000
CB64	Vina del Mar, Chile	1000
CC64	Concepcion, Chile	1000
CMBC	HAVANA, CUBA	150
JODG	Hamamatsu, Japan	500
RW29	Petrozavodsk, U.S.S.R.(8)	10000
RW56	Penza, U.S.S.R.	1200
XEOX	SALTILLO, MEXICO	500
ZTJ	Johannesburg, So.Af.(5)	10000
5CK	Crystal Brook, Austl.	7500
650 KC		
———	Cologne, Germany(8)	100000
CX6	Montevideo, Uruguay	10000
JOUK	Akita, Japan	300
TIGPH	San Jose, Costa Rica	1000
1-YA	Auckland, New Zealand	10000
660 KC		
———	Jerusalem, Palestine(8)	20000
———	Manchester, Gr. Brit.(8)	70000
RW38	Alexandrovsk, U.S.S.R.(2)	2000
XGOA	Nanking, China	75000
670 KC		
———	Sottens, Switz.(7)	100000
JOTK	Matsue, Japan	500
LS4	Buenos Aires, Argentina	7000
MTFY	Harbin, Manchuokuo	3000
PRA7	Ribeirao Preto, Brazil	———
PRE6	Nictheroy, Brazil	1500
PRG5	Santos, Brazil	750
RW23	Groznyl, U.S.S.R.(6)	1000
VOWR	ST. JOHNS, NFLD.	500
2CO	Corowa, Australia	1000
680 KC		
———	Belgrade, Yugoslavia(6)	2800
———	Salisbury, So. Rhodesia(1)	1500
CB68	Valparaiso, Chile	1000
CMCG	HAVANA, CUBA	150
CW27	Salto, Uruguay	150
JOVK	Hakodate, Japan	500
LKD	Bodo, Norway(6)	500
RDN	San Salvador, Salvador	500
RW17	Kazan, U.S.S.R.(6)	10000
RW27	Makhatch, U.S.S.R.(9)	4000
RW46	Karaganda, U.S.S.R.(6)	1200
RW71	Petropavlovsk, U.S.S.R.(9)	1200
RW74	Tcheboksary, U.S.S.R.	1200
VAS	GLACE BAY, N. S.	2000
690 KC		
———	Paris FPTT, France(5)	120000
CFRB	TORONTO, ONTARIO	10000
CJCJ	CALGARY, ALBERTA	100
CX8	Montevideo, Uruguay	500
JOBK-1	Osaka, Japan	10000
LV6	Mendoza, Argentina	500
PRA6	Sao Paulo, Brazil	5000
XET	MONTERREY, MEX.	500
XGOY	Kunming, China	250
6WF	Perth, Australia	3500

700 KC

HJN	Bogota, Colombia	500
JOCG	Asahigawa, Japan	300
RW48	Elista, U.S.S.R.(4)	500
SBA	Stockholm, Sweden(4)	55000
VPB	Colombo, Ceylon	1750
XMHC	Shanghai, China	500
ZP15	Villarica, Paraguay	——
2NR	Lawrence, Australia	7000

710 KC

I-1RO	Rome, Italy(3)	120000
JODK-1	Keijo, Korea	10000
LS-1	Buenos Aires, Arg.	5000
RW16	Samara, U.S.S.R.	10000
XEN	MEXICO CITY, MEX.	1000
XGML	Kashing, China(4)	7.5
XGOS	Chunking, China(1)	1000

720 KC

JORK	Kochi, Japan	500
JFBK	Tainan, Formosa	1000
PRA3	Rio de Janeiro, Brazil	1500
RW9	Kiev, U.S.S.R.(2)	36000
XLHC	Shanghai, China	50
XLHD	Shanghai, China	50
3YA	Christchurch, N. Z.	10000
6GF	Kalgoorlie, Australia	2000

730 KC

——	Tallinn, Estonia(1)	20000
CB73	Santiago, Chile	1000
CFPL	LONDON, ONTARIO	100
CJCA	EDMONTON, ALTA.	1000
CKAC	MONTREAL, P. Q.	5000
CKPR	FORT WILLIAMS, ONT.	100
CMK	HAVANA, CUBA	3000
CX10	Montevideo, Uruguay	1000
EAJ2	Madrid, Spain(1)	3000
EAJ5	Seville, Spain(1)	5500
JOCK-1	Nagoya, Japan	10000
LV2	San Juan, Argentina	1000
RW65	Saransk, U.S.S.R.(4)	1000
XHGS	Wuchow, China	50
5CL	Adelaide, Australia	2000

740 KC

——	Marseilles, France(9)	6000
——	Munich, Germany	100000
——	Pori, Finland(9)	1000
——	Sortavala, Finland(9)	200
JOSK	Kokura, Japan	1000
RW64	Ordjonikidze, U.S.S.R.	10000
XHHB	Shanghai, China	50
2BL	Sydney, Australia	3000

750 KC

——	Katowice, Poland(8)	12000
——	Maritzburg, U. So. Afr.	10000
CMCW	HAVANA, CUBA	150
HS7PJ	Bangkok, Siam	10000
JFAK	Taihoku, Japan	10000
LUHO	T'ung Hsien, China	20
OAX4A	Lima, Peru	1500
RW64	Urdjomikidze, U.S.S.R.(2)	10000
XEAM	MATAMOROS, MEX.	7.5
XGOK	Canton, China	1000
XQKB	Tientsin, China	150
ZTD	Durban, U. So. Africa	1500
7NT	Kelso, Australia	7000

760 KC

——	Falkirk, Gr. B.(7)	50000
CB76	Valparaiso, Chile	10000
CMHX	CIENFUEGOS, CUBA	200
JQAK	Dairen, Manchuokuo	1000
RW78	Ijevsk, U.S.S.R.(7)	——
XEOK	TIAJUANA, MEXICO	250
XLHI	Shanghai, China	7.5
XLHJ	Shanghai, China	100
2YB	New Plymouth, N. Z.	100

770 KC

——	Toulouse, France(6)	120000
CMBS	HAVANA, CUBA	150
CX12	Montevideo, Uruguay	1000
JOHK	Sendai, Japan	10000
LKF	Fredrikstad, Norway(6)	1000
RW26	Stalino, U.S.S.R.(6)	10000
VUM	Madras, India	200
3LO	Melbourne, Australia	3500

780 KC

——	Leipzig, Germany(5)	120000
CB78	Santiago, Chile	1000
CHWK	CHILLIWACK, B. C.	100
CKSO	SUDBURY, ONTARIO	1000
CMJK	CAMAGUEY, CUBA	1000
JOPK	Shizuoka, Japan	500
LT1	Rosario, Argentina	4000
PRD-2	Rio de Janeiro, Brazil	1000
XEYZ	MEXICO CITY, MEX.	10000
XLHA	Shanghai, China	50

790 KC

——	Lwow, Poland(5)	16000
CMGH	MATANZAS, CUBA	250
EAJ-1	Barcelona, Spain(5)	7500
JOGK	Kumamoto, Japan	10000
LR-10	Buenos Aires, Arg.	10250
RW51	Naitchik, U.S.S.R.(4)	1000
XLIJ	Wusih, China	50
ZTB	Bloemfontaine, U.So.Afr.	10000
4YA	Dunedin, New Zealand	10000

800 KC

——	Cardiff, Gr. Brit.(4)	70000
HIX	CIUDAD TRU., D. R.	1000
JOKG	Kofu, Japan	500
PRG2	Sao Paulo, Brazil	10000
TIX	San Jose, Costa Rica	——
4QG	Brisbane, Australia	2500

810 KC

CMCF	HAVANA, CUBA	600
CX24	Montevideo, Uruguay	500
I-1MI	Milan, Italy(3)	50000
JOIK	Sapporo, Japan	10000
VUC	Calcutta, India	3000
XFC	AG. CALIENTES, MEX.	350

820 KC

——	Bucharest, Roumania(3)	12000
CB82	Santiago, Chile	1000
CMHW	CIENFUEGOS, CUBA	100
CW23	Salto, Uruguay	250
LV7	Tucuman, Argentina	1000
PRH8	Rio de Janeiro, Brazil	1000
XEMZ	CORONADO ISLE, MEX.	—
XLKB	Tientsin, China(5)	55
2ZH	Napier, N. Z.	65

830 KC

JOFK	Hiroshima, Japan	10000
LR5	Buenos Aires, Arg.	30000
RW39	Moscow, U.S.S.R.(2)	100000
XGF	Tainan, China(3)	7.5
XGWH	Wu-hu, China	30
3GI	Longford, Australia	7000

840 KC

——	Berlin, Germany(1)	100000
CB84	Valparaiso, Chile	1000
CC84	Talcahuano, Chile	100
CFQC	SASKATOON, SASK.	1000
CRCT	TORONTO, ONTARIO	5000
F31-CD	Saigon, Fr. Indo-China	12000
LT8	Rosario, Arg.	500
PRB9	Sao Paulo, Brazil	5000
VOGY	ST. JOHNS, NFLD.(1)	100
XERA	VILLA ACUNA, MEX.	250000
XGTM	Chang-sha, China	15
XHHA	Shanghai, China	1000
ZBW	Hongkong, China(5)	2000
2YC	Wellington, N. Z.	200

850 KC

——	Sofia, Bulgaria	100000
——	Strasbourg SPTT,Fr.(9)	35000
CMBN	HAVANA, CUBA	150
CX16	Montevideo, Uruguay	10000
EAJ3	Valencia, Spain	3000
HI4V	CIUDAD TRU., D. R.	25
HSP-1	Bangkok, Siam(6)	2500
LKA	Aalesund, Norway	350
LKB	Bergen, Norway	1000
LKP	Parsgrund, Norway	——
RW73	Simferopal, U.S.S.R.(9)	10000
TIEP	San Jose, Costa Rica	500
VQ7LO	Nairobi, Kenya(8)	600
VUB	Bombay, India(5)	3000
XLIQ	Hongchow, China	100
XQHB	Shanghai, China	100
5RM	Renmark, Australia	1000

860 KC

——	Pozan, Poland(8)	16000
——	Radio-Agen Paris, Fr.(8)	600
PRA3	Rio de Janeiro, Brazil	2500
XEMO	TIAJUANA, MEXICO	5000
XGOF	Tsinan, China	500
XHHD	Shanghai, China	50
7HO	Hobart, Australia	7000

870 KC

——	London, Gr. Britain(7)	50000
JOAK-2	Tokyo, Japan	150000
LR6	Buenos Aires, Arg.	26000
RW85	Igarka, U.S.S.R.(1)	2000
XLIL	Suchow, China	50
2GB	Sydney, Australia	1000

880 KC

——	Graz, Austria(6)	16000
——	Helsinki, Finland(4)	10000
CFJC	KAMLOOPS, B. C.	100
CMQ	HAVANA, CUBA	500
CRCO	OTTAWA, ONTARIO	1000
LV2	Cordoba, Argentina	2000
RW61	Iochar-Ola, U.S.S.R.(8)	1000
XHHV	Shanghai, China	100
ZJV	Suva, Fiji Islands	——
1-YX	Auckland, New Zealand	500
6PR	Perth, Australia	500

890 KC

CB89	Santiago, Chile	1000
CX18	Montevideo, Uruguay	1000
JOIG	Tottari, Japan	500
MTBY	Hoten, Manchuokuo	1000
XEW	MEXICO CITY, MEX.	50000
XGAK	Kashing, China(5)	15
ZP9	Asuncion, Paraguay(8)	1500

900 KC

——	Hamburg, Germany(4)	100000
CB90	Valparaiso, Chile	1000
HIG	CIUDAD TRU., D. R.	50
KZIB	Manila, Philippine Is.	1000
LU2	Bahia Blanca, Arg.	2000
PRB7	Rio de Janeiro, Brazil	500
XGON	Nanking, China	200
XTGM	Tongchow, China	100
2ZP	Walroa, New Zealand	105
3MA	Mildura, Australia	50
4WK	Warwick, Australia	50

910 KC

——	Limoges, France(3)	100000
——	Radio-Toulouse, Fr.(3)	100000
CJAT	TRAIL, B. C.	1000
CKY	WINNIPEG, MAN.	15000
CRCM	MONTREAL, P. Q.	5000
JOLK	Fukuoka, Japan	500
LR2	Buenos Aires, Arg.	12000
RW30	Dnepropetrovsk, U.S.S.R.(3)	10000
XENT	NUE. LAREDO, MEX.	150000
XLIM	Hanim, China	50
4RK	Rockhampton, Australia	2000

920 KC

——	Brno, Czechoslovakia(2)	32000
CMX	HAVANA, CUBA	1000
HHK	PORT AU PRINCE, H.	1000

JOQK	Nugata, Japan	500
XEAA	MEXICALI, MEX.	200
XHHX	Shanghai, China	1000
2ZR	Nelson, New Zealand	15

930 KC

CB93	Santiago, Chile	2500
CFAC	CALGARY, ALBERTA	100
CFCH	NORTH BAY, ONT.	100
CFLC	PRECOTT, ONT.	100
CHNS	HALIFAX, N. S.	1000
CKPC	BRANTFORD, ONT.	100
CX20	Montevideo, Uruguay	2000
HI-1J	SAN PEDRO DE MACORIS, D. R.	40
JOAG	Nagasaki, Japan	500
ON4RB	Brussels, Belgium(2)	200
PRA8	Pernambuco, Brazil	5000
PRB2	Curityba, Brazil	250
PRC4	Amparo, Brazil	50
PRC7	Bello Horizonte, Brazil	250
RW55	Engelo, U.S.S.R.(2)	1000
TIRH	San Jose, Costa Rica	50
VUG	Delhi, India(3)	1000
XEBH	HERMOSILLO, MEX.	500
3UZ	Melbourne, Australia	650

940 KC

———	Algiers, Algeria(1)	12000
JOBK-2	Osaka, Japan	10000
PRF4	Rio de Janeiro, Brazil	10000
SBB	Goteberg, Sweden(1)	10000
VOAS	ST. JOHNS, NFLD.	100
XEFO	MEXICO CITY, MEX.	5000
XHHE	Shanghai, China	100
3ZR	Greymouth, N. Z.	400

950 KC

———	Breslau, Germany	100000
———	Poste Parisien, Fr.(9)	60000
CJOC	LETHBRIDGE, ALTA.	100
CMCD	HAVANA, CUBA	250
CRCS	CHICOUTIMI, QUE.	100
JONK	Nagano, Japan	500
LR3	Buenos Aires, Arg.	31000
RW40	Gomel, U.S.S.R.(9)	1000
RW54	Gomel, U.S.S.R.(9)	1000
XGOP	Peiping, China	300
YNVA	Managua, Nicaragua	30
ZTP	Pretoria, U. So. Afr.(2)	500
2UE	Sydney, Australia	1000

960 KC

———	Bordeaux, France(8)	3000
CC96	Curico, Chile	100
CHNC	NEW CARLISLE, QUE.	1000
PRF3	Sao Paulo, Brazil	5000
XEAW	REYNOSA, MEX.	50000
RW13	Odessa, U.S.S.R.(8)	10000
RW67	Oukhta, U.S.S.R.(8)	2000
RW69	Odessa, U.S.S.R.	10000
XHHE	Shanghai, China	100
YV1RC	Caracas, Venezuela	5000
5DN	Adelaide, Australia	300

970 KC

———	Belfast, Gr. Brit.(7)	100000
CB97	Santiago, Chile	1000
CMBY	HAVANA, CUBA	150
CX22	Montevideo, Uruguay	250
JODK-2	Keijo, Korea	10000
LV9	Salta, Argentina	500
XHIB	Wusih, China	75
3BO	Bendigo, Australia	200

980 KC

———	Torun, Poland	24000
CNO	Casablanca, Morocco(3)	25
I-1GE	Genoa, Italy(6)	10000
JOXK	Tokushima, Japan	500
OZX4E	Lima, Peru	50
PRC6	Rio de Janeiro, Brazil	1000
XEF	JUAREZ, MEXICO	100
XMHB	Shanghai, China	500
2LV	Invernell, Australia	———
2ZJ	Gisborne, New Zealand	60
4AY	Ayr, Australia	100
6AM	Northam, Australia	100

