ALL-WAVE RADIO

MARCH • 1937

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for broadcast and short wave

THE "FLEXIBLE 400"
10-meter fone transmitter

QRR TRANSMITTER
for emergency traffic

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(Name on Request).

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Edited by M. L. Muhleman

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ALL-WAVE RADIO

Reg. U. S. Pat. Off.

VOLUME 3 • NUMBER 3

GENERAL

PUBLISHED MONTHLY by the Manson Publications Corporation, 16 East 43rd Street, New York, N. Y. Entered as second-class matter August 27, 1935, at the Post Office, New York, New York, under the Act of March 3, 1879. Additional entry, as second-class matter, at East Stroudsburg, Pa., August 27, 1936. M. L. Muhleman, President and Secretary; Edwin W. Lederman, Vice President and Treasurer.

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COVER

Waters of the Ohio river rushing through a break in the Beechmont Levee at Cincinnati (Photo by Acme Newspictures)—and staff Sergeant Augustus Erke at amateur station W8MGD-DB, in Cincinnati.

FEATURES

DEPARTMENTS

A NEW MEMBER OF AN ILLUSTRIOUS FAMILY!

The SKY CHALLENGER

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Hallicrafters sensational new Communications Receiver

The SKY CHALLENGER takes its place among the famous Hallicrafters' Communications Receivers, representing a new high in amateur radio values! It offers everything needed for precise, accurate tuning,—greater sensitivity and selectivity, a tuning range from 38 M C to 535 K C (7.9 to 540 meters) with no gaps, covering all active amateur bands including the 10 meter band.

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CONGRATULATIONS, AMATEURS!

Amateur Radio has covered itself with glory! The recent flood disaster proved that amateurs can be depended upon in an emergency. They gave unstintingly of their time and skill when other communications were destroyed.

At left, W9NLP, Chicago, one of many amateurs who kept communications alive during the flood.

All Hallicrafters Receivers Now Available on New More Favorable Time Payment Plan.

THE SUPER SKY RIDER

An 11-Tube 5 Band Superheterodyne, tuning from 40 M C to 535 K C in 5 bands. America's most outstanding communications receiver.

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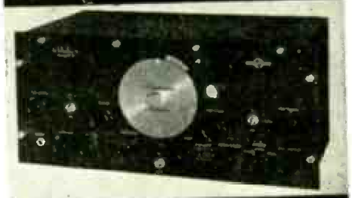

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A 10 - Tube 4 Band Superheterodyne designed especially for Ultra High Frequency reception. Tunes from 3.76 to 53 meters.

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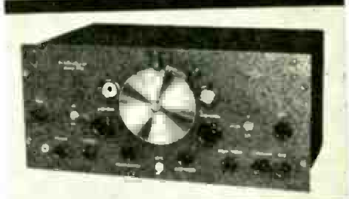

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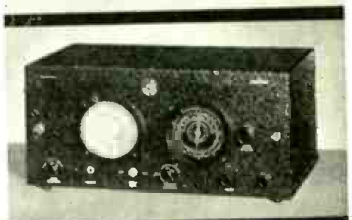

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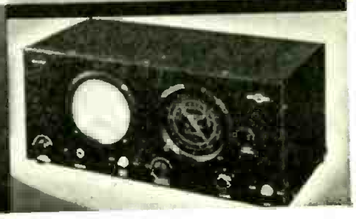

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EDITORIAL QUOTES

BY THE EDITOR

HAMS and the FLOOD

Amateur station W8ESN, and the boys who handled the flood traffic. From left to right: Paul Luckman, W8KPH; Lee R. Kemberling, W8ESN; and Ed. Melville. *(Photo courtesy Toledo Blade.)*

AGAIN raging waters have brought tremendous loss and deep misery to the peoples of cities, towns and villages within reach of the mighty Ohio and Mississippi rivers. And again the Radio Amateur has rolled up his sleeves and taken over the huge task of establishing an emergency communications network. He has braved danger, gone without sleep and stuck it out all along the line because of an ideal. He has had as a motivating force that has seen him through many a tough spot the bright knowledge that he was upholding a fine and courageous tradition that is a gold thread woven through the history of Amateur Radio.

The thread of gold is unbroken. The Radio Amateur has played his part efficiently, effectively and heroically. How well he has lived up to the traditions of his fraternity are written into the pages of this issue of ALL-WAVE RADIO. We held up the presses so that the inspired, first-hand account, written by George B. Hart, who himself played an active part, could be included.

The story presented by Mr. Hart has been read by Major James W. Glore, Executive Officer of the Ohio National Guard in the Flood Area, and bears his approval as an authentic and true account of amateur activities in that region.

We are also pleased to have the opportunity of publishing a first-hand account of amateur activities in Toledo, written by Mr. J. F. Satterthwaite, a well-known listener and a member of the Radio Signal Survey League. Though Mr. Satterthwaite paints a glowing picture of the unselfish devotion of the Radio Amateur in times of emergency, it should not be lost sight of that Satterthwaite himself played a part by putting his equipment to use as a monitoring station. He and a number of other listeners were thus able to render a public service. Hereafter, it will not be said that the listener cannot also serve!

Mr. Satterthwaite's account follows:

"The following is from an old-time radio operator who couldn't resist setting down his reactions to the fine work the "Hams" did in flood relief.