990 KC

———	Hilversum, Holland	120000
JOCK-2	Nagaya, Japan	10000
LR4	Buenos Aires, Arg.	16000
XEAF	NOGALES, MEXICO	500
XEK	MEXICO CITY, MEX.	100
XES	TAMPICO, MEXICO	250
XGCK	Chaching, China	7.5
XGOD	Hangchow, China	2000
2GZ	Orange, Australia	2000

1000 KC

———	Daventry, Gt. Brit.(3)	50000
CMBZ	HAVANA, CUBA	150
HJ3ABH	Bogota, Colombia(5)	2000
JOBG	Maebashi, Japan	500
OKR	Bratislavia, Czech.(4)	13500
PRB6	Sao Paulo, Brazil	1000
PRE7	Sao Paulo, Brazil	5000
RW86	Tchernigov, U.S.S.R.(3)	5000
TIGH	San Jose, Costa Rica	500
VOCM	ST. JOHNS, NFLD.	50
XEBK	NUEVO LAREDO, MEX.	100
XEY	MERIDA, MEXICO	10
XGMK	Poatung, China	15
XGOT	Talyuan, China	50
ZP3	Asuncion, Paraguay	300
4GR	Toowoomba, Australia	500

1010 KC

CB101	Santiago, Chile	1000
CHML	HAMILTON, ONT.	100
CHWC	REGINA, SASK.	500
CKCD	VANCOUVER, B. C.	100
CKCK	REGINA, SASK.	500
CKCO	OTTAWA, ONTARIO	100
CKIC	WOLFVILLE, N. S.	50
CKWX	VANCOUVER, B. C.	100
CMJA	CAMAGUEY, CUBA	50
CX24	Montevideo, Uruguay	2500
HI4D	CIUDAD TRU., D. R.	25
TIGA	Cartago, Costa Rica	30
YV9RC	Caracas, Venezuela	———
XEU	VERACRUZ, MEX.	250
XGOW	Hangkow, China	5000
3HA	Hamilton, Australia	300
4ZB	Dunedin, New Zealand	25
4ZM	Dunedin, New Zealand	3
4ZO	Dunedin, New Zealand	25

1020 KC

———	Krakow, Poland(2)	2000
EAJ-15	Barcelona, Spain(2)	3000
EAJ-19	Oviedo, Spain(2)	700
JOFG	Fukui, Japan	300
PRH4	Sao Paulo, Brazil	———
XEJ	JUAREZ, MEXICO	1000
XHHG	Shanghai, China	100
2KY	Sydney, Australia	1000

1030 KC

———	Konigsberg, Germany(1)	10000
CD103	Magallanes, Chile	100
CFCN	CALGARY, ALBERTA	10000
CKLW	WINDSOR, ONTARIO	5000
CMCY	HAVANA, CUBA	1000
CT-1GL	Lisbon, Portugal	5000
JBAK	Fusan, Korea	150
LR9	Buenos Aires, Arg.	5000
XEB	MEXICO CITY, MEX.	10000
YV11RMO	Maracaibo, Venez.(4)	———
3DB	Melbourne, Australia	600

1040 KC

———	Rennes, France	120000
CP4	La Paz, Bolivia	10000
JOJG	Yamagata, Japan	500
RW70	Leningrad, U.S.S.R.	10000
XHHH	Shanghai, China	100
5PI	Port Pirie, Australia	2000

1050 KC

———	Falkirk, Gr. Britain	50000
CMKD	SANTIAGO, CUBA	250
CRCK	QUEBEC, P. Q.	1000
CX26	Montevideo, Uruguay	2000
HIT	CIUDAD TRU., D. R.	100
HJ3ABX	Bogota, Colombia	1000
I-1BA	Bari Italy(9)	20000
JOHG	Kagoshuma, Japan	500
RW33	Krasnodar, U.S.S.R.	1000
TIFA	San Jose, Costa Rica	75
XHKA	Tientsin, China	100
2CA	Canberra, Australia	500

1060 KC

CB106	Santiago, Chile	150
HJ1ABG	Barranquella, Col.	5000
JOIG	Toyanau, Japan	500
RW57	Tirospol, U.S.S.R.(8)	4000
XEA	GUADELAJARA, MEX.	500
XHHI	Shanghai, China	100
3YB	Melbourne, Australia	25
4MB	Mayborough, Australia	50

1070 KC

———	Bordeaux, France(7)	100000
CMBX	HAVANA, CUBA	500
CMHA	SAGUA LA GRANDE, C.	50
JOOK	Kyoto, Japan	300
LR1	Buenos Aires, Arg.	50000
XGOX	Honan-fu, China	200
XKRI	Canton, China(1)	100

1080 KC

———	Zareb, Yugoslavia(6)	800
JOOG	Obihiro, Japan	500
LT3	Rosario, Argentina	4500
OAX4F	Lima, Peru	50
PRC8	Rio de Janeiro, Brazil	250
SCC	Falun, Sweden(6)	2000
XHHT	Shanghai, China	200
ZP7	Asuncion, Paraguay(3)	700
2AD	Armidale, Australia	———
3SH	Swan Hill, Australia	50

1090 KC

CC109	Rancagua, Chile	100
CX28	Montevideo, Uruguay	3000
EAJ7	Madrid, Spain(5)	10000
RW75	Vinnitza, U.S.S.R.(5)	10000
XEAQ	ROSARITO, MEXICO	1000
XGOB	Loyang, China	250
XLIO	Shaohing, China	———
1ZB	Auckland, N. Z.	100

1100 KC

———	Madana, Latvia(4)	50000
CRCV	VANCOUVER, B. C.	500
I1NA	Naples, Italy(4)	1500
XEL	MEXICO CITY, MEX.	250
XHHS	Shanghai, China	100
YV4RC	Caracas, Venezuela	100
7LA	Lanceston, Australia	300

1110 KC

———	Radio Normandie,Fr.(3)	10000
CB111	Vina del Mar, Chile	1000
CD111	Magallanes, Chile	100
CMCJ	HAVANA, CUBA	500
HIL	CIUDAD TRU., D.R.(1)	20
HJ3ABD	Bogota, Colombia(1)	50
LS-5	Buenos Aires, Arg.	5000
OKK	Moravska, Czech.(3)	112000
PRA9	Rio de Janeiro, Brazil	1000
XELO	PIEDROS NEGROS, M.	10000
2VW	Sydney, Australia	1000

1120 KC

———	Shaerbeek, Belgium(2)	100
———	Newcastle, Gr. Britain(2)	1000
———	Alexandria, Egypt(2)	500
CD112	Osarno, Chile	100
CHLP	MONTREAL, P. Q.	100
CHSJ	ST. JOHN, N. B.	500
CKOC	HAMILTON, ONTARIO	500

CKX	BRANDON, MANITOBA	100
CMGF	MATANZAS, CUBA	150
CMKM	MANZANILLO, CUBA	50
CW29	Mercedes, Uruguay	50
HAE	Nyiregyhaza, Hungary(2)	6200
LV5	San Juan, Arg.	500
OAX4I	Lima, Peru	——
ON4GT	Brussels, Belgium(2)	100
ON4RC	Brussels, Belgium(2)	100
XLHM	Shanghai, China	50
XLH	Shanghai, China	200
4BC	Brisbane, Australia	1000

1130 KC

CB113	Quillota, Chile	100
CMJI	CIEGO DE AVILA, CUBA	50
CX3O	Montevideo, Uruguay	500
SBH	Horby, Sweden(1)	10000
XGOL	Foo-Chow, China	250
XGOC	Nan-Chang, China	500
ZP1	Asuncion, Paraguay	1000
6ML	Perth, Australia	500

1140 KC

———	Cardiff, Gr. Britain(9)	20000
———	London, Gr. Britain(9)	20000
———	Manchester, Gr. Brit.(9)	20000
———	Turin, Italy	7000
CB114	Santiago, Chile	5000
CMBG	HAVANA, CUBA	200
XHHL	Shanghai, China	100
2HD	Newcastle, Australia	500
4YO	Dunedin, N. Z.	1500

1150 KC

———	Kosice, Czechoslovakia(8)	2600
CMJP	CAMAGUEY, CUBA	200
HC2ET	Guayaquil, Ecuador(3)	300
HI4M	CIUDAD TRU., D. R.	20
HJ1ABM	Cartagena, Colombia(4)	50
LR8	Buenos Aires, Arg.	7000
OAX4H	Lima, Peru	——
XED	GUADELAJARA, MEX.	2500
XEFL	TIAJUANA, MEX.	250
XEH	MONTERREY, MEX.	250
XEOO	MEXICO CITY, MEX.	100
XGOZ	Chinkeang, China	100
XKYY	Tsangchow, China	15
YV7RMO	Maracaibo, Venezuela(3)	500
YV12RM	Maracay, Venezuela	——
2WG	Wagga, Australia	200
2ZM	Gisborne, N. Z.	15

1160 KC

———	Monte Ceneri, Switz.(7)	15000
CB116	Valparaiso, Chile	1000
CMHJ	CIENFUEGOS, CUBA	100
CW31	Salto, Uruguay	250
LT5	Resistencia, Arg.	500
PRC2	Porto Alegre, Brazil	3000
PRD8	Nictheroy, Brazil	1000
PRD9	Sorocaba, Brazil	50
PRG4	Jaboticabal, Brazil	250
XEAS	SALTILLO, MEXICO	100
XEC	TIAJUANA, MEXICO	30
XEP	JUAREZ, MEXICO	500
XESL	TIAJUANA, MEXICO	——
XHHU	Shanghai, China	100
2KA	Katoomba, Australia	100
4MK	Mackay, Australia	100

1170 KC

———	Copenhagen, Den.(6)	10000
CC117	Concepcion, Chile	100
CMBD	HAVANA, CUBA	150
CX32	Montevideo, Uruguay	500
XLIE	Wusih, China	50
2NZ	Narrabi, Australia	2000
2ZD	Masterton, New Zealand	5
4TO	Townsville, Australia	200

1180 KC

CB118	Santiago, Chile	5000
CMJO	CIEGO DE AVILA, CUBA	50
LKM	Tromsoe, Norway(6)	100
RW20	Kharkov, U.S.S.R.(5)	10000
XEFA	MEXICO CITY, MEX.	500
XHHZ	Shanghai, China	150
3KZ	Melbourne, Australia	600

1190 KC

———	Cassel, Germany(5)	2000
———	Coblenz, Germany(5)	2000
———	Frankfurt, Germany(5)	25000
———	Freiburg, Germany(5)	5000
———	Kaiserslautern, Ger.(5)	1500
———	Trier, Germany(5)	2000
HIJ	CIUDAD TRUJILLO, D.R.	10
LS2	Buenos Aires, Arg.	30000
VONF	ST. JOHNS, NFLD.(5)	500
XLKA	Peiping, China(4)	30
2CH	Sydney, Australia	1000

1200 KC

———	Praha No. 2, Czech.(4)	5000
CB120	Valparaiso, Chile	1000
CHAB	MOOSE JAW, SASK.	100
CKNX	WINGHAM, ONTARIO	50
CKTB	ST. CATHERINES, ONT.	100
CMCO	HAVANA, CUBA	150
HH2V	PORT AU PRINCE, H.	300
HJ3ABE	Bogota, Colombia	1000
LT9	Santa Fe, Argentina	500
OAX4B	Lima, Peru	250
PRG9	Sao Paulo, Brazil	500
VUL	Lahore, India	100
XHHN	Shanghai, China	100
YV3RC	Caracas, Venezuela	3000
3YL	Christchurch, N. Z.	500
5KA	Adelaide, Australia	300

1210 KC

———	Lille, France(3)	60000
CD121	Osorno, Chile	100
CJCS	STRATFORD, ONT.	50
CJCU	AKLAVIK, N. W. T.	50
CKBI	PRINCE ALBERT, Sask.	100
CKCH	HULL, QUEBEC	100
CKMC	COBALT, ONTARIO	50
CMHI	SANTA CLARA, CUBA	150
CX34	Montevideo, Uruguay	500
LV-10	Mendoza, Argentina	500
OA4AR	Lima, Peru	25
OA4D	Lima, Peru	25
TGW	Guatemala City, Guate.	10000
XEAT	HIDALGO, MEXICO	50
XEE	DURANGO, MEXICO	50
XEFV	JUAREZ, MEXICO	100
XETH	PUEBLA, MEXICO	100
XHKC	Tsingtao, China	100
XLPH	Pinghu, China	15
XLTC	Wusih, China	150
2GF	Grafton, Australia	50
6KG	Kalgoorlie, Australia	85

1220 KC

———	Bloemendaal, Holland	100
———	Norvik, Norway(2)	300
CMJE	CAMAGUEY, CUBA	50
HI5E	CIUDAD TRUJILLO, D.R.	20
HJ3ABF	Bogota, Colombia	——
I-1TR	Trieste, Italy	10000
TIVCA	San Jose, Costa Rica	——
XETF	VERACRUZ, MEX.	12
XGOT	Peiping, China	500
4AK	Oakey, Australia	1000
4ZL	Dunedin, New Zealand	100

1230 KC

———	Gleiwitz, Germany(1)	5000
CMCB	HAVANA, CUBA	150
LS8	Buenos Aires, Arg.	15000
XEFJ	MONTERREY, MEX.	100
XLIR	Hangchow, China	50
YNOP	Managua, Nicaragua	100
2NC	Newcastle, Australia	2000

1240 KC

———	Nice, France(9)	2000
———	Orebro, Sweden	200
———	Saffle, Sweden	400
———	Varberg, Sweden	200
CB124	Valparaiso, Chile	250
CJCB	SYDNEY, N. S.	1000
CMHB	SANCTI SPIRITUS, C.	50
CW35	Paysandu, Uruguay	250
LU7	Bahia Blanca, Arg.	2000
LV-14	La Rioja, Argentina	500
PRA5	Sao Paulo, Brazil	5000
XEAC	TIAJUANA, MEXICO	250
XEAI	MEXICO CITY, MEX.	100
XEKL	LEON, MEXICO	500
XELA	SALTILLO, MEX.	50
XEME	MERIDA, MEXICO	15
XHHY	Shanghai, China	100
2ZL	Hastings, New Zealand	50
3TR	Sale, Australia	500
6CK	Cork, Irish Free State	1000
6IX	Perth, Australia	500

1250 KC

———	Kuldiga, Latvia(8)	10000
———	Rome No. 3, Italy(8)	1000
CMKC	SANTIAGO, CUBA	100
CX36	Montevideo, Uruguay	250
EAJ8	San Sebastian, Spain(8)	——
HC2JB	Guayaquil, Ecuador	30
HJ4ABK	Medellin, Colombia	300
MABS	Siangyang, China	35
OAX4L	Lima, Peru	100
XLIF	Wusih, China	75
XLWU	Wusih, China	50

1260 KC

———	Nurnberg, Germany(7)	2000
CB126	Santiago, Chile	1000
CFRN	EDMONTON, ALBERTA	100
PRE3	Rio de Janeiro, Brazil	10000
XHHP	Shanghai, China	100
1-ZM	Manurava, New Zealand	50
3WR	Shepparton, N. Z.	50

1270 KC

CA127	Antofagasta, Chile	100
CMHD	CAIBARIEN, CUBA	250
LKK	Kristianssand, Norway(6)	500
LKS	Stavangu, Norway(6)	500
LS9	Buenos Aires, Arg.	6000
OA4O	Lima, Peru(7)	100
PRB4	Santos, Brazil	1000
PRG7	Jahu, Brazil	200
TUA	Tunis, Tunisia(5)	500
XDYF	Wuhu, China	75
XEG	ENSENADA, MEXICO	200
XFB	JALAPA, MEXICO	250
YNLF	Managua, Nicaragua	20
YV8RB	Baraquisimeto, Venez.	——
ZP4	Asuncion, Paraguay(5)	150
2SM	Sydney, Australia	1000

1280 KC

———	Aberdeen, Gr. Britain(5)	1000
———	Dresden, Germany(5)	250
———	Stara-Zagora, Bulgaria(5)	2000
PRG3	Rio de Janeiro, Brazil	10000
XEMX	MEXICO CITY, MEX.	12
XHJA	Hangkow, China	100
XHHQ	Shanghai, China	80
XQKC	Tientsin, China	100
3AW	Melbourne, Australia	600
4ZC	Cromwell, N. Z.	7

1290 KC

———	Klagenfurt, Austria(4)	6000
———	Linz, Austria(4)	15000
———	Vorarlburg, Austria	6000
CX38	Montevideo, Uruguay	500
XGOE	Yungning, China	1000
4BK	Brisbane, Australia	500

1300 KC

———	Danzig, Danzig(3)	500
CB130	Santiago, Chile	1000
CPX	La Paz, Bolivia	5000
HI7P	CIUDAD TRUJILLO, D.R.	25
HJ1ABA	Barranquilla, Colombia	100
LT-10	Santa Fe, Arg.	500
LU6	Mar del Plata, Arg.	500

OAX4C	Lima, Peru	——
VOAC	ST. JOHNS, NFLD.	20
XQHC	Shanghai, China	1000
YV5RMO	Maracaibo, Venezuela	150
2TM	Tamworth, Australia	50

1310 KC

CHCK	CHARLOTTETOWN, P. E. I.	50
CJKL	KIRKLAND LAKE, O.	1000
CJLS	YARMOUTH, N. S.	100
CKCV	QUEBEC, P. Q.	100
SBC	Malmo, Sweden(2)	250
SCK	Karlstad, Sweden(2)	250
SCO	Norrkoping, Sweden(2)	250
SCQ	Trollhatan, Sweden(2)	250
5AD	Adelaide, Australia	300

1320 KC

CB132	Valparaiso, Chile	1000
CD132	Valdivia, Chile	100
CMOX	HAVANA, CUBA	200
CW39	Payoandu, Uruguay	100
HAE-2	Magyarovar, Hungary(1)	1250
HJ3ABK	Bogota, Colombia	50
HJ4ABQ	Medellin, Colombia	1000
PRE2	Rio de Janeiro, Brazil	500
XL-1A	Ningpo, China	15
3BA	Ballarat, Australia	50

1330 KC

——	Bremen, Germany	2000
——	Flensburg, Germany	2000
——	Hanover, Germany	2000
——	Lodz, Poland(9)	2000
——	Magdenberg, Germany	2000
——	Stettin, Germany	2000
CMHK	CRUCES, CUBA	250
CX40	Montevideo, Uruguay	500
PRC5	Belem, Brazil	100
PRD7	Sorocaba, Brazil	500
PRF8	Bahia, Brazil	50
XGSA	Kiangyin, China	10
XLIK	Chang-Chow, China	75
2BH	Broken Hill, Australia	100
4RO	Rockhampton, Australia	50

1340 KC

——	Cairo, Egypt	500
——	Konigsberg, Germany(8)	2000
——	Milan, Italy	4000
——	Radio ILLE-Paris, Fr.(8)	800
——	Salzburg, Austria	2000
CB134	Santiago, Chile	1000
CMJL	CAMAGUEY, CUBA	75
CW39	Rocha, Uruguay	50
HRN	Tegucigalpa, Honduras	50
LKR	Rjukan, Norway(8)	150
LT7	Corrientes, Arg.	500
PRB3	Juiz de Fora, Brazil	250
PRD4	Araraguara, Brazil	250
XEFE	NUEVO LAREDO, MEX.	250
XFD	JALAPA, MEX.	350
XHHR	Shanghai, China	50
2RN	Dublin, Ir. F. State(8)	1000
2XN	Lismore, Australia	50
4ZR	Balelutha, N. Z.	4
5MV	Murray Bridge, Australia	100

1350 KC

——	Tampere, Finland(1)	700
— ——	Turin, Italy	200
CMCA	HAVANA, CUBA	200
LKN	Notodden, Norway(7)	150
LS6	Buenos Aires, Arg.	6000
OA6E	Arequipa, Peru	30
XQKA	Tientsin, China	150
YV6RV	Valencia, Venezuela	350
3GL	Geelong, Australia	50

1360 KC

CD136	Magallanes, Chile	100
CMJH	CIEGO DE AVILA, CUBA	50
CW41	San Jose, Uruguay	50
OA4K	Lima, Peru	150
PRE8	Rio de Janeiro, Brazil	10000
XQHD	Shanghai, China	200
2MO	Gunnedah, Australia	50

1370 KC

——	Basle, Switz.(5)	500
——	Berne, Switz.(5)	500
CC137	Temuco, Chile	100
CKCW	MONCTON, N. B.	100
CMGE	CARDENAS, CUBA	150
CX42	Montevideo, Uruguay	1000
HIZ	CIUDAD TRU., D. R.	100
XEFZ	MEXICO CITY, D. F.	100
XEI	MORELIA, MEX.	125
XEZZ	SAN LUIS POTOSI, M.	100
XLID	Hangchow, China	50
3HS	Horsham, Australia	50

1380 KC

CB138	Santiago, Chile	5000
CMCR	HAVANA, CUBA	150
XLHE	Shanghai, China	50
XLHF	Shanghai, China	50
4BH	Brisbane, Australia	600

1390 KC

——	Montpelier, France(3)	5000
——	Radio Lyons, Fr.(3)	25000
——	Varna, Bulgaria(3)	2000
CB139	Valparaiso, Chile	1000
CMJC	CAMAGUEY, CUBA	150
HIH	S. P. DE MACORIS, D.(1)	75
LR11	La Plata, Arg.	500
XLIN	Wusik, China	50
2GN	Goulburn, Australia	100
7BU	Burnie, Australia	——

1400 KC

——	Ornskoldsvik, Swed.(2)	500
——	Umea, Sweden(2)	1000
CB140	San Antonio, Chile	100
CMGC	MATANZAS, CUBA	100
CMKR	SANTIAGO, CUBA	100
CW37	Colonia, Uruguay	25
FFZ	Shanghai, China	250
HI6Y	CIUDAD TRUJILLO, D.R.	25
OA6D	Arequipa, Peru	150
TGX	Guatemala City, Guate.	50
XLHO	Shanghai, China	100
2ZO	Palmerston, N. Z.	100

1410 KC

——	Uddevalla, Sweden	50
CC141	Concepcion, Chile	100
CKFC	VANCOUVER, B. C.	30
CKMO	VANCOUVER, B. C.	——
CX44	Montevideo, Uruguay	200
HI-1A	SANTIAGO, D. R.	50
PRF6	Bahia, Brazil	500
PRF9	Porto Alegre, Brazil	500
PRG8	Bauru, Brazil	250
2KO	Newcastle, Australia	500

1420 KC

——	Alexandria, Egypt(9)	500
——	Turku, Finland(9)	600
——	Voasa, Finland	500
CKBG	TIMMINS, ONT.	100
CMCQ	HAVANA, CUBA	250
XEAZ	GUANAJUATO, MEX.	7
XEFB	MONTERREY, MEX.	100
1ZS	Auckland, N. Z.	50
3XY	Melbourne, Australia	600

1430 KC

CC143	Talca, Chile	100
CMJP	CAMAGUEY, CUBA	75
CQ25	Duranzo, Uruguay	500
HAE-3	Miskolc, Hungary(8)	1250
RW10	Minsk, U.S.S.R.(8)	100000
2WL	Wollongong, Australia	50
4GY	Gumpie, Australia	50

1440 KC

CB144A	Santiago, Chile	100
CB144B	Santiago, Chile	100
CB144C	Santiago, Chile	100
CB144D	Santiago, Chile	150
CMOA	HAVANA, CUBA	150
HI-5N	SANTIAGO, D. R.	100
HP-50	COLON, PANAMA	25
LS-11	La Plata, Arg.	700
TIFS	Cortago, C. R.	7.5
XEFI	CHIHUAHUA, MEX.	250
XLHQ	Shanghai, China	40
OA6U	Arequipa, Peru(3)	50
2QN	Deniliquin, Australia	——
41P	Ipswich, Australia	50

1450 KC

——	Paris, France(6)	20000
CC145	Rancagua, Chile	100
CFCT	VICTORIA, B. C.	75
CHGS	SUMMERSIDE, P. E. I.	50
CX46	Montevideo, Uruguay	1500
XLIB	Suchow, China	15

1460 KC

——	Courtrai, Belgium(5)	100
CMCV	HAVANA, CUBA	150
CMKF	HOLGUIN, CUBA	50
CW33	Florida, Uruguay	75
PRA4	Bahia, Brazil	500
PRC9	Campinos, Brazil	250
PRD5	Rio de Janeiro, Brazil	1000
PRE5	Uberaba, Brazil	250
HAE-4	Pecs, Hungary(5)	1250
ON4EB	Antwerp, Belgium(5)	100
ZP5	Asuncion, Paraguay(5)	150
7UV	Ulverstone, Australia	300

1470 KC

——	Bournemouth, G. B.(4)	1000
——	Plymouth, G. B.(4)	300
CMOK	HAVANA, CUBA	150
CW43	Lavelleja, Uruguay	100
HI8Q	CIUDAD TRU., D. R.(5)	25
LT-11	Parana, Arg.	500
XGDZ	Chang-Chow, China	10
2BE	Bega, Australia	100
3ZM	Christchurch, N. Z.	60
4CA	Cairns, Australia	100

1480 KC

CW47	Canelones, Uruguay	100
PRB8	Mogy das Cruzes, Brazil	50
PRD3	Taubate, Brazil	50
PRE9	Portaleza, Brazil	500
PRF2	Rio Claro, Brazil	250
XQHF	Shanghai, China	200
2AY	Albury, Australia	100
4BU	Bundaberg, Australia	100

1490 KC

——	Binche, Belgium(2)	100
——	Nemes, France(2)	200
EAJ43	Tenerife, C. I.	8000
ON4CE	Chatelineau, Bel.(2)	100
ON4RW	Tamworth, Australia	50
XLKS	Liege, Bel.(2)	100
2TM	Kashing, China	20

1500 KC

——	Pietarsaari, Finland	250
——	Seraing, Belgium	100
——	Vellereille, Belgium	100
——	Verviers (No. 1), Bel.	100
——	Verviers (No. 2), Bel.	100
CB150	Santiago, Chile	10000
CJ-1C	S. STE. MARIE, ONT.	100
CMCX	HAVANA, CUBA	150
CX48	Montevideo, Uruguay	1500
EAJ50	Las Palmas, Canary Is.	250
ON4EX	Liege, Belgium	150
ON4FC	Liege, Belgium	150
XHHT	Shanghai, China	100
XOCL	Tsinan, China	7.5
XQHG	Shanghai, China	250
3AK	Melbourne, Australia	200

1510 KC

CFRC	KINGSTON, ONT.	100
CKCR	WATERLOO, ONT.	100
YDA8	Transjongpriak, Java	500

SHORT-WAVE STATION LIST

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

KC	Meters	Call	Location	Time
55500	5.41	W3XKA	● Philadelphia, Pa.	Weekdays 11 A.M.-11 P. M. Sun. 9 A.M.-11 P.M.
55500	5.41	W8XKA	● Pittsburgh, Pa.	2-10 P.M. daily
55500	5.41	W1XKA	● Boston, Mass.	Sunday 7-11 A.M., 4 P. M.-12 A.M. Daily 11 A.M.-9 P.M.
31600	9.4	W8XWJ	● Detroit, Mich.	Sunday 2:30-7:30 P.M. Daily 6:15 A.M.-12:30 P.M., 2-5 P.M., 7-10 P.M.
24380	12.3	CRCX	● Bowmanville, Ont.	Experimental
21540	13.92	W8XK	● Pittsburgh, Pa.	7 A.M.-9 A.M. daily
21520	13.94	W2XE	● Wayne, N. J.	6:30 A.M.-12 noon Daily
21500	13.95	NAA	Washington, D. C.	(E) Time signals
21470	13.97	GSH	● Daventry, England	6-8:45 A.M., 9 A.M.-12:30 P.M. daily
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	WQD	Rocky Point, N. Y.	(E) Tests LSY irreg.
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.
18450	16.26	HBF	Geneva, Switzerland	(E) Commercial; irreg.
18440	16.25	HJY	Bogota, Colombia	(P) Phones CEC-OCJ 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	IUD	● Addis Ababa, Ethiopia	Irregular
18250	16.43	FTO	St. Assise, France	(P) LSM-LSY A.M.
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, U. S. eves.
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	Daily 6-8:45 A.M., 9 A.M.-12 noon; 3:40-5:45 P.M.
17780	16.87	W3XAL	● Bound Brook, N. J.	8 A.M.-4 P.M. Daily
17780	16.87	W9XAA	● Chicago, Ill.	Irreg. Before 8 A.M., 4-6 P.M. or special
17775	16.88	PHI	● Huizen, Holland	Sunday 7:30-9:30 A.M., 1-2 P.M.; Mon., Thu., Fri., Sat., 7:30-9:30 A.M.
17760	16.89	DJE	● Zeesen, Germany	12:05-5:15 A.M.; 5:55-11 A.M. daily
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	CMA5	Havana, Cuba	(P) Phones and tests evenings
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.
16250	18.46	FZR	Saigon, Indo-China	(P) Phones FTA-FTK early A.M.
16240	18.47	KTO	Manila, P. I.	(P) Phones JVE-KWU evenings

Short-Wave Station List

KC	Meters	Call	Location	Time
16140	18.59	GBA	Rugby, England	(P) Phones Argentina & Brazil irreg
16117	18.62	IRY	Rome, Italy	(P) Phones IDU-ITK A.M.
16050	18.69	JVC	Nazaki, Japan	(P) Phones Hong Kong early A.M.
16030	18.71	KKP	Kahuku, Hawaii	(P) KWU A.M. & P.M. 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.; U. S. eves.
15860	18.90	CEC	Santiago, Chile	(P) Phones OCJ A.M.
15810	19.02	LSL	Buenos Aires, Arg.	(P) GAA. A.M.; GCA, PSE, PSF P.M.
15760	19.04	JYT	Kemikawa-Cho, Japan	(E) Tests KKW-KWE-KWU evenings
15740	19.06	JIA	Chureki, Japan	(P) 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
15450	19.42	IUG	Addis Ababa, Ethiopia	(P) Phones 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	Irregular
15355	19.54	KWU	Dixon, Calif.	(P) Phones Japan, Manila and Java evenings
15340	19.56	DJR	● Zeesen, Germany	8-10 A.M. daily
15330	19.56	W2XAD	● Schenectady, N. Y.	10 A.M.-3:45 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
15280	19.63	LRU	● Buenos Aires, Arg.	7 A.M.-3:45 P.M. daily
15280	19.63	DJQ	● Zeesen, Germany	5-7 A.M., 7:15-11 A.M., 4:50-10:45 P.M. daily
15270	19.64	W2XE	● Wayne, N. J.	12 noon-5 P.M. daily
15252	19.67	RIM	Tashkent, USSR.	(P) Phones RKI early mornings
15243	19.68	TPA2	● Pontoise, France	1-1:55 A.M., 4:55-10 A.M. daily
15220	19.71	PCJ	● Eindhoven, Holland	Sunday 6:30-7:30 A.M.; Tues., 4-6 A.M.; Wed., 7-11 A.M.
15210	19.72	W8XK	● Pittsburgh, Pa.	9 A.M.-7 P.M. daily
15200	19.74	DJB	● Zeesen, Germany	12:05-5:15 A.M., 5:55 A.M.-12:20 P.M., 4:50-10:45 P.M. daily
15183	19.76	RV96	● Moscow, USSR.	1:30-2 P.M. Sunday
15180	19.76	GSO	● Daventry, England	12:15-3:40 P.M. daily
15145	19.81	RKI	● Moscow, USSR.	Phones RIM early A.M. Broadcasts Sun. 6-7 A.M., 10-11 A.M., Wed. 6-7 A.M.
15140	19.82	GSF	● Daventry, England	9 A.M.-12 noon; 3:40-5:45 P.M.; 9-11 P.M. daily
15121	19.84	HVJ	● Vatican City, Vatican	10:30-10:45 A.M. weekdays
15110	19.85	DJL	● Zeesen, Germany	12-2 A.M., 8-10 A.M., 11:35 A.M.-4:30 P.M. daily. Sun. 4-6 A.M.
15055	19.92	WNC	Hialeah, Fla.	(P) Phones daytime
15040	19.95	HIR	Ciudad Trujillo, R. D.	(P) Phones WNC days
14985	20.02	YSL	San Salvador, Salvador	(P) Phones days irreg.
14980	20.03	KAY	Manila, P. I.	(P) Phones DFC-DFD-GCJ early A.M.; KWU evenings
14970	20.04	LZA	● Sofia, Bulgaria	Sunday 12:30 A.M.-8 A.M., 10 A.M.-4 P.M.; Mon., Wed., Fri., Sat., 5-7 A.M.; Tues., Thu., 1-3 P.M.
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 and broadcasts 1-2:30 A.M. irreg.
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. B.C. music 12-1 A.M. daily & eves. 5-9 P.M.
14590	20.56	WMN	Lawrenceville, N. J.	(P) Phones England days
14535	20.64	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 day time
14460	20.75	DZH	● Zeesen, Germany	Irregular
14440	20.78	GBW	Rugby, England	(P) Phones Lawrenceville daytime
14410	20.80	DIP	Zeesen, Germany	(E) Experimental; irreg.
14250	21.00	W10XDA	Schooner Morrissey	(P) Irregular
14236	21.07	HB9B	● Basle, Switzerland	Monday, Thursday, Friday 4-6 P.M.
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
13410	22.37	YSJ	San Salvador, Salvador	(P) Phones WNC days
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
13100	22.90	VPD	● Suva, Fiji Islands	Week days 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
12795	23.45	IAC	Pisa, Italy	(P) Phones ships and tests Tripoli, irreg.
12780	23.47	GBC	Rugby, England	(P) Phones VWY early A.M.