"A call for help went out over Broadcast Station WHAS; Mayor Miller, of Louisville, made the plea Monday, January 25th. He requested that leaders in all cities send uniformed policemen to Louisville, to relieve his men who had been on duty up to 96 hours.

"One Toledoan who heard the message was Mr. Walter Alexander, a local radio serviceman. He immediately called City Manager Edy of Toledo, Ohio, and suggested that if immediate communication with Louisville was desired, he knew just the man for the job. He referred to Lee R. Kemberling, a city Fireman, W8ESN, one of the oldest hams in point of service, and best known as the "Ever-So-Noisy Fireman of the Air." W8ESN was then on duty at No. 17 Enginehouse.

"As a result of the conversation, City Manager Edy called Kemberling and detailed W8ESN for flood relief work at his home transmitter. Although the transmitter was on 20 meters, with the assistance of Edward Melville, a former A. T. & T. operator, the station took to the air on 75 meters just 45 minutes later, and sent a message to Mayor Miller of Louisville, offering 16 fully equipped men, including officers and policemen.

"Then action started. Ham stations were contacted, regular flood traffic schedules arranged and a complete system set up, consisting of five auxiliary receivers as monitors of stations on schedule, a typist, and additional land wire operators to handle the flood of local calls. Local newspapers gave W8ESN publicity and innumerable calls demanding personal messages were received. The regular staff included relief operators Edward Melville, William Golding, W8GJS, with Paul Luckman, W8KPH. At the listening posts were the writer; S. R. Lewis, the Toledo Radio Club's President and Champion BCB DXer, as well as Joe Solark and numerous other helpers who between them could handle anything that came along.

"Shortly W8ESN was made Official Red Cross Station for Toledo and, governed by Miss B. Ilett, handled the Red Cross traffic. Schedules were maintained with W8LEK Columbus, W8YX Cincinnati, W8DQM Portsmouth, W8PGL, W9AAI and occasional contacts with many others. Marvelous cooperation from the rest of the transmitting local hams was a great factor in reducing QRM and their 'standing by' the essence of ham spirit.

"When you consider that the foregoing story was being repeated in city, village and hamlet all over the area affected by the flood one gets a lasting thrill over the advance of ham radio and the unselfish devotion of the amateur to his hobby."

National Guard Net Control Station AB, at Columbus. Left to right: Corporal Abraham Havens, W8ISK-WLHO, and Sergeant Roger Lindley, W8FJN. (Photo by H. Maxwell, W8VE.)

QRR—

An Official Account Played by the Ham

AS TOLD BY

RAIN! RAIN! RAIN! A continuous downpour. The skies had opened over the Ohio Valley. Then a lull.

Black Sunday

Water rippled through the first floor of the Armory, and outside a sleety snow sent temperatures dropping. Black Sunday, January 24th, had ominously put in its appearance. On that day the ordained and comfortable ways of life suddenly changed for everyone and Amateur Radio began in earnest the job of expediting the evacuation of 780,000 persons from the flooded areas of the Ohio and Mississippi River Valleys.

Amateur Radio had been on the job since Wednesday; on Thursday members of the Army-Amateur, Naval Reserve and National Guard nets were mobilized for the emergency. Black Sunday found them still at their posts; W8KVF, Batavia, Ohio, and the operators at W8MGD, Cincinnati National Guard Armory, had not yet been to sleep. All major stations such as that of the University of Cincinnati, W8YX, had been operating on a regular 24-hour basis. The situation was tense.

At Portsmouth, Ohio, hunger threatened. Boat crews rescued staple goods even as they labored to rescue hundreds of persons who had remained in their homes. Not expecting the river to reach them, old-time residents, who had seen many a minor flood, refused to leave them when first warned.

As the Ohio, abetted by the swollen Scioto River, crept higher inch by inch, however, they began to shout for help. Their plight was made even more desperate by lack of food and heat.

W8DQM Cited

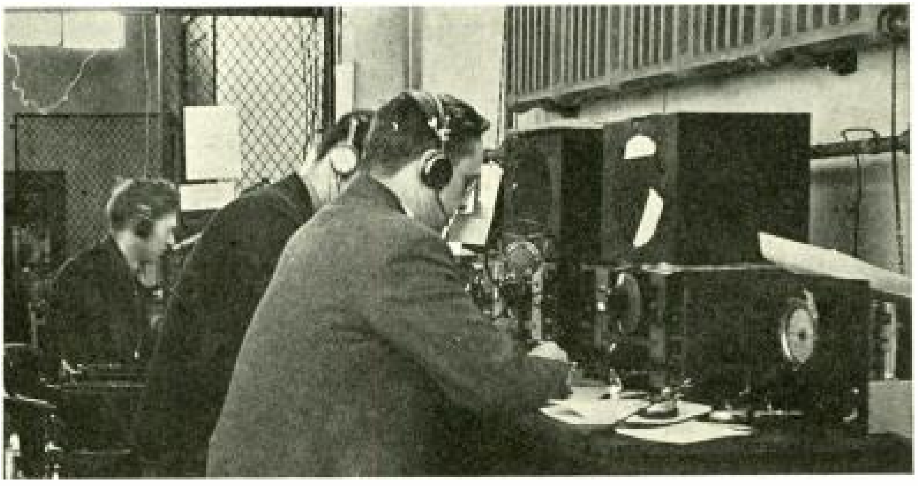
In suburban New Boston, Mayor D. H. Bowling appealed for help, for food and medical supplies. But communication was broken, the lines were out; only amateur stations W8DQM, W8KYQ and W8MRU remained in operation. Of these W8MRU worked night and day maintaining official communication in the National Guard net with Columbus and Cincinnati: W8KYQ assisted in the handling of personal messages on 75-meter phone and W8DQM heroically stuck by his mike from two different locations as the rising waters forced him to higher ground. W8DQM is cited by the National Guard station W8MGD, the U. S. Engineers' station W8FIC, and the U. S. Naval Reserve Station NEG for meritorious service during the flood. At one time he would move only after the water had reached his station. Several members of the U. S. Army Engineering staff at Portsmouth were assigned to help him get established in a new location on a hill overlooking the town. W8MRU operated c.w. on 3525 kc throughout the emergency and did a fine job for the National Guard and Amateur Radio.