Short-Wave Station List

KC	Meters	Call	Location	Time
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 Lawrence ville days
12280	24.43	KUV	Manila, P. I.	(P) Phones early A.M.
12250	24.49	TYB	Paris, France	(P) Phones JVH-XGK and ships irreg.
12235	24.52	TFJ	Reykjavik, Iceland	(P) Phones England days
12235	24.52	TFJ	● Reykjavik, Iceland	English broadcast each Sun., 1:40-2:30 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	Irregular
12100	24.79	CJA	Drummondville, Que.	(P) Tests VIY early A. M. and evenings
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
12020	24.95	VIY	Rockbank, Australia	(P) Tests CJA6 early A.M. and evenings
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	IUC	● 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
11900	25.21	XEWI	● Mexico City, Mexico	Sun. 1-2:15 P.M.; Tues. and Thurs., 7:30-8:45 P.M., 10:30 P.M.-12 A.M.; Mon., Wed., 3-4 P.M.; Fri., 3-4 P.M., 9 P.M.-12 A.M.; Sat., 9-10 P.M.
11885	25.24	TPA3	● Pontoise, Franee	1-4 A.M., 11:15 A.M.-5 P.M daily
11870	25.26	W8XK	● Pittsburgh, Pa.	5-9 P.M. daily
11860	25.30	YDB	● Soerabaia, Java	7:30 P.M.-2 A.M. daily
11855	25.31	DJP	● Zeesen, Germany	Irregular
11830	25.36	W2XE	● Wayne, N. J.	5-9 P.M. daily
11830	25.36	W9XAA	● Chicago, Ill.	Daily 8:30 A.M.-5 P.M.
11810	25.40	2RO4	● Rome, Italy	5:43 A.M.-9:30 A.M., 10:30 - 11:30 A.M., 11:40 A.M.-6 P.M. daily. Mon., Wed., Fri., Am. Hour, 6-7:30 P.M. Tues., Thurs., Sat., Spanish, 6-7:45 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	Irregular
11790	25.43	W1XAL	● Boston, Mass.	5 P.M. News Items—Mon. to Fri. inc.
11770	25.49	DJD	● Zeesen, Germany	11:35 A.M.-4:30 P.M., 4:50-10:45 P.M.
11750	25.53	GSD	● Daventry, England	1:15-3:15 A.M., 12:15-3:25 P.M., 6-8 P.M. daily
11720	25.60	CJRX	● Winnipeg, Manitoba	Daily 6 P.M.-12 A.M.
11720	25.60	TPA4	● Pontoise, France	5:15 P.M.-12 A.M. daily
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. Broadcasts irreg. 1-2:30 A.M.
11570	25.93	HH2T	● Port-au-Prince, Haiti	Sp'l programs irreg.
11560	25.95	CMB	Havana, Cuba	(P) Phones New York 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.
11402	26.31	HBO	Geneva, Switzerland	(E) Broadcasts Sundays 11:30 P.M.; commercial, irreg.
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 5:30-11 A.M. week days; Sun., 5:30-10:30 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
10955	27.38	HS8PJ	● Bangkok, Siam	Mondays 8-10 A.M.
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. daily and 5-9 P.M. irreg.
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 ex. Sat. and Sun., 7-7:20 P.M. (see CED, 10230 KC.)
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.; 12-1 A.M. daily
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
10530	28.49	JIB	Tawian, Japan	(P) Phones JVL - JVN early mornings to 8 A.M.; sp'l bc's 3-4 A.M. Sun.
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	28.76	YBG	Medan, Sumatra	(P) Phones PLV - PLP early A.M.
10420	28.79	XGW	Shanghai, China	(P) Tests GBP - KAY early A.M. Musical tests 10:45 A.M.-3 P.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	Tenerife, Canary Islands	(P) Phones EDN 3:30-6 A.M.
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	1:30-3 P.M. daily
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 5:30-11 A.M. week days; 5:30-10:30 A.M. Sundays
10250	29.27	LSK3	Buenos Aires, Arg.	(P) Afternoons
10230	29.33	CED	● Antofagasta, Chile	Retransmits programs of CEC, 10670 KC., daily ex. Sat. and Sun., 7-7:20 P.M.
10220	29.35	PSH	Rio de Janeiro, Brazil	(P) Phones LSL-WOK evenings; special pgm. service irreg.
10169	29.50	HSG	Bangkok, 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) Calls 5 A.M. daily. Phones ORK aftnoons
10080	29.76	RIR	Tiflis, USSR.	(P) Phones RIM-RKI 7-11 A.M.

Short-Wave Station List

KC	Meters	Call	Location	Time
10070	29.79	EDN	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	Irregular
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 1-3 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	COCQ	●Havana, Cuba	8 A.M.-12 mid. daily
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	Irregular
9670	31.02	TI4NRH	●Heredia, Costa Rica	Daily 9-10 P.M.; 11:30 P.M.-12 A.M.; Sat. night to 2 A.M. Sun.
9660	31.06	LRX	●Buenos Aires, Arg.	8-9 P.M. daily, experimentally
9650	31.09	CT1AA	●Lisbon, Portugal	Tues., Thurs., Sat., 4-7 P.M.
9635	31.13	2RO3	●Rome, Italy	Not in use. See 11810 K.C.
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.
9610	31.22	YDB	●Soerabaia, Java	Week days 5:30-11 A.M., 6-7:30 P.M., 10:30 P.M.-2 A.M. Sundays, 5:30-10:30 A.M., 7:30 P.M.-2 A.M.
9600	31.25	RAN	●Moscow, USSR.	English 7-7:30 P.M.; German 7:30-8 P.M. daily
9600	31.25	HJ1ABP	●Cartagena, Colombia	Daily 6-11 P.M.
9600	31.25	CB960	●Santiago, Chile	Daily 10:30 A.M.-12 noon; 6-8:30 P.M.
9595	31.27	HBL	●Geneva, Switzerland	Saturday 5:30-6:15 P.M. First Monday each month 6-7 P.M.
9595	31.27	HH3W	●Port-au-Prince, Haiti	1-2 P.M., 7-8:30 P.M.; ex. Sunday
9595	31.27	YNLF	●Managua, Nicaragua	8-9 A.M., 1-3 P.M., 6:30-10:30 P.M. daily
9590	31.28	W3XAU	●Philadelphia, Pa.	11 A.M.-7 P.M. daily
9590	31.28	VK2ME	●Sydney, Australia	Sunday 12:30-2:30 A.M., 4:30-8:30 A.M., 9:30-11:30 A.M.
9590	31.28	HP5J	●Panama City, Panama	Week days 12-1:30 P.M., 6-10:30 P.M. Sundays 10:30 A.M.-1:30 P.M., 3-4 P.M., 6-10:30 P.M.
9590	31.28	PCJ	●Eindhoven, Holland	Sundays 7-8 P.M.; Wed. 7-10 P.M.
9580	31.31	GSC	●Daventry, England	6-8 P.M., 9-11 P.M. daily
9580	31.31	VK3LR	●Melbourne, Australia	Daily 3:30-8:30 A.M.; Sat. 10 P.M.-2 A.M.
9575	31.33	HJ2ABC	●Cucuta, Colombia	11 A.M.-12 noon; 6:30-9 P.M. daily
9570	31.33	W1XK	●Boston, Mass.	Week days 6 A.M.-12 midnight; Sunday 7 A.M.-12 midnight
9565	31.36	VUY VUB	●Bombay, India	11:30 A.M.-12:30 P.M., Wed. & Sat.; Sunday, 7:30-8:30 A.M.
9560	31.38	DJA	●Zeesen, Germany	12:05-5:15 A.M., 4:50-10:45 P.M. daily
9553	31.40	CQN	●Macao, China	Mon. & Fri. 7-8:30 A.M.
9545	31.44	HH2R	●Port-au-Prince, Haiti	Sp'l programs irreg.
9540	31.45	DJN	●Zeesen, Germany	12:05-5:15 A.M., 4:50-10:45 P.M. daily
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	1:15-3:15 A.M., 12:15-5:45 P.M. daily
9510	31.55	VK3ME	●Melbourne, Australia	Mon.-Sat. 4:00-7:00 A.M.
9510	31.55	HJU	●Buenaventura, Colombia	12-2 P.M., 8-11 P.M., Mon., Wed., Fri.
9505	31.56	XEFT	●Vera Cruz, Mexico	Same as 6120 KC.
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.
9500	31.58	HJ1ABE	●Cartagena, Colombia	6-10 P.M. daily; specials later
9490	31.61	KEI	Bolinas, Calif.	(P) Phones Indo-China and China 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 7 A.M.-12 night. Sun. 8-9 A.M., 11:30 A.M.-1:30 P.M., 6-9 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. Sundays irreg.
8650	34.68	WVD	Seattle, Wash.	(P) Tests irregularly
8630	34.76	CMA	Havana, Cuba	(P) Phones New York irreg.
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
8515	35.23	IAC	Pisa, Italy	(P) Phones and tests irreg.

Short-Wave Station List

KC	Meters	Call	Location	Time
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	Week days 11:15 A.M.-12:15 P.M., 7:15-10:30 P.M. Sundays 3:30-5 P.M.
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	KTP	Manila, P. I.	(P) Phones KWX-KWV-PLV-JVQ A.M.
8110	37.00	ZP10	●Asuncion, 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	Shangbai, China	(P) Tests early mornings
7968	37.65	HSJ	Bangkok, 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 Mon. 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	IUB	●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	Sun. 4-5 P.M., Weekdays 5-7 P.M., 8:30-10 P.M.
7520	39.89	KKH	Kahuku, Hawaii	(P) KEE-KEJ evenings, KWX-KWV nights
7518	39.90	RKI	Moscow, USSR.	(P) Phones RIM early mornings
7510	39.95	JVP	●Nazaki, Japan	(P) Tests Point Reyes early A.M.; broadcasts Mon., Thurs., 2-3, 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 Mon., Thurs., 2-3, 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.
7220	41.55	VP3BG	●Georgetown, Brit. Guiana	6-8:45 P.M. daily
7177	41.80	CR6AA	●Labito, Angela, Africa	3:45-5:30 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
6950	43.17	WKP	Rocky Point, N. Y.	(E) Relays programs evenings
6950	43.17	GBY	Rugby, England	(P) Phones U.S.A. irreg.
6922	43.34	IUF	Addis Ababa, Ethiopia	(E) Irregular
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
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.
6796	44.14	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.
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
6710	44.71	TIEP	●San Jose, Costa Rica	7:00-10:30 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., 5:40-8:40 P.M. ex. Sun. Sat. DX 10:40 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.
6545	45.84	YV11RB	●Ciudad Bolivar, Venez.	7-10 P.M. daily; 3-6 P.M. Sun.
6520	46.01	YV6RV	●Valencia, Venezuela	10:30 A.M.-1:30 P.M., 4:30-9:30 P.M. daily
6500	46.15	HIL	●Ciudad Trujillo, R.D.	12-2 P.M., 6-8 P.M.
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
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	46.72	HI1S	●Puerto Plata, R.D.	11:40 A.M.-1:40 P.M. 5:40-7:40 P.M.
6420	46.72	W3XL	●Bound Brook, N. J.	No regular schedule
6415	46.77	HJA3	Barranquilla, Colombia	(P) Phones HJA2 evenings
6410	46.80	TIPG	●San Jose, Costa Rica	7:30-9:30 A.M., 12-2 P.M., 6-11:30 P.M. daily
6400	46.88	YV9RC	●Caracas, Venezuela	7-11 P.M. irreg.
6375	47.10	YV4RC	●Caracas, Venezuela	5:30-9:30 P.M. ex. Sun.
6351	47.24	HRP1	●San Pedro de Sula, Honduras	12-2 P.M., 7:45-10 P.M. daily
6330	47.39	JZG	●Nazaki, Japan	5:00-7:00 A.M. irregular