As town after town found itself submerged by the record crests of the Ohio River, telephone and telegraph lines went out of service. Deluged with official business and emergency rescue traffic the National Guard and Naval Reserve nets were relieved of the barrage of personal messages that refugees and friends wished to send through W8YX, the University of Cincinnati amateur station under the guidance of that prince of fellows Professor Wm. Carl Osterbrock (W8CAU).

Network Around W8YX

A network of Ham stations was quickly set up with W8YX as the nucleus. By this means vital communication between disaster-ridden communities and the outside world was maintained. Portsmouth, Ohio, Ashland, Maysville, Carrolton and Louisville, Kentucky; Aurora, Lawrenceburg, Vevay, Madison and New Albany, Indiana, were either completely dependent on Amateur Radio, or had such inadequate communication facilities that for days Amateur Radio had to carry the bulk of the important messages.

The network created to handle this



Operating position at W8YX. From left to right: Richard E. Walker, W8BRQ; Professor Bell; Professor Wm. Carl Osterbrock, W8CAU. (Photo by Jacob Marx.)

FLOOD!

of the Dramatic Part in the Flood Area

GEORGE B. HART

Another view of station AB at Columbus, Ohio. The operators are, from left to right, Fred Gardner, W8LPN, and Robert J. Pierson, W8JHE. (Photo by H. Maxwell, W8VE.)

traffic consisted, in the main, of the following amateur stations: W9NKD at Carrolton, Kentucky; W8PGL, at Wheelersburg, just outside Portsmouth, Ohio, where W8DQM and W8KYQ cooperated; W9CHN at Shelbyville, Kentucky, who had access to a land wire into Louisville; W9AEN, Maysville, Kentucky; W9KCZ, Fort Knox, Kentucky; W8LEK, Columbus, Ohio; W8GPE, Detroit, Mich., and W8AZH, Franklin, Ohio. This network was supplemented by Coast Guard Stations LC9X, at Indianapolis, and LC9E at Evansville, Indiana; by Army station WLM at Washington, D. C.; and by broadcast stations WCPO, WKRC, and WLW, Cincinnati; WHAS, Louisville; and WHIO, Dayton. American Airlines placed all of their communication facilities at the disposal of W8YX, which greatly relieved the congestion of traffic to be handled through the station. The American Radio Relay League set up a network of amateur stations throughout New York and New England, to relay urgent messages from or to that area. Canadian Airlines offered the services of their national teletype system to facilitate the transmission of messages. Also available were the police radio systems of both Indiana and Ohio.

The Federal Communications Commission granted W8YX authority to operate on a frequency of 4002 kilocycles, outside the regular amateur bands, so as to provide a clear channel for its messages.

Eastern Network

The Eastern Network consisted of W1SZ, West Hartford, Conn.; W8BHN, Erie, Pa.; W8AOM, Buffalo, N. Y.; W8BRC, Van, Pa.; W2BO, Brooklyn, N. Y.; W3FJU, Allentown, Pa.; W8DJE and W8PX, Pittsburgh, Pa.; and was supported by Detroit's W8GPE, who kept the band clear of QRMing stations. W8AOM and his sister, W8KYR, maintained a 24-hour watch to keep the channel clear for W8YX.

Constant contact on five meters was maintained between W8YX and the local power company, and through that contact only was the power company able to get word to their sources of emergency power supply at Indianapolis and Dayton that all available current should be sent to Cincinnati. The message was relayed through W9AAI, at Fort Wayne, Indiana. When complete failure of electric power in Cincinnati seemed imminent, and the steam-driven generator at the University was rendered useless by the failure of the water supply, the International Harvester Company loaned a 2½-ton tractor to drive the generator. Spare tubes for the 200-watt transmitter at W8YX were loaned by the local broadcasting stations.

The work of W8YX's net was a credit to Amateur Radio. In one instance the Deputy Sheriff at Carrolton, Kentucky, placed a message with W9NKD at 3:22 P.M. At 3:32 the message, which read: "Have ambulance to meet baby at Madison being brought by speedboat from Carrolton. Be there in thirty minutes. Be ready for appendicitis operation," was relayed to W8YX; at 3:35 it was relayed to LC9X, at Indianapolis, who had a direct wire to most points in Indiana, including Madison. At 3:38—sixteen minutes after the message was written—the ambulance was on its way to meet the speedboat, and the hospital at Madison was preparing for an emergency appendicitis operation.