Short-Wave Station List

KC	Meters	Call	Location	Time
6325	47.43	HH3NW	● Port-au-Prince, Haiti	1-2 P.M., 7-8:30 P.M. ex. Sunday
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	9-10 A.M., 12-1 P.M.,, 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 10:40 A.M.-1:40 P.M., 4:40-8:40 P.M.
6235	48.11	OCM	Lima, Peru	(P) Phones afternoons
6235	48.11	HRD	● La Ceiba, Honduras	8-11 P.M., Sundays 4-6 P.M.
6230	48.15	HJ4ABJ	● Ibague, Colombia	8:00-11 P.M.
6230	48.15	OAX4G	● Lima, Peru	7-11 P.M. daily
6190	48.47	HI1A	● Santiago de Caballeros, R. D.	Daily 11:40 A.M.-1:40 P.M., 7:40-9:40 P.M.
6182	48.53	XEXA	● Mexico City, Mex.	8-11:30 A.M., 3-5 P.M. 7-11 P.M. ex. Sunday
6170	48.62	HJ3ABF	● Bogota, Colombia	11 A.M.-2 P.M. 6-11 P.M.
6150	48.78	HJ5ABC	● Cali, Colombia	11A.M.-12 noon, 7-10 P. M. Mon. to Fri., 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	6 P.M.-12 A.M. daily
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	YV3RC	● Caracas, Venezuela	10:30 A.M.-1:30 P.M., 3:30-9:30 P.M. daily
6150	48.78	CB615	● Santiago, Chile	4-7 P.M. daily
6150	48.78	COKG	● Santiago, Cuba	12-1 P.M., 5-8:45 P.M. daily. Tues., Thurs., Sat., 10-10:30 P.M. Sunday 1-2 A.M.
6140	48.86	W8XK	● Pittsburgh, Pa.	9 P.M.-1 A.M. daily
6137	48.88	CR7AA	● Lourenco Marques, Africa	12:45-3 P.M. daily; 8-10:30 A.M. Sundays
6131	48.93	HIX	● Ciudad Trujillo, R. D.	Mon. to Sat., 12:10-1:10 P.M., 4:40-5:40 P.M. Sunday, 7:40-9:40 A. M. Tues. and Fri., 8:10-10:10 P.M.
6130	48.94	ZGE	● Kuala Lumpur, S.S.	Sun., Tues, Fri. 6:40-8:40 A.M.
6130	48.94	TGX	● Guatemala City, Guat.	Irreg.
6130	48.94	COCD	● Havana, Cuba	Sunday 11 A.M.-2:00 P M. 7:00-10 P.M. Week days 11:30 A.M. to 11 P.M.
6130	48.94	VE9HX	● Halifax, Nova Scotia	9 A.M.-11 P.M. daily
6130	48.94	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	Daily 11 A.M.-4 P.M., 7:30 P.M.-12 A.M.
6120	49.02	W2XE	● Wayne, N. J.	9-10 P.M. daily
6110	49.10	HJ4ABB	● Manizales, Colombia	11:00 A.M.-1:00 P.M. 5:00-8:00 P.M.
6110	49.10	VUC	● Calcutta, India	Mon. 8-9 A.M. Wed. 10:30-11:30 A.M.
6105	49.14	HI3C	● LaRomana, R. D.	12:10-2:10 P.M., 6:10-7:40 P.M. weekdays. Sun. 12:10-2:40 P.M.
6100	49.18	Belgrade	● Belgrade, Yugoslavia	2 A.M.-12 midnight daily
6100	49.18	W9XF	● Chicago, Illinois	Sun., Tues., Thurs., Fri. 8 P.M.-1 A.M. Mon., Wed., Sat. 12 -1 A.M.
6100	49.18	W3XAL	● Bound Brook, N. J.	Mon., Wed., Sat. 4:00 P.M. 12:00 A.M.
6090	49.26	CRCX	● Bowmansville, Ont.	Week days 5-11 P.M.; Sundays 2-11 P.M.
6090	49.26	ZTJ	● Johannesburg, S. Africa	11:45 P.M.-12:30 A.M. 3:30-7:00 A.M. 9 A.M.-4:45 P.M.
6090	49.26	HJ4ABE	● Medellin, Colombia	11 A.M.-12 noon, 6-10:30 P.M. daily
6085	49.30	HJ5ABD	● Cali, Colombia	11 A.M.-2 P.M., 6-11 P. M. daily
6080	49.34	W9XAA	● Chicago, Ill.	6:30-8:30 A.M., 5 P.M.-12 A.M. daily
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	Irregular
6072	49.41	OER2	● Vienna, Austria	Weekdays 9 A.M.-5 P.M. Saturdays to 6 P.M.
6070	49.42	YV7RMO	● Maracaibo, Venezuela	Daily 8 P.M.-12 A.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 ex. Sun. 6:30 A. M.-7 P.M., 10 P.M.-1:30 A.M. Sundays, 7 A.M.-7 P.M., 10 P. M.-12:30 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.	7-10 P.M. daily
6060	49.50	VQ7LO	● Nairobi, Kenya Colony, Africa	Mon. to Fri. 5:45-6:15 A.M., 11:30 A.M.-2:30 P.M. Tues. and Thurs., 8:30-9:30 A.M. Sat., 11 A.M.-3 P.M. Sun., 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	HJ3ABD	● Bogota, Colombia	Daily 9-11 A.M., 12-2 P. M., 6-11 P.M.
6043	49.65	HJ1ABG	● Barranquilla, Colombia	Daily 11 A.M.-11 P.M. Sun., 11 A.M.-8 P.M.
6040	49.67	HI9B	● Santiago de los Caballeros. R. D.	Daily 6:10-9:40 P.M.; Sat. 11:40 P.M.-12:40 A.M.
6040	49.67	PRA8	● Pernambuco, Brazil	9:30-11:30 A.M., 2:30-8:30 P.M.
6040	49.67	YDA	● Tandjong Priok, Java	Week days 5:30-11 A. M., 6-7:30 P.M., 10:30 P.M.-2 A.M. Sundays 5:30-10:30 A.M., 7:30 P.M.-2 A.M.
6040	49.67	W4XB	● Miami, Florida	Temporarily off the air. Undergoing repairs.
6040	49.67	W1XAL	● Boston, Mass.	Sun. 3-9 P.M.; Mon. to Fri. inc., 7-9 P.M.
6030	49.75	HP5B	● Panama City, Panama	12 noon-1 P.M., 8-10:30 P.M.
6030	49.75	HJ4ABP	● Medellin, Colombia	6-10:30 P.M. daily
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.
6025	49.79	HJ1ABJ	● Santa Marta, Colombia	11:30 A.M.-2 P.M., 5:30-10:30 P.M. daily
6020	49.83	PGD	Kootwijk, Holland	(P) Phones Java and E. Indies irreg.
6020	49.83	DJC	● Zeesen, Germany	Irregular
6020	49.83	XEUW	● Vera Cruz, Mexico	10 P.M.-1 A.M. daily
6018	49.85	ZHI	● Singapore, S. S.	Mon., Wed., Thurs. 5:40-8:10 A.M.; Sat. 10:40 P.M.-1:10 A.M.; 2nd & 4th Sundays, 5:10-6:40 A.M.—organ
6015	49.88	HI3U	● Santiago de los Caballeros, R.D.	Week days 7:10-8:40 A. M., 10:40 A.M.-1:40 P.M., 4:40-9:40 P.M. Sundays 10:40 A.M.-1:40 P.M. only.
6012	49.90	HJ3ABH	● Bogota, Colombia	11:30 A.M.-2 P.M., 6-11 P.M., Sun. 12-2 P.M., 4-11 P.M.
6011	49.91	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	COCO	● Havana, Cuba	8 A.M.-10 P.M. daily
6005	49.96	HP5K	● Colon, Panama	7:30-9 A.M., 12-1 P.M., 6-9 P.M.
6005	49.96	CFCX	● Montreal, Que.	Week days 6:45 A.M.-12 A.M.; Sunday 8 A. M.-10:15 P.M.
6005	49.96	VE9DN	● Montreal, Que.	Sat. 11:30 P.M.-1 A.M. Fall, Winter & Spring
6000	50.00	XEBT	● Mexico City, Mexico	10 A.M.-1:45 A.M.
5980	50.17	HJ2ABD	● Bucaramanga, Colombia	Daily 11:30 A.M.-12:30 P.M., 6-10 P.M.
5975	50.20	XEWI	● Mexico City, Mexico	Not in use. See 11900 K.C.
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.
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.
5880	51.02	IUA	● 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	Week days 8:45-9:45 A. M., 11:15 A.M.-12:45 P.M., 4:45-9:45 P.M. Sundays 10:45 A.M.-12:45 P.M.
5850	51.28	GBT	Rugby, England	(P) Phones U.S.A. irreg
5845	51.33	KRO	Kahuku, Hawaii	(P) Tests early mornings
5830	51.46	TIPGH	● San Jose, Costa Rica	8-11 P.M. daily ex. Sun
5825	51.50	HJA2	Bogota, Colombia	(P) Phones HJA3 afternoons irreg.
5800	51.72	KZGF	Manila, P. I.	(P) Tests A.M. irreg
5800	51.72	YV2RC	● Caracas, Venezuela	Sun. 8:30-11:30 A.M., 3:30-9:30 P.M. Weekdays 10:30 A.M.-1:30 P.M., 4:15-9:30 P.M.
5790	51.81	JVU	Nazaki, Japan	(P) Phones JZC early mornings

Short-Wave Station List

KC	Meters	Call	Location	Time
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.	Sun., Wed., Thurs., 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 A.M., 6-10 P.M., 10:30 P.M.-2 A.M. daily
4795	62.56	VE9BK	● Vancouver, Canada	Weekdays 11:30-11:45 A.M., 2:30-3 P.M., 7:30-8 P.M. Sat. (same ex. last), 7-7:30 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.
4510	66.52	ZFS	Nassau, Bahamas	(P) Phones WND daily; tests GYD-ZSV irregular
4465	67.19	CFA2	Drummondville, Que.	(P) Phones No. Amer.; irregular days
4355	68.88	IAC	Pisa, Italy	(P) Phones and tests irreg.
4348	69.00	CGA9	Drummondville, Que.	(P) Phones ships and Rugby evenings
4320	69.40	GDB	Rugby, England	(P) Phones CGA8 and tests evenings
4295	69.90	WTDV	St. Thomas, Virgin Is.	(E) Weather reports, 8 A.M.-12 Noon; 3-6 P.M.
4295	69.90	WTDW	St. Croix, Virgin Is.	(E) Weather reports, 8 A.M.-12 Noon; 3-6 P.M.
4295	69.90	WTDX	St. John, Virgin Is.	(E) Weather reports, 8 A.M.-12 Noon; 3-6 P.M.
4273	70.21	RV15	● Khabarovsk, USSR.	Daily 11 P.M.-10 A.M.
4272	70.22	WOO	Ocean Gate, N. J.	(P) Phones ships afternoons and eve.
4272	70.22	WOY	Lawrenceville, N. J.	(P) Tests evenings
4002	75.00	CT2AJ	● Ponta Delgada, Azores	Wed. and Sat. 5-7 P.M.
3770	79.60	HB9B	● Basle, Switzerland	Mon. Thurs. Fri. 4-6 P.M.
3750	80.00	HCK	● Quito, Ecuador	Mondays 8:30-10:30 P.M. and occasional specials
3310	90.63	CJA8	Drummondville, Que.	(P) Phones Australia A.M.
3040	98.68	YDA	● Batavia, Java	Week days 5:30-11 A.M., 6-7:30 P.M., 10:30 P.M.-2 A.M.; Sundays, 5:30-10:30 A.M., 7:30 P.M.-2 A.M.

who will do a guaranteed job of planting for the least possible number of *pesos*. In the event of necessity, neither Señora Perez nor the estimable Señor Lopez would do us much good up here in Middleburg, N. Y., with the nearest railroad thirty miles away.

Ultimately, the problem of short-wave commercials appears to be a matter meriting a place on the Cairo agenda.

✦

RADIO REVIEW, published by the Women's National Radio Committee, asks the question: "When a foreign statesman's address, delivered in native language, is translated into English for the purposes of our dramatized news programs, why is an accent added?"

For the same reason that the most carefully edited and prepared programs deliberately read poor English into the announcements. (Typical programmar: The Voice of Firestone, with the Firestone tires that "stop you quicker." Aside from being bad English, the statement, unqualified, makes no sense. "Quicker" than what?—some other tire? —all other tires?—no tires at all?)

For the same reason that programs are still constructed around the assinine formula of—"What shall we play now? Have you got a good number there? What do you say we play 'Red Sails in the Sunset'?"—when everybody knows that the program is pre-arranged, rehearsed, and that nothing short of a breach of contract could stop the orchestra from playing "Red Sails in the Sunset."

For the same reason that the radio audience is advised to chew Wrigley's gum in order to keep within the speed limit when driving an automobile!

We might ask a question: Why does the studio audience laugh at the witlesscisms of Joe Cook, Frank Fay, Bob Burns and the rest of their ilk, when folks sitting in front of the radio are either silent or groan? Answer: Because someone in the studio holds up a card that says "LAUGH."

✦

NONE OTHER THAN McMurdo Silver wins the year subscription to ALL-WAVE RADIO for identifying the photo appearing in this column for August as having been taken one of the evenings during the test week set aside for the reception of European broadcasting stations in 1923. Actually it was Sunday evening, November 25th—the place, the laboratory of *Radio Broadcast* magazine, in Garden City, L. I. Mr. Silver correctly identified Arthur H. Lynch as the person with the cigarette, but slipped up on the lad operating the superheterodyne whom he tagged as Howard Rhodes, well-known radio engineer. To the best of our knowledge this was a chap by the name of Hulse. (Weston Hulse—Ed.) Mac's enthusiasm ran away with him a little in recognizing some of his own apparatus in the picture. Again to the best of our knowledge, these supers were designed and built, one by A. J. Haynes and the other by that old timer of old timers, George Eltz. Believe it or not, all broadcasting stations in the U. S. shut down that night so that England could get through!

CHANNEL ECHOES

[*Continued from page 441*]

✦

HERE'S THE TEASER for this month—with a free subscription to ALL-WAVE RADIO for the best written identification of the first famous male duo of radio. Prominent in the early days of broadcasting, they have stuck together for well over a decade and are still occasionally heard on the air. They were better known than Amos n' Andy for a good many years.

On the Market

C R L Bridge with Visual Null Indication

A BRIDGE designed about the 6E5 cathode-ray tube offers for the first time satisfactory visual null indication in the measurement of capacity, inductance and impedance. The bridge manufactured by the Tobe Deutschmann Corporation, Canton, Mass., is completely self-contained, comprising the usual standards and ratio arms, 60 and 1200-cycle oscillator, power supply, amplifier and indicator tube. In addition to the 6E5, a 6J7 is employed as the dual frequency oscillator, while an 84 is used in the rectifying circuit.

The sensitivity of the electric eye is adjustable, facilitating a rough balance, and providing the sensitivity desirable for a precise null. The range of the bridge is from 2 mfd to 100 mfd in capacity, from a fraction of one ohm to one megohm in resistance and from 10 microhenries to 100 henries in inductance.

While designed primarily for the research laboratory, this bridge has a definite appeal to the serious experimenter, and to the short-wave enthusiast who designs much of his own equipment. To the serviceman, such a bridge is invaluable in checking and maintaining the standards employed in his routine service apparatus, as well as in making direct measurements of power factor, chokes, etc. ALL-WAVE RADIO.

✦

UTC Universal Equalizer

AFTER TWO YEARS of research and development, UTC has released a universal equalizer for broadcasting and recording service. This unit is of a depressed chassis rack panel construction. It incorporates separate controls for high and low-frequency equalization. A switch is provided on the low end control to obtain maximum equalization at 25, 50 or 100 cycles. Another switch is used for the high-frequency end at 4000, 6000, 8000 and 10,000 cycles. Calibrated T type attenuators are used for low-frequency equalization and high-frequency equalization, permitting accurate control from 0 to 25 db.

This unit is recommended for use in equalizing broadcast lines, microphones, pickups, amplifiers, and other radio equipment. This equalizer is also applicable to standard amplifiers for home and p-a service where overall high fidelity is essential. This unit is described in the new UTC equalizer bulletin. ALL-WAVE RADIO.

✦

W2APF on Trip

MR. DAVID L. MARKS, well-known radio amateur and exporter, sailed on the *Queen Mary* August 26 for a three-month business trip through Central Europe.

"Uncle Dave" as Mr. Marks is known throughout the world over his own transmitting station W2APF, will personally contact his agents and those amateurs whom he has previously met over the air, and expects quite a good QSO.

This is Mr. Marks' ninth crossing and he will return to the States in time for the Christmas Holidays.

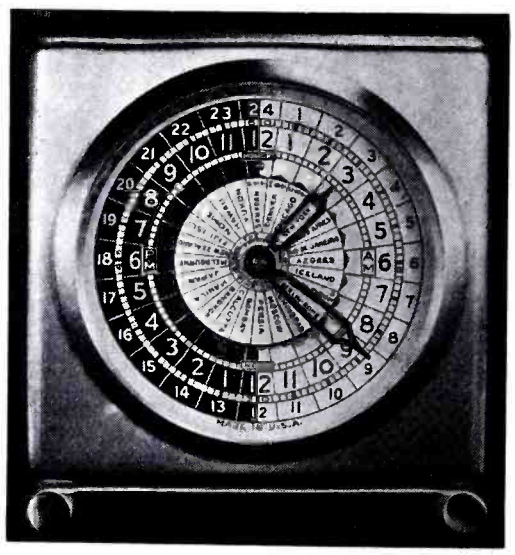
✦

Sky Pilot World Time Clock

THE SKY PILOT Organization, Pearl River, New York, has placed on the market a world time clock specially designed for use by all-wave listeners, amateurs, etc.

Besides being a regular time-piece with an A.M. and P.M. dial, it also has a 24-hour dial. It may be set at any time zone in any city or country, and when so set will indicate directly on the dial the corresponding time at every other time zone throughout the world.

The Sky Pilot World Time Clock, shown in the accompanying illustration, is only 5½ inches square and is modernistic in design. The case is of brushed brass. The clock has a 40-hour movement. ALL-WAVE RADIO.



Main Line Noise Filter

BLOCKING LINE noise before it reaches the house wiring system is the function of the latest F 1005DH Filtercon made by Continental Carbon, Inc., 13900 Lorain Avenue, Cleveland, Ohio.

In analyzing the cause for the intensity of interference at ground levels, which necessitates special aerial lead-ins, the Continental Carbon engineers discovered that much of this interference was radiated from unshielded electric wiring within dwellings. The radio set picked up the disturbance through its aerial or through the power supply connection. The cause

of the interference was often several blocks away, the power lines conducting it within range of the radio set. A new heavy-duty Filtercon was designed to keep this form of radio disturbance out of the house wiring system and divert it to the ground.

The Filtercon may be connected between the main line fuse plugs and the individual circuit fuse plugs. It is provided with a mounting bracket for open panel installations. Its small size, 4⅜" by 3" in diameter, permits mounting within most of the larger metal cabinet fuse boxes. It is conservatively rated to carry 10 amperes at 110 or 220 volts.

Noise, originating from devices in the same building, may be blocked at its source with the Filtercon. Familiar items which often cause noise are old style electric refrigerators, stokers, oil burner ignition systems, job printing presses, neon sign transformers, and laundry mangles. The Filtercon should be coupled into the line as near the source of interference as possible and properly grounded. Instructions accompany each unit. ALL-WAVE RADIO.

✦

Acousti-Reflex Speaker Cabinet

AN EXCLUSIVE Operadio Patented Development, the advantages of this *Acousti-Reflex* Speaker Cabinet are many, accord-

ing to the makers. It minimizes "feedback" difficulties; it increases the efficiency of speakers over the old method approximately 85%; it affords better coverage with less amplifier power output; it substantially increases tonal quality by reproducing more of the fundamental bass frequencies thereby adding to the richness of musical reproduction; it makes an infinitely better appearing unit than the usual unsightly baffle or horn.

Accommodating only electro-dynamic speakers of the 12" size, such as the Operadio E-4 Series, the cabinet is so designed that within itself there is inbuilt an exponential chamber which takes the sound from the back of the electro-dynamic speaker cone and expands it in a normal manner, and then projects it out in front to augment the volume of sound which is generated by the front of the speaker cone. The result is approximately the same as would be obtained if two speakers were used. The difference, however, is that while the sound output has been increased, the output of power from the amplifier has not been increased. By the same token a smaller amplifier would show to better advantage for a given sound level.

The cabinet itself is built of seasoned plywood, heavy enough to eliminate cabinet vibrations.

Catalog 10-E gives full particulars. Write Operadio Manufacturing Company, St. Charles, Illinois. ALL-WAVE RADIO.

◆

C-D Dykanol Condensers

THE CORNELL-DUBILIER Type TJ High Voltage Transmitting Capacitor recently introduced to the broadcast and amateur fields has won wide acclaim, states the manufacturer. These sturdy capacitors, extremely compact, (only 2⅛" high for the 1. mfd.), filled and impregnated with Dykanol "A" are hermetically sealed in welded metal containers. Dykanol "A," a special non-inflammable liquid diphenyl impregnating medium of exceptionally high dielectric

constant and dielectric strength, remains chemically stable under all temperature conditions. It has also been possible to materially improve the leakage resistance and power-factor change by the use of this impregnating material.

The Type TJ capacitors have been successfully operated at voltages exceeding 10% above their rating, it is said. This condenser series is available in a complete capacity range at voltages up to, and including 6000 volts, D.C. Capacitors up to 100,000 volts, D.C. can be obtained in the Type TB construction. Catalog No. 127 illustrating in complete detail gladly supplied free of charge upon application at the home office of the company. ALL-WAVE RADIO.

◆

New Solar Analyzer

TEN OUTSTANDING advantages are claimed for the newest Analyzer unit from Solar Mfg. Corp., 599 Broadway, New York City. This is a Capacitor-Analyzer and Resistance-Bridge, planned to suit the needs of amateurs as well as radio experimenters . . . a refined and extended Wien

bridge built into instantly useful form for laboratory, shop and field work. All readings are secured direct from a color-coded panel . . . saving time and trouble formerly required in cross-referring to charts and graphs.

This unit may be had in two models, both attractively housed in wood cabinets with detachable hinged covers. Compact, light yet sturdy and thoroughly scientific. ALL-WAVE RADIO.

◆

Sylvania Type 6G5 Tuning Indicator

HYGRADE SYLVANIA Corporation announces the release from their Engineering Laboratories of an improved tuning indicator 6G5, which in most cases may directly replace type 6E5, with more accurate results.

Type 6E5, announced last season, was found to have certain disadvantages—mainly that either the indication of weak signals was unsatisfactory, or that the shadow closed entirely on strong signals.

In the 6G5 the triode grid has been somewhat changed, so that the plate current cut-off occurs around —22 volts instead of —8 volts as in type 6E5. In the 6G5 it will be possible to use all of the developed AVC voltage, with the result that indications of weak signals are enlarged, while the strongest signals will not quite close the shadow.

The 6G5 can be used to replace the 6E5 in nearly all present applications where difficulty has been experienced due to complete closing of the shadow. Usually no circuit changes will be required. Where no difficulty exists due to complete closing of the shadow, increased weak signal indications can be obtained, if only a portion of the AVC voltage is now in use, by applying the total AVC voltage and substituting a type 6G5. ALL-WAVE RADIO.

New Crystal Mike

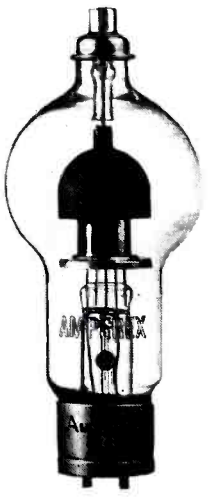
THE ASTATIC Microphone Laboratory, Inc., of Youngstown, Ohio, has developed a new single diaphragm crystal microphone, known as Model 218, that is especially de-

signed for effective pickup where the microphone is to be concealed or hidden. The interior assembly is cushion mounted, permitting use under adverse conditions of vibration. It is so designed that a long cable may be used without serious loss of output. It has a wide angle uni-directional pickup with an output level of approximately —56 db. using a 5.0 meg, load. Net weight is 3½ ounces—is 2⅛" in diameter by ⅞" thick—with flat back, domed screen front and provided with spring clip for attachment. ALL-WAVE RADIO.

◆

New Amperex Mercury Rectifier

AMPEREX ELECTRONIC Products, Inc., announces a new Mercury Vapor Rectifier Tube, the 575-A. It is an intermediate rectifier planned to fill the gap between the 872-A and 869-A. Designed and proportioned along the lines of the 869-A with only slightly lower voltage current characteristics yet considerably lower in price.



Rating and characteristics of the 575-A Half-Wave Mercury Vapor Rectifier: Filament: Voltage, 5 Volts A.C.; Current, 10 Amperes; Overall length, 10½ inches; Maximum diameter, 3 3/16 inches; Plate cap diameter, .500 inch; Base, standard 50 watt. Maximum ratings. For operation at supply Frequency up to 150 cycles and Ambient Temp. Range of 15°-50° C.; Peak Inverse Voltage, 15,000 volts; Peak Plate Current, 6 Amperes; Average Plate Current, 1.5 Amperes; Average Tube Voltage drop, 10 volts. ALL-WAVE RADIO.

[*Continued on page 474*]

Backwash

A Ham To Be

Editor, ALL-WAVE RADIO:

I am only an SWL but I thought that I would write and tell you that "Barb" and "Ernest" have been the sole means of raising my code speed to 10 words/min. I have read only two issues of AWR but wish I had found out sooner that such a FB "mag" was on the stands.

Tell "Beat Note" to keep up the fine work. That story in August AWR was the "Besta of the Mosta."

One thing that I notice is the lack of photographs. But that is offset by the abundance of A-1 reading matter. Keep needless pictures out of your Mag. Readers want something to read when they buy a "mag"—not a picture book.

I have no "raspberries" for you because AWR is the "Acme of Perfection" from cover to cover. Those other readers who threw "raspberries" at AWR were not satisfied and, I think, never can be satisfied.

I hope "Barb" and "Ernest" keep up their progress and keep on writing to AWR.

R. H. SPOONER,
EVERETT, MASS.

(Barb and Ernest are going great guns, but they'll be plugging for months to come. Beat Note thanks you.—Ed.)

✦

Reception Reports

Editor, ALL-WAVE RADIO:

I should like to express my appreciation for Mr. Hind's monthly article in ALL-WAVE RADIO. The station list (which I assume is traceable to him) is, in my opinion, the most accurate of all such monthly lists.

My reason for writing is, however, to inquire whether you might not be interested in doing a bit of research and publishing the results in the "Globe Girdling" column. So far as I have noticed no magazine has polled leading short-wave stations as to whether they published advance program information and if so, what steps are necessary for the American listener to procure the same. You are undoubtedly familiar with the advance sheets of the BBC, Reich, etc., but most of the listeners I contact are not acquainted with the fact that such services are available and seem greatly interested in subscribing. Could you not set aside a small block in the next article and include what data you have as to addresses, cost, etc., and close with a plea for additional data?

Another point of service (though not to the general reader) which occurs to me is that of publication of comprehensive receiving reports on a particular station in each band for the 30 days preceding the report. For example, I have a record on the 19-meter "Radio Colonial" running back some months, the report for each day including R and A ratings, fading, static, weather conditions, etc. I should be greatly interested in seeing a parallel report on this station as compiled by a New York listener, a Chicago listener, a San Francisco one, etc. Such a mass of data could readily become a nightmare, proving absolutely nothing if misdirected. On the other hand, I think such material, properly supervised and edited, would be of considerable importance in educating the radio manufacturer and John Q. Public as to what to expect from his short-wave bands.

I do not suggest this with any idea of research into correlation between signal strength and weather conditions, or any other such technical problem. It seems to me that RCA in its communication division would be the proper agency for carrying out such research, and for all I know they may have such records, including scientific measurements of volume, degree of fading, Heaviside layer or layers data, etc. If RCA has completed such studies, abstracts of the same ought to be prepared and published.

DAVID H. MCKINLEY,
CLEVELAND, OHIO

(Mr. Hinds has promised to compile a list of stations and organizations providing advance program data. Your suggestion regarding reception reports is in line with our own plan, outlined in this issue. We trust something comes of it. That will depend upon the co-operation we can obtain from our readers. A great deal of data on radio signal surveys appeared in the series of articles, "Radio and the Atmosphere," by J. L. Richey, published in recent issues of AWR.—Ed.)

✦

From an Ama-CHEWER

Editor, ALL-WAVE RADIO:

I first heard of your magazine from Mr. Hinds with whom I have had a somewhat casual correspondence.

That idea of your guiding Mr. and Mrs. Rowland through to getting a license is a fine one, both from the publicity standpoint, and in encouraging those who have been a little shy about becoming amateurs. However, I hope—and other hams will probably hope—that too many do not become encouraged, as with 40,000 hams on the air the bands are pretty well jammed now.

I like 75 m. fone, but there are so many signals, it is hard to make a contact due to QRM. In fact, among amateur circles, there's a tendency to discourage too much effort to induce more people to become hams. With about one hundred applications coming in daily at Washington, the bands will soon become choked.

I hope to be able to contact those would-be hams if they start off on 160 m. fone as I operate on that band as well as 75 m., and expect to be on 20 m. soon.

I became a ham after visiting one of six amateurs who reported on a test I arranged to clear Irvington of at least one source of noise. I began learning code when the sponsor, a co-owner of a radio parts store, phoned me to see if I was interested in attending his new class. My attendance of the big Perth Amboy ham-fest later on settled any doubts, and I then studied harder and became an ama-CHEWER. I wish Mr. and Mrs. Rowland all the luck in their venture.

There's one thing which doesn't seem right in your cooperation with the Rowlands. You plan to design, build, install and adjust the transmitter for them. Now, frankly, aren't you depriving them of valuable experience? When I started out, I built my own transmitter for fone, designing it with the help of an amateur. Before I got the bugs removed and everything working all right, I wished I had bought a transmitter. But now, I wouldn't buy a transmitter unless perhaps I had sufficient money to have something specially built according to my own specifications.

I am planning a new outfit, using 500 watts, as soon as I have the cash. I am designing it myself. Then I'll be thoroughly familiar with it and its operation and will know where to look for trouble when it arises. At least they won't say about me what was said about a well-known ham here who recently increased his power, using a new transmitter. A number of hams asked who built it for him and put it in, implying he didn't have the knowledge or ability.

Commercial outfits are all right, but only by actually building up a transmitter can one learn what cannot be gathered from books or in other ways.

CLEMENT VAN VELSO, *W2HNX*
IRVINGTON, N. J.

(We're going to make Barb and Ernest —it will probably be Ernest who will do the dirty work—build their own equipment, but we'll design it for them and check it before plate voltage is applied. We'll also make sure that the rig is properly adjusted before it is put on the air, but we'll make the Rowlands follow the procedure so they'll know what is being done, and why.

The 20, 75 and 160-meter fone bands are admittedly overcrowded. These channels may be relieved somewhat if there is an exodus to the 5 and 10 bands. Five is hot, but dirty, but it can hold a raft of stations if only the transmitters are cleaned up. Moreover, it is a cheap band to get into.

In any event, the new crop of hams are a serious-minded crew. The dabbler hasn't the gumption to condition himself

[*Continued on page 474*]

Readers' Data Bureau

JOSEPH CALCATERRA — DIRECTOR

ANY of the catalogs, booklets and folders listed in this department may be obtained by ALL-WAVE RADIO *readers simply by filling in the coupon and drawing circles around the numbers listed in the coupon corresponding to the numbers of the items desired, and mailing the coupon to Readers' Data Bureau,* ALL-WAVE RADIO, *16 East 43rd Street, New York, N. Y.*

A complete stock of these catalogs and other literature is kept on hand and will be sent in answer to requests as long as the supply lasts. There is no limitation on the number of items you may ask for, but to avoid waste please do not ask for material in which you are not actually interested.

Only the literature listed in this issue is available. Please do not ask for catalogs which are not listed. Do not include letters for information from other departments with your request for booklets as that will cause delay in answering your inquiries.

✦

2. HAMMARLUND CATALOG. A complete, 12-page catalog containing specifications, illustrations and prices of the entire line of Hammarlund variable and adjustable condensers; intermediate-frequency transformers, coils and coil forms; sockets; shields, chokes and miscellaneous parts for broadcast, short-wave and ultra-short-wave reception and transmission. Also contains description and prices of the Hammarlund line of "Comet Pro" and "Super Pro" receivers.

✦

5. ELECTRAD VOLUME CONTROL AND RESISTOR CATALOG. Contains full engineering and servicing data and prices on Electrad standard and replacement volume controls, Truvolt adjustable resistors, vitreous wire-wound fixed and adjustable resistors and voltage dividers, precision wire-wound non-inductive resistors, center-tapped filament resistors, high-quality attenuators, power (50 and 150-watt) rheostats and other Electrad resistor specialties.

✦

57. AMPERITE MICROPHONES AND HOW TO USE THEM. Describes the entire line of Amperite Velocity Ribbon Microphones and gives instructions and wiring diagrams on how to use them to best advantage.

✦

59. THE EVOLUTION OF TUBE TESTING. This interesting booklet, published by the Supreme Instruments Corp., gives a complete technical description and operating instructions on the Supreme Model 89 Radio Tester for testing all tubes, and also paper and electrolytic condensers.