U. S. Engineers' Station, W8FIC. From left to right: Walter D. Wilkes, W8NMS; Roger A. Burrus, W8FIC.

Graphic Messages

Samples of urgent messages handled by W8YX and the network give a graphic illustration of the exemplary work done by Amateur Radio:

"To U. S. Public Health Service, Washington. Send enough typhoid vaccine for eight thousand people to Maysville at once."

"Airplane with serum ready to leave Philadelphia for Louisville. Advise over WHAS where plane should land."

"Send to Carrolton six nurses, serum

Elmer H. Schubert's station, W8NC-AX9B-NEC, at Cincinnati, Ohio.

gitis and smallpox. No cases yet but expected."

W8CXR, at Wheeling, West Virginia, was very active in clearing traffic and, like a true Ham, when he could no longer be of service QRTed to clear the air for those who could. If only there could have been more like W8CXR!

As the river crest went south W9HQD, Harrisburg, Illinois; W9NLP, Chicago, Illinois; W9CJH, Scottsfield, Illinois; W9UWL, Cairo, Illinois; W9EWU, Benton, Illinois; and W9WC, Evanston, Illinois, picked up the work and carried it on. They were helped by W9SYJ, (where Bill Randall did a *swell* piece of traffic handling), W4FK, Memphis, and W4AEE, Nashville. Even W6HJS of Oakland, California, did his bit to aid in the clearance of serum for the flood sufferers.

W8FIC-W8MOL On River Traffic

As W8YX and his net took over the phone traffic, so W8FIC, Cincinnati, established a network to handle river traffic for the War Department's engineers. At Huntington, W. Va., W8MOL did a similar job for the U. S. Army engineers stationed there. W8FIC maintained schedules up and down the Ohio with amateurs and with the USS *Scioto,* the USS *Kentucky,* and a Patrol boat using the call WZBA. W4LU, Signal Mountain, Tennessee, patroled the 3950-kc channel for W8FIC in order to insure the transmission of emergency traffic to the south. W8FIC reports that after the river did fall at Portsmouth, Ohio, the river gauge was found in the top of a tree! Oddly enough, it would seem that long hours agree with Hams for everyone of the FIC staff gained an average of five pounds during the week they were on duty!

The American Red Cross in Cincinnati employed a five-meter net in order to facilitate the rescue of marooned persons. W8FAY was established in the center of the metropolitan district and excellent coverage was had. Mobile units were established aboard boats and automobiles and did excellent work.

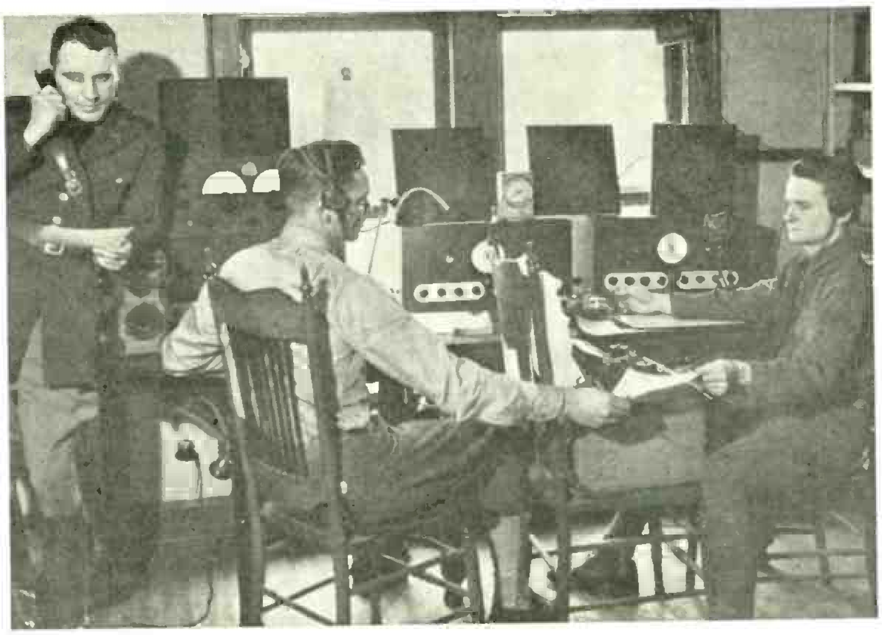
Heroic WLHI Crew

With the exception of the splendid work done by W8YX and W8FIC and their nets, this was the uniformed amateur's cake, and, though he had to eat cold beans, he did the finest QRR work in the history of Amateur Radio. At New Richmond, Ohio, WLHI of the Army-Amateur net stood by and continued to work while the city's entire population was evacuated. Then, and only then, with water covering what once was a thriving river town, WLHI moved out—moved out after four days of 24-hour service to relieve W8KVF at Batavia, then to Bethel when Batavia was evacuated; but always carrying on regardless of lack of sleep and insufficient food.

To John B. Thayer, W8EH, of Norwood, Ohio, the uniformed amateurs take off their hats. When conditions became such that operators were collapsing at their posts and Black Sunday became a reality rather than a fear, we asked ourselves, "where can we get a man who can handle the 30 to 35 word-per-minute traffic of the National Guard net to relieve Batavia?" Johnny Thayer was suggested as a former Western Union operator and owner of one of the best known 40- and 20-meter c.w. stations in the country. Thayer accepted the generous offer of hard work at no pay and set out in an Army station wagon for Batavia. Flooded roads forced long detours that eventually brought him and his chauffeur-sergeant to New Richmond. Roads from there to Batavia were impassable, so Thayer stepped into the breach at WLHI and aided in the evacuation of New Richmond; then on to Batavia, then to Bethel, to Columbus, and home. W8EH gave a week of tireless effort towards a cause whose only reward was a job well done and a word of thanks from men he had never met before. Our hat's off to a man and a *real* amateur, W8EH. Tnx OM.

W8MGD-DB Set Up

At Cincinnati Headquarters Company, First Battalion, 147th Infantry, O.N.G., under First Lieutenant James A. Biehl, was ordered to supply communication facilities for the Cincinnati Flood Area. The official call assigned was DB, but Corporal George (Mike) Dively's call



Radio Station AB, at Columbus. The operators from left to right are: Second Lieutenant Dane O. Sprankle, W8CKG; First Class Private Theodore Drake, W8JBI; and Corporal Bert Hayhurst, W8IZK. (Photo by H. Maxwell, W8VE.)

W8MGD was used for most communication purposes. The transmitter operated on 3527 kc and another operated in the five-meter band. From Thursday at 9 P.M. until Thursday at 8 A.M. of the following week Corporals Ray Murphy (exW8HGI) and Dively and the writer as chief operator operated continuously 24 hours a day under the most terrific traffic and QRM conditions. The aggregate sleep of the three men was 57 hours, or less than 20 hours' sleep per man during a seven-day period.

A mobile five-meter unit was operated by Private Allen Holmes (exW8IGN) and Private William Goodrich (W8LNL). This unit enabled the runners to maintain constant communication with the headquarters station and speeded up the dissemination of information and traffic.

The excellent work of this unit has prompted the State to plan the erection of a 500-watt c.w. station with the most modern of receiving equipment for future emergencies.

Until the water around the Armory rose so high as to break down the insulation of the telephone lines, W8MGD had a private line to broadcast station WCPO so that that station might cooperate in the handling of the emergency *urgent* traffic that this station confined itself to.

Cincinnati Area Flood Station, W8MGD-DB, with Corporal George (Mike) Dively, W8MGD, and Corporal Raymond Murphy, ex-W8HGI. Stations MGD and YX were the net centers, with MGD working c.w. and YX fone.

AB and NEG Hook In

At Columbus the National Guard Net Control Station was known as AB and was under the command of Lt. Raymond Strasburger, Division Radio Officer. AB maintained 24-hour contact with every vital point in the flood area.

One Ohio National Guard airplane, piloted by Lt. Barr, was ordered into the flood area for observation purposes. Lt. H. E. Maxwell, acting as observer, received his mission direct from Columbus by means of radio. The Columbia Broadcasting System cut in for fifteen minutes to present to the public this new use for radio.

While homes were being crumpled into masses of twisted wreckage and empty railroad tank cars were floating fifteen feet above their inundated tracks, the Naval Reserve through its station NEG on the thirtieth floor of the Union Central Building, in Cincinnati, was working 24 hours a day to relieve the suffering and havoc the river had wrought. Trunk nets were placed in operation with every major town and city in the country, as well as in the flood area. At Cleveland, Ensign Harry Tummonds, W8BAH (Naval AX9G), and Lt. H. Scott, W8WY (Naval AB9C) were assisted by the amateur members of the reserve unit there in the handling of traffic for the north and northwest. At Louisville, Kentucky, W9ELL, Lt. (j.g.) LaVille, did sterling work during the first three days of the disaster. After that power failure stopped the operation of his station and it was not until WHAS was able to get on the air that Louisville again had communication with the outside world.

HEADQUARTERS
CINCINNATI FLOOD AREA
33 West Ninth St.
Cincinnati, Ohio

February 5th, 1937.

Mr. George B. Hart
6738 Belkenton Place,
Silverton, Ohio

Dear Mr. Hart:

Now that the flood crisis is safely past, and the National Guard is withdrawing from this area, I desire to express through you, my appreciation of the splendid service rendered by the radio amateurs who are members of our National Guard communication units.

For a period of many hours, the most satisfactory communication which was maintained along the Ohio River, was that which was due to the efforts of the radio amateurs in the various National Guard organizations.