✦

65. SUPREME TESTING INSTRUMENTS. Complete information on the entire line of Supreme testing instruments is given in this catalog which covers technical descriptions, prices and features of the Model 385 Automatic Tube Tester and Analyzer, the Model 339 DeLuxe and Standard Analyzers, and other standard Tube Testers, Set and P. A. Analyzers and Signal Generators. Complete details are given of the Supreme Easy Payment Plan for purchasing testing equipment on the installment plan.

✦

67. PRACTICAL MECHANICS OF RADIO SERVICE. A very informative and valuable booklet which gives complete information, including cost, features and

ALL-WAVE RADIO READERS' DATA BUREAU,
16 EAST 43RD STREET,
NEW YORK, N. Y.

AR-1036

Please send to me, without charge or obligation, the catalogs, booklets, etc., the numbers of which I have circled below.

2 5 57 59 65 67
69 73 74 75 76

My connection in radio is checked below:

( ) Service Man operating own business (IS)
( ) Service Man for manufacturer (MS)
( ) Service Man for jobber (JS)
( ) Service Man for dealer (DS)
( ) Service Man for servicing company (SS)
( ) Dealer (D)
( ) Jobber (J)
( ) Short Wave Listener (SW)
( ) Broadcast Listener (BC)
( ) Experimenter (EX)
( ) Professional Set Builder (SBP)
( ) Amateur Set Builder (SBA)
( ) Licensed Amateur (LA)
( ) Station Operator (SO)
( ) Radio Engineer (RE)
( ) Laboratory Technician (LT)
( ) Public Address Worker (PA)
( ) Manufacturer's Executive (ME)
( ) Student (S)

I am a:
( ) Subscriber
( ) Newsstand reader

I buy approximately $ .00 of radio material a month. (Please answer without exaggeration or not at all.)
(Please print name and address)

Name .....
Address .....
City .....State .....

Avoid delay. The catalogs and booklets listed are now in stock and will be sent promptly as long as the supply lasts.

outline of lessons of the Frank L. Sprayberry course in Radio Servicing. A list of Sprayberry Data Sheets for modernizing old radio equipment is included.

✦

69. YOUR FUTURE IN RADIO. The many opportunities which the radio industry offers to ambitious men are described in detail in this interesting 32-page book published by the Sprayberry Academy of Radio. Each specialized radio field is described and its opportunities discussed. The book also gives information on the New Sprayberry Course in Radio Service Engineering which includes all standard equipment and supplies for the practical work required in mastering the course and going into business.

✦

73. HOW TO ELIMINATE RADIO INTERFERENCE. A handy descriptive folder of the Sprague Interference Analyzer showing how it can be used to locate various sources of radio interference and pointing out the remedies which can be used to eliminate the different types of radio interference.

✦

74. SPRAGUE ELECTROLYTIC AND PAPER CONDENSER CATALOG. The complete Sprague line of paper and wet and dry electrolytic condensers are listed in this catalog together with technical specifications and list and net prices. Information on the Sprague Capacity indicator for making capacity tests on condensers and in servicing radio receivers is included.

✦

75. TEL-U-HOW CONDENSER GUIDE. A valuable chart, compiled by the Sprague Products Co., which tells the proper types, capacity values and voltages of condensers required in the various circuits of radio receivers and amplifiers. It includes data on condenser calculations and information on how to locate troubles due to defective condensers.

✦

76. FACTS YOU SHOULD KNOW ABOUT CONDENSERS. This folder, prepared by the Sprague Products Co., explains the importance of various characteristics of condensers, such as power-factor, leakage, capacity and voltage in determining the efficiency or suitability of a given condenser to provide maximum filtering and safety in operation.

BACKWASH

[*Continued from page 472*]

for the exam and the now required speed of 13 wpm. So don't worry too much about the newcomers.

A home-built rig is the nuts, but there's two sides to every (most every) modulated carrier, and the other side is simply the fact that many hams well versed in the technical ramifications are still poor hands at building or lack constructional facilities—so they buy complete jobs. Still other hams are interested only in rag chewing, and you can't blame them for that.—Ed.)

ON THE MARKET

[*Continued from page 471*]

Electro-Dynamic Replacement Speakers

COMPLETELY NEW series of 6, 8 and 11 inch electro-dynamic replacement speakers with convenient changeable field coil feature is announced by the Oxford-Tartak Radio Corporation, of Chicago, makers of Oxford Speakers.

Aside from new design and construction features which make for improvement in tone quality, sensitivity and power handling capacity—this new type speaker permits a quick easy change of field coil, if necessary, to secure the proper combination of transformer and field "for the job" when needed. No centering is necessary. Each unit is self adjusting, so that the voice coil remains centered—and the use of a Universal Transformer permits perfect matching of any tube. The speakers may be used for a-c with an Oxford Field Exciter. *All-Wave Radio.*

✦

UTC Equalizer Bulletin

UTC HAS JUST announced the release of a new bulletin covering equalizers and filters for broadcast, recording and similar service. A complete analysis of various types of filters and their application is given with schematics, frequency curves, and description of the standard items they manufacture. Included in this leaflet is data on simple equalizers—resonant equalizers—universal equalizers—divider networks—application of equalizers—high Q coils—band pass filters—band elimination filters—low pass filters—and high pass filters.

A limited number of copies is available. Write to United Transformer Corp., 72 Spring Street, New York City. ALL-WAVE RADIO.

✦

Lifetime Velocity Mike

THE LIFETIME CORP. of Toledo, Ohio, announces the development of a new type of Velocity Microphone—radically different in design yet incorporating the latest engineering improvements in this type of microphone.

The basic principles of this new microphone eliminate many of the inherent faults of a pressure operated unit in that it contains no stiff diaphragm with its basic resonance peaks, but depends on the actual velocity of the sound wave actuating a lightly floating ribbon with no resonance point of its own for excitation.

Due to an entirely new structural feature developed and used exclusively by Lifetime there is no accentuation of the base response even when working very close to the microphone. The new unit will withstand severe abuse, is without internal or background noise in operation, and is entirely unaffected by change of

temperature or humidity. The directional characteristics of this microphone reduce feedback to an absolute minimum, allow radically higher gain, and decrease extraneous noises in installations where the unit must be operated near the speakers and background level is high.

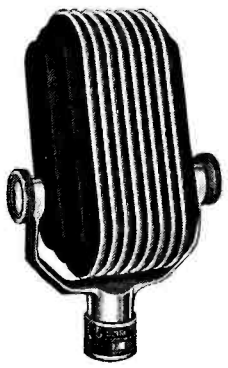
Lifetime Model No. 70 is furnished in either a high-impedance unit operating directly to grid, or in a low-impedance unit to operate into a 200 or 500-ohm line.

The Grid unit has an output level of minus 58 db and a frequency response of 48 to 12,000 cycles, while the line job has an output of minus 64 db with the same frequency response. ALL-WAVE RADIO.

✦

New Electro-Voice Mike

THE ELECTRO-VOICE Mfg. Company, Inc., 324 East Colfax Avenue, South Bend, Indiana, announces the new "K" Series Velocity Microphones. It is a low priced companion line to the present "V" Series. The housing is streamlined to give correct acoustic con-

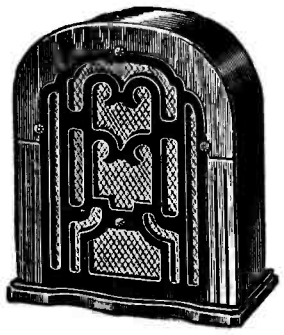


ditions and smart appearance. Three models are available. Furnished complete with 8′ cable, dual shock-absorber and locking cradle. Standard output impedance is direct-to-grid. Finish is black and chromium. Adaptable to quality reproduction of voice and music. ALL-WAVE RADIO.

✦

New Oxford Magnetic Speakers

A NEW SERIES of improved magnetic speakers—for Midget a.c., a.c.-d.c., and Battery Sets—for Hotels, Schools, Announcing Systems, and other multiple-unit P.A. installations—and for extension use on any home or auto radio set—is announced by the Oxford-Tartak Radio Corporation, 915 W. Van Buren St., Chicago.



These Oxford reproducers are available in 5", 6½" and 8½" models. They have heavy pressed steel cadmium plated frames, heavy magnets with improved balanced armature unit, and extra-flexible diaphragms.

Of special interest are the complete cabinet units—handsome, substantial, modern Square-Type and deluxe Gothic-Type cabinets equipped and fitted with these new Oxford speakers. The square-type cabinet has the same style grille in both front and back, so that it presents an all-round "finished" appearance from any view and therefore may be placed on a table or anywhere in any position in any room.

The square cabinet type also may be had with a volume control and on-off switch. This allows complete control of volume from minimum to maximum right *at the speakers*. When the volume control switch is turned off, loading resistor is thrown across line to take the place of speaker resistance so that the volume of any other speakers on the line will not be affected.

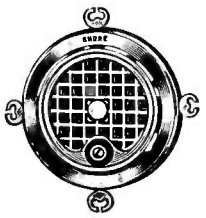
The cabinets are attractively finished in walnut. The grilles are backed with gold bronze silk cloth. Completely equipped with felt mounting feet on base, and with two-conductor flexible cord.

Illustrated catalog sheets giving full details are available on request. *All-Wave Radio.*

✦

New Shure Carbon Microphones

A NEW SERIES of inexpensive two-button carbon microphones with improved constructional features is announced by Shure Brothers, "Microphone Headquarters," 215 W. Huron Street, Chicago, U. S. A. The new models are mechanically rugged and are very attractive in design. They have a frequency characteristic which compares favorably with that of much higher priced instruments.



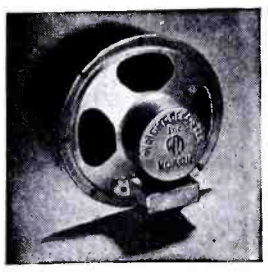
Model 3B is designed for spring suspension in standard carbon microphone rings. The unit has a rigid cast frame, 3 inches in diameter with a protective grill in front through which sound is admitted to the diaphragm. The finish is bright nickel-plate overall.

Model 10B is a convertible hand microphone which is readily adapted for stand mounting with spring suspension by removing the head and inserting four "Quickway Hooks." The microphone is finished in bright nickel-plate with black enameled handle and measures 8⅞ inches in length overall. Furnished complete with 6 feet of 3-conductor cordage and 4 "Quickway Hooks" for stand mounting.

Model 10BS is similar to Model 10B, but includes a built-in, concealed switch which automatically cuts out the microphone when the unit is placed in a horizontal position. *All-Wave Radio.*

Nokoil Reproducers

THE NEW ALNICO Magnet which is composed of three different materials, aluminum, nickel, and cobalt, furnishes an extremely high flux density in the new Nokoil Reproducers.



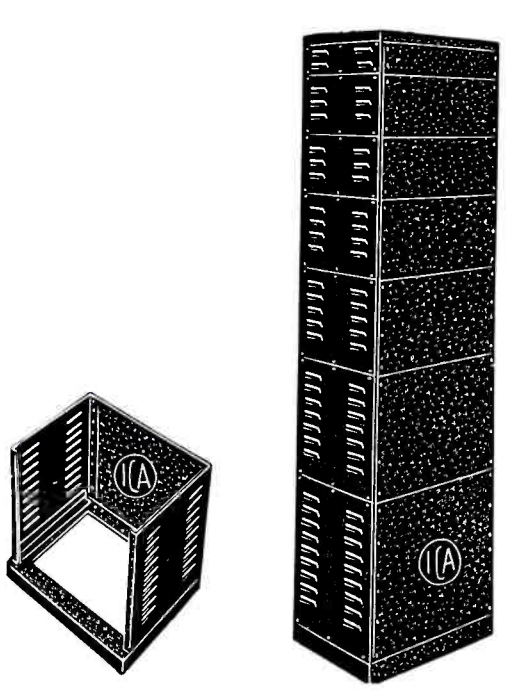
Not very long ago it would have been considered an absolute impossibility to secure sufficient flux to attain electro-dynamic speaker performance with a magnet as small as that used in the Nokoil.

The Nokoil Reproducer is even smaller in depth than an electro-dynamic speaker of equal size. Literature fully describing this new unit will be mailed to you free of charge by Wright-DeCoster Inc., St. Paul, Minnesota. *All-Wave Radio.*

◆

Sectional Standard Construction Rack

CONSTRUCTORS OF rack and panel jobs have long felt a need for a system which would allow any desired height rack and panel to be built using standard knock-down parts.



I. C. A. presents such a useful item in the I. C. A. Sectional Standard Construction Rack. In this ingeniously designed rack, any desired number of standard panels of any desired standard size may be accommodated simply by mounting together the requisite sections, which are available in as many sizes as there are standard panel widths.

The constructor starts with the foundation units comprising a base 20" x 15¾" x 2½" and a top 20" x 14¾" x 1¼". To construct a complete single panel rack, two sectional side walls and a back of the same height as the panel being used are obtained. The sectional side walls and the backs come in the same eleven standard sizes as do the panels. To make a multi-panel rack it is therefore only necessary to obtain sectional side walls and backs of the same height as each panel and to bolt them together. By an unusual feature of design the I. C. A. Sectional Standard Construction Rack may be used with either Bureau of Standards or Stromberg Carlson (W. E. Type) Panels.

The I. C. A. Sectional Standard Construction Rack is assembled easily with a screw driver and when completed forms a fully enclosed rack of professional appearance. The rack has a highly durable black wrinkle finish. Both sides and rear are sufficiently louvred for ventilation. *All-Wave Radio.*

◆

New Amplifier Circuit

A NEW AMPLIFIER circuit employing the popular 6B5 tubes in push-pull has just been released by Jefferson Electric Company, Bellwood, Illinois, and described in detail in Bulletin PA-11. This circuit features a double channel input from low and moderate level sources with gains of 138 or 98 db. Input from either channel is controlled by a single center-tapped potentiometer. Flat frequency response and low harmonic distortion contribute to give an amplifier of exceptional tone quality at all output levels.

This amplifier is adaptable to all types of public-address and station amplifier work, the output being sufficient for one to four dynamic speakers.

High quality, low cost Jefferson components consist of the power transformer, two chokes, input and output audio transformers, the chassis base and the fuse and fuse block. A template furnished with each chassis base simplifies assembly and assures every constructor a perfect performing amplifier. ALL-WAVE RADIO.

◆

New Presto Catalogs

TWO NEW catalogs describing in complete detail the latest developments in equipment, discs and parts, for the instantaneous recording and transcription fields, is announced by the Presto Recording Corp. Copies furnished upon request at 139 West 19th Street, New York City. A special article on instantaneous recording prepared by their chief engineer, is also available.

"ON THE NOSE"

[*Continued from page 432*]

This article has been written as a non-technical explanation of present-day radio broadcasting procedure in an attempt to point out as clearly as possible, the great importance and relative value of time as it is used in the broadcasting business. The precision with which the far-flung networks of radio broadcasting stations are co-ordinated is today really

a miracle that is taken for granted. It will be superseded only when and if chain station synchronization becomes a standard practice. Some development and research has been carried on along this line by the major networks and in the laboratories of manufacturers of radio broadcasting equipment. There are things to be said on both sides for and against this type of network control. But let's not become technical at this time!

THE "X" BAND

[*Continued from page 434*]

shelter or smoke of cities or other "civic bodies," shall we say.

Note of Advice

You will note that all this mentioned refers to weather reports, not forecasts. These data are used by airway weather bureaus and transport companies in preparation of forecasts which at present are not broadcast over the system. So on phone we will not expect to hear forecasts but only reports. As for code, that is something else again. Not all the voice is confined to weather work, however. Sometimes one can hear the beacon station "working" an airplane that has called him for ground wind or other advice. Only one side of the conversation would be heard unless a short-wave set were also tuned to the plane transmitter which might be on a commercial aero frequency or be on the national itinerant plane frequency of 3105 kc.