Yours very truly,

L. S. CONELLY,
Brigadier General, ONG,
Commanding.

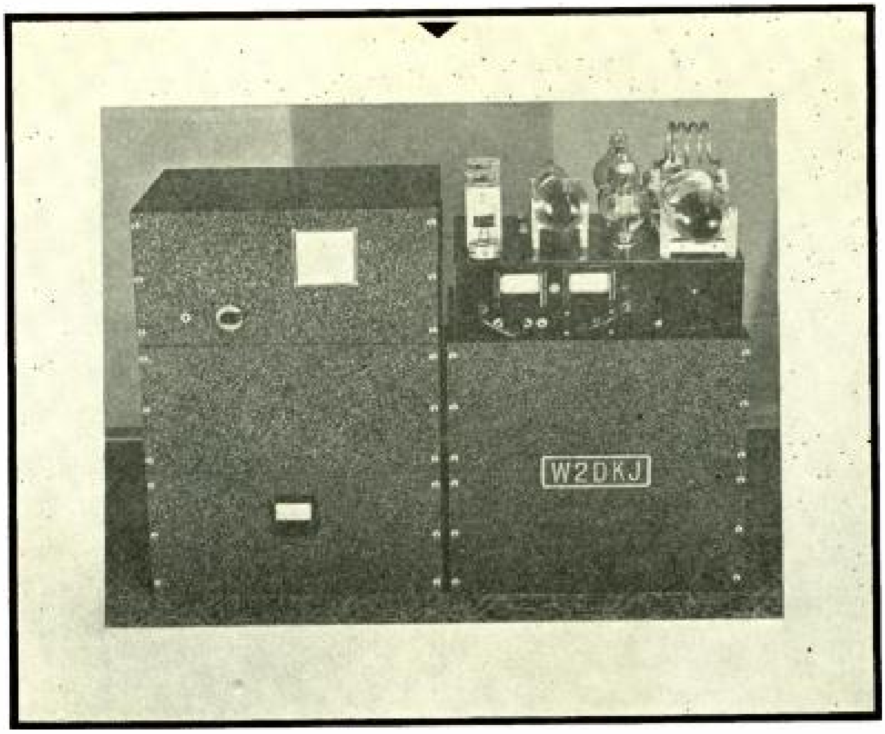
This letter from Brigadier General L. S. Conelly, Ohio National Guard, to Mr. Hart, speaks for itself. It is a fine tribute to Amateur Radio.

Tribute

While throughout the United States housewives were aiding the Red Cross and refugees by packing the pants that papa hadn't worn since he grew so stout; sister Mary's party dress that she hadn't worn since 1928; baby's diapers which hadn't been in use since 1930; and their own stockings—with just the little run in them—the Amateurs were working to relieve the suffering of the refugees in their own way. Not only the till of the Red Cross did they fill, but the till of humanity was filled to overflowing with the well of sympathetic cooperation that the Hams gave to the refugees and their rescue.

The victory in the Ohio Valley is complete, the story of the Mississippi is still to be told. The Amateur is up against the toughest proposition he has so far undertaken, and doing a remarkable job. His value can not now, nor can it ever be expressed in dollars and cents.

(Continued on page 166)



THE COMPLETE "FLEXIBLE 400" PHONE TRANSMITTER. SPEECH EQUIPMENT AT LEFT. R. F. UNITS AT RIGHT

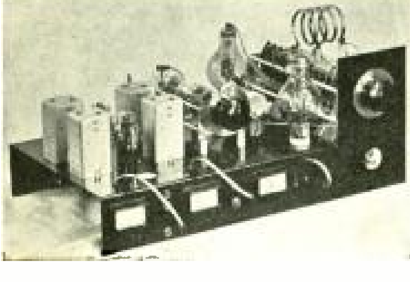
THE "FLEXIBLE 400"

PHONE TRANSMITTER WITH SURE-FIRE TRITET

BY ARTHUR H. LYNCH • W2DKJ

Constructed by Edwin Ruth, W2GYL, and Harry Lawson W2IER

NEARLY all amateur radio is based upon the inspiration which one ham gets from the description or the performance of some other ham's transmitter, receiver or antenna. In our own case we can trace the genealogy of the radio-frequency portion of our transmitter back at least two generations. The grandfather of our rig is Herb Becker—W6QD—whose "cornfed kilowatt" was so ably described in *Radio*. The father of our rig is James Millen—W1HRX—and his description of it appeared on the inside, back cover as well as on page fifty-three of the November issue of *QST*.



A Chinese copy of the r.f. unit designed by James Millen. This was the basis for the design of the "Flexible 400."

Just to get the hang of the thing we made a Chinese copy of Millen's transmitter and an accompanying view of it will indicate that the copy is almost identical to the original, with the exception that our chassis was a little larger and it was painted black instead of gray. This unit worked so well that we were not able to keep it for very long—as a matter of fact, it ended up in South America.

From the experience we had with this rig and from our chats with some local "engineer-hams," we decided to make certain changes in our own rig which would simplify the construction and make it much easier for the average ham to duplicate it. It will be observed from the circuit diagram that quite a number of changes have been incorporated in our layout, and the photos and sketches will indicate that certain mechanical changes have also been included. But, more of this anon.

We had several chats with James Millen about his rig, and we attempted to get him to supply full information concerning its construction as well as data on the power supplies that could be used with it. His opinion was that the construction was so obvious and that so many people already had suitable power supplies, that these details were unnecessary. After two weeks work that were put in on building our R.F. Unit and the various power supplies for it, as well as the modulator and the speech amplifier, we have a hunch that there are still quite a number of amateurs who would welcome considerably more information regarding this very efficient type of transmitter, than has been published to date. It is with this thought in mind that we are telling what our experiences with it have been so that any who are interested may duplicate it without having to start from scratch, as we had to do.

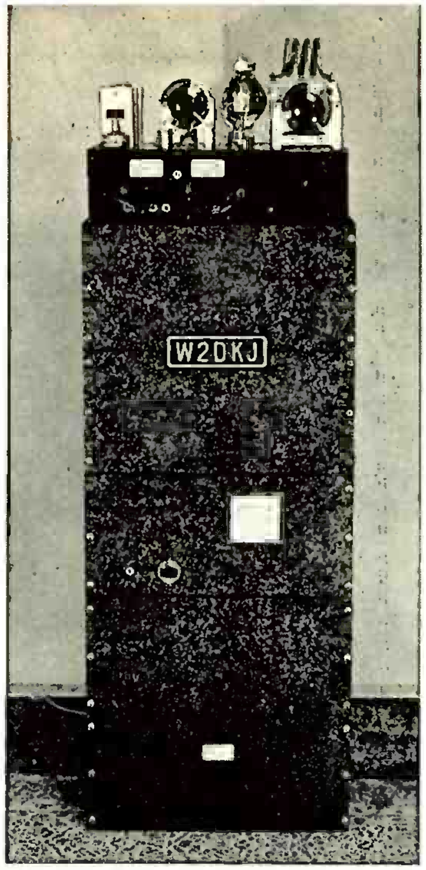
The Components and Why

It will be seen from the photographs that the entire transmitter has been worked up into three separate units and that the entire radio-frequency portion is complete in itself and is assembled on a conventional type chassis 5 inches high, 18 inches wide and 13 inches deep. This regulation type chassis—slightly higher than most—is a distinct departure from the type of chassis used by James Millen and, though we have not attempted to set it up in rack and panel form, it is obvious that it can be incorporated in a rack with very little trouble if the width is brought down to the standard 17 inches.

The radio-frequency power supply is complete in itself and is assembled on a standard 17x13x3-inch sub-panel which drops right into the smaller of the two metal cabinets.

The larger of the two cabinets houses the speech amplifier with its power supply and the power supplies and filters for the modulator.

If the three units are placed directly above each other they occupy approximately the space occupied by a four-section steel filing cabinet. Because they are made as separate units they can be transported conveniently and they can be set up either on the floor or side by side on a work bench or desk.



This view shows the speech amplifier, the modulator and their power supplies housed in a three-section cabinet as the foundation for the whole layout. The two-section cabinet above houses the power supplies for the r.f. unit.

Power

Our own installation has been designed to operate with an input of 400 watts to the RK-38 tubes which are used in the final amplifier. On test it has been run up to 500 watts and the radio-frequency portion of the transmitter can be used, without any apparent overload, at much greater input.

The r.f. power supply delivers 2000 volts to the plates of the RK-38's, 1000 volts to the plate of the RK-37, through a dropping resistor, and 400 volts to the plates of the 6L6's.

The speech amplifier and modulator carry their own power supplies and approximately 1250 volts are supplied to the plates of the RK-31's which are operated at zero bias, Class B.

Because this entire assembly appears to be so small—smaller in fact than a great many 50-watt rack-and-panel assemblies it must not be confused with some of the lower-powered equipment and the power necessary for the operation of this unit is sufficient to make *very short work of the person who handles it carelessly.* Four-hundred watts, at the voltage that we are considering, is enough to put such a transmitter in the category of a lethal device, and such power demands considerable respect and care in its manipulation.

The drain on the lighting circuit, when this transmitter is being modulated, is reasonably high and it is much more than should be drawn from the ordinary house wiring. In our own case we ran a special line from the meter board to the radio room. This line is made of standard No. 10 BX. In addition to preventing a voltage drop, due to a high resistance line, the arrangement that we use has the additional advantage of offsetting any flickering of the lights throughout the house when the transmitter is turned on or when it is being modulated. This should be enough general information for the experienced amateur to duplicate what we have if he cares about doing so.

Full information concerning the power equipment will be the subject of subsequent articles, so we will confine our attention to the design and construction of the radio-frequency portion.

The Complete R.F. Circuit

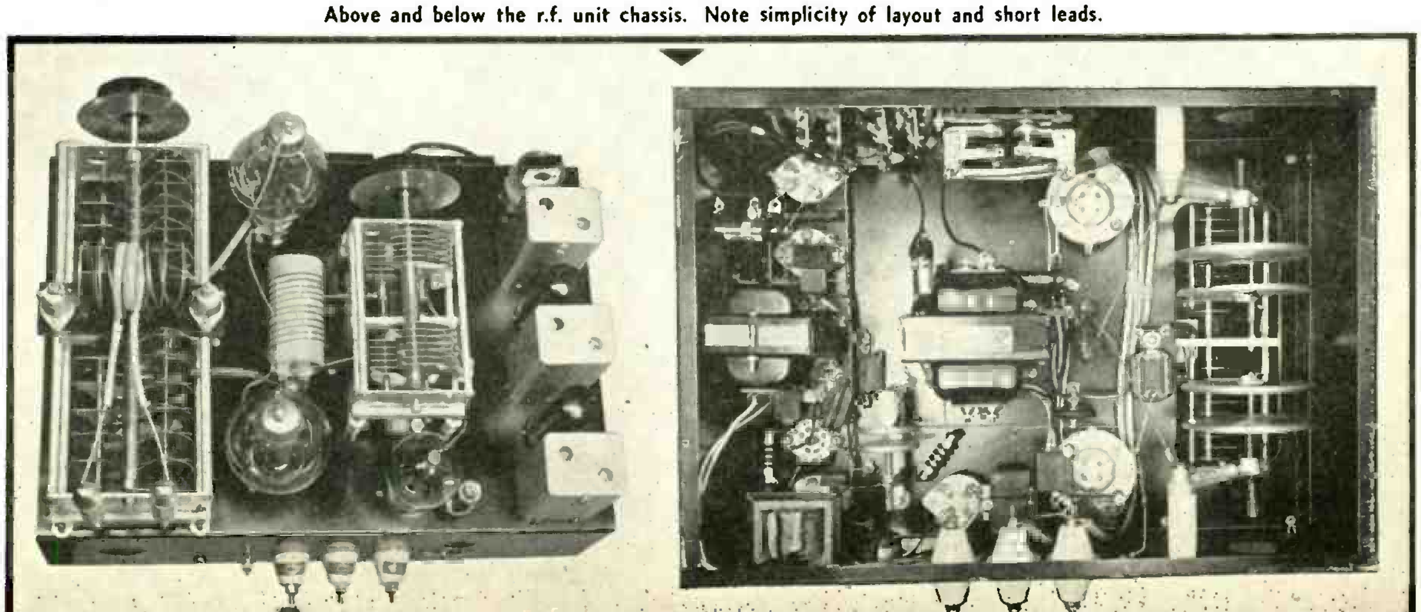
Before getting into the details of the circuit, it should be pointed out that our own r.f. unit has been designed primarily for operation in the 10-meter band and all of the constants given are for that band. Coil data, etc., for operation in the 20- and 75-meter bands, as well as possible operation in the 5-meter band, will be given next month.