Those exploring the band will run across other signals that may or may not come under this classification. Many beacon stations not listed may be heard, but they have no set schedule for broadcasting wx sequences, though they may do so. Another type of station is the marker beacon, with a local range of 15 miles, so called because they are intended to mark certain junction points on the airway. It should also be remembered that the regular stations are only designed to have a satisfactory operating range of about 250 miles although they may be heard much farther at night.

How It Got Its Name

We must confess here that we do not know just why the band was called the "X" Band. Perhaps, as in our old algebra books, "X" represents the unknown. If so, we hope to have dispelled some of the mystery. We suspect, however, that it came from the abbreviation "wx" which means weather in many codes. But then again it may have been nicknamed that by the scientist who had just gotten through the job of naming some of the Kennelly-Heaviside layers!

GLOBE GIRDLING

[*Continued from page 440*]

vius, Hollywood, California; Marshall C. Neel, Modesto, California; Arthur Bickhart, West Reading, Pennsylvania; and to extend to them and many others the thanks of ALL-WAVE RADIO and the writer for their kindly assistance and encouraging comments.

Please bear in mind that we invite your criticisms, for by them we will be able to improve this department. Information as to changes in time schedules, frequencies or other notes of interest from our many readers, will be gratefully received.

As heretofore, we will continue to answer all questions pertaining to reception, unknown stations, or station matters in general. Address your letters to me at 85 St. Andrews Place, Yonkers, New York, enclosing self addressed stamped envelope in case you desire a reply. All questions of a technical nature should be forwarded to Queries Editor, ALL-WAVE RADIO, 16 West 43rd Street, New York, N. Y.

THE AWR 2-3

[*Continued from page 448*]

The antenna used for the air tests was a 20-meter Johnson Q. This antenna has been found, under actual operating conditions, to be the most efficient type tried. Reports run one to two R's better than with any other antenna.

With the r-f section all tuned up, and the antenna coupling adjusted for a plate current of 175 ma on the final, the speech amplifier and modulator were turned on. The minimum plate current reading for the RK-31's was 30 ma. Turning the gain control from minimum to maximum showed no deviation from this reading, indicating complete lack of any tendency to feedback. With the gain control set for a swing of the modulation meter to around 200 ma on speech, the oscilloscope showed 100% modulation on peaks. The monitor indicated excellent quality and the rig was ready to knock off a few fone QSO's.

Results

The transmitter was first put on the air at about 5 P.M., Eastern Daylight Saving Time. A quick listen showed conditions to be poor, most of the fone signals being "in the mud". Exercising the prerogative of a new transmitter test, a CQ was called . . . and nothing happened. Rather disappointing. Then SU1CH, in Cairo, Egypt, was heard finishing up a fone QSO with another station. He was given a blind call, and came right back, with a report of QSA4, R6. A two-way fone contact with Egypt for the first QSO with a new rig is not to be sneezed at and we felt a lot better. A later contact with a W9 gave us a report of fine quality and R8 signal strength. Later in the evening the transmitter was tuned up on 20-meter C.W. and U2NE and PAOMDW were

worked. The next morning the first CQ brought an answer from VE1DR, who reported us R9, while his sigs were pretty far down. The next CQ raised W7EXK, who reported R9 sigs with some fading. A W7 contact on fone is somewhat unusual in the morning from the East coast. From the SU1CH contact through eight QSO's were had without a miss.

These results of the first fone tests are given as a rough idea of what a good 150-watt fone signal will do even when conditions are not of the best. A station cannot be worked on every call, even with a West Coast kilowatt, but the 150-watt carrier will provide a good percentage of stations called-to-worked.

Speech Equipment

The RK-31's only need 900 milliwatts, which is 9/10 of a watt drive from the speech amplifier, according to ratings. The amplifier used, being the one used to modulate the AWR 2-3 unit, has an output in excess of 15 watts. Just how far down the gain control must be turned with a high-gain crystal microphone we cannot say, as the Turner Hi-Level microphone was not available for these tests. A Brush four-cell high-fidelity crystal microphone belonging to a 1-kw fone rig which was also being tested, was used. The output level of the Brush microphone is only minus 90 db, as compared to a level of minus 55 db for the Turner. But as long as the full output of the speech amplifier was not necessary the Brush microphone had more than enough output to fully drive the RK-31's. This means that any type of crystal microphone can be used with this transmitter and have sufficient output.

LIST OF PARTS

High-Voltage Supply

BIRNBACH
5—Type 4125 Feedthru Insulators
CORNELL-DUBILIER
1—Type TD-20020 Filter Condenser, 2 mfd at 2000 v. working.
1—Type TA-20040 Filter Condenser, 4 mfd at 2000 v. working.
HAMMARLUND
2—Type S4 Isolantite 4-prong Sockets.
LEEDS
1—Black Crackle Finish Steel Panel, 10½" x 19".
1—Black Crackle Finish Steel Chassis, 17" x 12" x 2".
1—Pair Large Brackets.
RAYTHEON
2—Type 866-A Rectifier Tubes.
UNITED TRANSFORMER
1—Type PA-112 Power Transformer, 1250 or 1400 v. (a.c.) at 400 ma.
1—Type CS-303 Smoothing Filter Choke, 500 ma.
1—Type CS-306 Swinging Filter Choke, 500 ma.
1—Type CS-404 Filament Transformer, 2.5 v. at 12 amps, 10 v. at 6.5 amps.
WARD LEONARD
1—Filament Rheostat, 100 Ohms.
2—Bleeder Resistors, 25,000 Ohms, 160 Watts.
MISCELLANEOUS
1—SPST Toggle Switch.
1—DPDT Toggle Switch.
1—DPST Toggle Switch.
3—A.C. Outlets.

High-Power Modulator

BIRNBACH
1—SPDT Porcelain Knife Switch.
2—Type 458 Feedthru Insulators.
8—Type 4125 Feedthru Insulators.
GENERAL RADIO
1—Type 637A Knob With Pointer.
HAMMARLUND
2—Type S4 Isolantite 4-prong Sockets.
LEEDS
1—Black Crackle Finish Aluminum Panel, 8¾" x 19".
1—Black Crackle Finish Chassis, 17" x 10" x 2".
1—Pair Small Brackets.
RAYTHEON
2—Type RK-31 Modulator Tubes.
TRIPLETT
2—Type 331 Three Inch A.C. Voltmeters With 0-15 Scale.
1—Type 321 Three Inch D.C. Milliammeter With 0-300 Scale.
UNITED TRANSFORMER
1—Type CS-408 Filament Transformer, 7½ volts at 6.5 amps.
1—Type PA-59 Input Transformer, 500-ohm line to RK-31 Grids.
1-Type VM-4 Varimatch Output Transformer.
WARD LEONARD
1—Filament Rheostat, 100 Ohms.
MISCELLANEOUS
2—A.C. Outlets.

Antenna Panel

BIRNBACH
6—Type 430 Standoff Insulators For Mounting Condensers.
2—Type 432 Standoff Insulators For Mounting Coil.
2—Type 433 Standoff Insulators For Antenna Connections.
1—DPST Porcelain Knife Switch.
CARDWELL
2—Type XT-220-PS Tuning Condensers, 220 Mmfd.
GENERAL RADIO
1—Type 677-U Coil Form.
2—Type 717-A Dials.
LEEDS
1—Black Crackle Finish Aluminum Panel, 10½" x 19".
TRIPLETT
2—Type 341 Three Inch Thermocouple Meters With 0-2.5 Amp. Scales.

Relay Rack

LEEDS
1—Rack With 66¾" Panel Mounting Space.

QUERIES

[*Continued from page 452*]

ground in a good electrically conductive condition.

An excellent type of $CuSO_4$ or NaCl (salt) ground can be made with an iron pipe into which a goodly number of ¼-inch holes have been drilled throughout its length. The end to be inserted into the ground should be hammered flat or forced into a point. After driving into the ground, a ground clamp is fastened to the projecting end, and the chemical solution poured in with the aid of a funnel. The funnel should be fastened permanently, so that water will be introduced into the pipe when it rains. During periods of fairly heavy rain, the pipe should be filled with salt or $CuSO_4$. The rain will do the rest. A sketch of such a ground is shown in Figure 1.

In dry locations, where a ground is not essential for stabilization or hum elimination, a counterpoise will give excellent results—the counterpoise consisting of a single wire about the same length as the aerial and stretched fifteen to twenty feet underneath. It need not be directly under the antenna. If more convenient, the counterpoise can be buried in a shallow trench. It is immaterial whether it makes electrical contact with the ground (earth) or not. The counterpoise, of course, is connected in place of the ground.

With the doublet type aerial very often a good ground is not required—the ground having nothing to do with the signal pick-up. However, it may be necessary for stabilization and hum elimination.

$CuSO_4$, incidentally, is a poison, and it should not be used too close to a well. (In most cases where a well is available, the well, itself, can be used as a most excellent ground.) All foliage will be killed within a radius of several feet of a $CuSO_4$ ground.

Question Number 16

"I am experiencing considerable noise with a very expensive receiver. Is there any simple test that I can make to determine if the noise is coming over the power lines—as I suspect to be the case? —*E. H. M., Bronx, N. Y. C.*"

Answer

Yes. Disconnect the antenna and turn on full volume. If the noise is absent, the chances are that it is being picked up by the aerial system. If it persists, the trouble is either in the set or the power lines. Whichever it is can be determined by operating your receiver in another locality, or another receiver in your home.

These tests are not always conclusive. Noise can be radiated from the power line and picked up only when the antenna is connected to the receiver. In many instances it may take an expert to locate the source of noise.

If the trouble is in the power line, it will be best to call in a radio serviceman who is also an electrician to inspect your house wiring before complaining to the power company. The responsibility of the power company ends at the cut-out box in your house.

NIGHT-OWL HOOTS

[*Continued from page 443*]

with his great work in the field of DX and someone must be found to carry on with the CDXR—or else . . . The Globe Circlers DX Club announces that Mr. W. H. Wheatley is not connected with their organization any longer and the new headquarters are at 1652 Radcliff Ave., Bronx, N.Y.C. A sample copy of the club bulletin will be sent to any DXer upon request by Raphael Geller, Sec'y-Treas. of the club. . . . Add little things which irk us: The boastful manner in which the WNEW announcers shout at each station break, "On the air 24 hours a day." . . . XEP is a new Mexican on 1160 kc. . . . WMEX can now give many of the other Boston stations the well known ha-ha. While the bigger stations battled with each other and the FCC for more power, little WMEX calmly steps up and acquires itself a choice spot on 1470 kc with 5000 watts! From a practically unknown 100-watter on the end of the dial to a station second in potency only to WBZ in the city of Boston—some jump! Can you hear the gnashing of teeth at the other hub broadcasting houses? . . . KGU was denied permission to use a short-wave relay station on the 25- and 19-meter bands. . . . Westinghouse has added two more stations to its fold: WOWO and WGL in Fort Wayne, Ind. . . . General Electric wants an experimental station on 790 kc to operate between 12 and 6 A. M. . . . An unusual request for a station in a country where everyone is fighting for more power is that of KGA. The Spokane station wants to decrease its power from 5 kw to 1 kw nights. . . . Add to requests for 500 kw: KFI, WOR, and WOAI. . . . Our personal nomination for the cleverest and most individual sign-off in radio: WSB's recording by Lamden Kay. . . . All DXers are cordially invited to send any interesting information to the Chief Night Owl at 135 Highland Street, Worcester, Mass.

THE HAM BANDS

[*Continued from page 449*]

a degree of selectivity in the tuning circuits that is impossible to obtain when a smaller capacity is used across the grid and ground . . . the added selectivity being due, of course, to the fact that less inductance and consequently less resistance is in the circuit at any particular frequency. Dynamic stability in a receiver is just as important as in a trans-

mitter, and since we are able to use a parallel condenser of very low C as a bandspreader, it seems foolish not to take advantage of the greater dynamic stability offered by the larger condenser.

✦

W8NCV OF CINCINNATI, is working 20-meter fone with 100 watts in the plate circuit. He showed us some of his cards when we were down there recently and it looked as if he has something of which to be proud. Carl has always gone in for conservative efficiency rather than large outlay.

Remember when you used to be a private in our National Guard Company, Carl? And we made you study code because the company needed a good radioman?

✦

VE4GY IS GRID-MODULATING a pair of ten's. Says he gets out well with the new rig; and no complaints about the power bill.

✦

A VE2 THAT really works his traffic is VE2DA. FB.

✦

HAVE ANY OF you fellows ever used push-push doubling with a single tube? We have had considerable success using a 46-doubler in this arrangement. The grid coil goes to control grid and screen grid, with a split-stator condenser to tune the circuit. A small midget should be connected across each section to compensate for the unbalanced condition existing between the two grids. Grid No. 1 being closest to the filament has the highest mu, so it receives less voltage than grid No. 2, which has a lower mu, and therefore requires more driving voltage to have an equivalent effect on the plate current of the tube.

✦

HAMS WHO HAVE news they want published while it is still news should write to us and we'll do the rest.

✦

WELL, UNTIL NEXT month we'll be listening for you. Best of 73's. K.

EMBRYO HAMS

[*Continued from page 451*]

frequency current than to a low-frequency current. Or, conversely, a coil having a high value of inductance or a large number of turns will have a greater reactance to the flow of a current of given frequency than will a coil with a low value of inductance or a small number of turns.

We learn from this that a coil with but a few turns of wire would severely retard the flow of a high-frequency current, if not check flow altogether, while its reactance to an audio-frequency current would be negligible.

Critical Frequency

There is one more point—and an important one—to consider in this respect, and that is, a coil of given inductance has a critical resonance point where its reactance is maximum to the flow of an alternating current. This is illustrated in Fig. 13, and shows that the reactance of the coil is maximum at the frequency to which the coil naturally responds, and drops off rapidly at frequencies above or below the point of resonance. It is by means of this property that we are able to tune circuits containing coils in such a manner that the circuits will select a signal on one wavelength to the exclusion of signals on other wavelengths.

The principle may be followed through by reference to the simple receiver circuit of Fig. 14, where A is the aerial, B is the coil and C is the ground connection. The arrow drawn through the coil indicates that it is variable, or in other words, that its value of inductance may be altered, such as by means of a sliding contact. Connected across the coil is the detector, D, whose principle of operation you need not worry about now, and the headphones, E.

Consider the aerial first. It is not a selective agent, and it feeds minute radio-frequency currents not from one, but many, radio signals into the simple receiver circuit. Consequently, if there were no means of selecting one signal from the many, the sounds in the headphones would be a mixture of all the signals.

Selective Circuit

It is the coil with variable inductance that does the trick. If we assume as an example that the inductance of the coil is such that its natural resonance point is at 1000 kilocycles, then we know that it will offer maximum reactance to a signal of that frequency and much less reactance or retarding force to signals of differing frequency, as indicated by the "resonance curve" shown in Fig. 13. The result is that the reactance of the coil is so high to a radio-frequency current of 1000 kilocycles that the current cannot readily flow through the coil to ground. The path of least resistance is then through the detector, D, the headphones, E, and thence to ground. The headphones are actuated by the current flow and therefore signals are heard. On the other hand, the reactance of the coil to signals of frequencies other than 1000 kilocycles is so low that these signal currents are able to reach ground through the coil and therefore do not flow in the headphone circuit. By the same means, if the inductance of the coil is varied so that its reactance is maximum at 1500 kilocycles, a signal of that frequency will be heard in the headphones, and signals of all other frequencies will readily pass to ground through the coil. Thus, in each instance, the inductance of the coil is so adjusted that the reactance of the coil to the desired signal will be maximum, and so long as this condition holds, the desired signal will be shunted through the circuit containing the headphones, and signals of differing frequency will be shunted to ground through the coil.

So much for that. Do you find it clear? If not, let me know what points you do not understand and I'll go over them in my next letter at which time we'll get around to other types of coils, and to condensers and resistors.

Gerald.

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