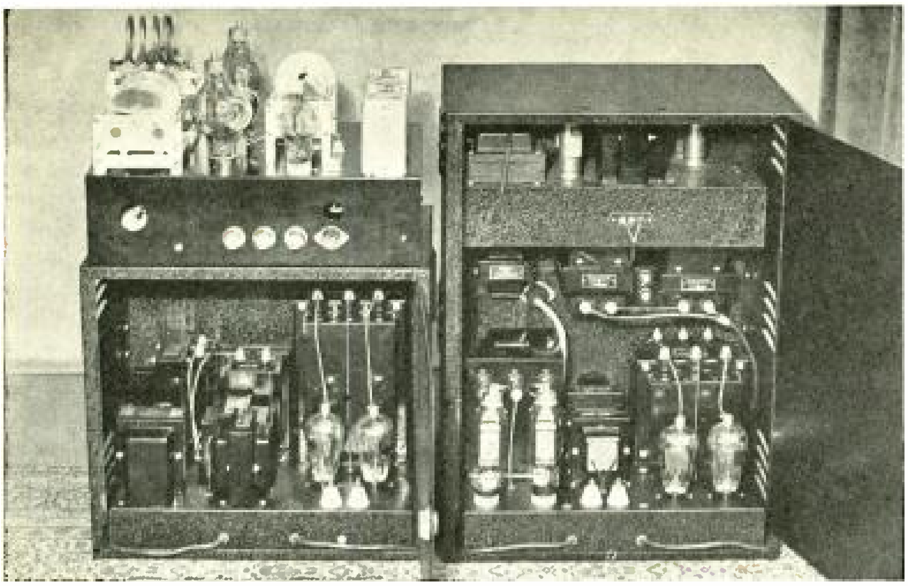
In looking over the radio-frequency portion it is desirable to consider the photographs, the diagram and the parts list simultaneously. In this way a very much more complete understanding of the circuit and its possibilities will be had.

Considering the diagram, it will be seen that the first circuit incorporates a tritet crystal oscillator functioning with a 6L6 tube and a low-drift 40-meter crystal. The next stage comprises a 6L6 tube, with suitable circuit design for doubling the frequency output from the oscillator stage and supplying sufficient power to the grid circuit of the RK-37 which is used as a straight buffer stage. The output from the RK-37, in turn, excites the RK-38's which form the final Class "C" amplifier.

The ceramic form shown between the RK-38 tubes in the top view of the radio-frequency unit, carries the interwound coils for the plate of the RK-37's and the grids of the RK-38's, the center tap for the latter winding being accomplished by the use of two r.f.chokes. This assembly is shown in the diagram as L4, L5 and RFC3 and RFC4.

Above and below the r.f. unit chassis. Note simplicity of layout and short leads.





Nothing crowded—some idea of the accessibility of all the components in the power supplies in the speech and r.f. sections. At left; r.f. unit and its power supply. At right; (below) modulator and its power supply, and (above) speech amplifier and its power supply.

Fundamentally, this arrangement provides unity coupling between the output circuit of the RK-37 and the input of the RK-38's and tuning the plate circuit of the RK-37 results in automatically tuning the input circuit to the RK-38's. This has the effect of providing an efficient transfer of energy and eliminates the necessity for an additional tuning condenser. This arrangement is very desirable because it results in simplifying the construction of the r.f. portion as well as materially reducing its size. It has been used because the efficiency of the RK-37 results in more than ample excitation for the final stage.

Some confusion may result from observing a variable crystal in the illustrations. This is a subject which will be treated at a later date; the one actually used at present is a low-drift crystal cut for 7003 kc.

From start to finish, the circuit employed in the radio-frequency unit is straightforward and the ease with which the circuit adjustments have been made after the radio-frequency unit was finished indicates that no "bugs" need be feared. We believe that one factor which contributes much to the efficiency of this assembly and the simplicity with which it has been possible to fire it up, results from a mechanical and electrical design which has made possible extremely short leads. As a matter of fact, in the exciter portion of the unit, the various resistors, condensers, etc., actually form the leads and very little additional wire has been used.

The 100-m.a. meter shown at the left and the 300-m.a. meter shown at the right of the filament toggle switch, on the front panel, along with the two plugs and six jacks, shown beneath them, permit the complete metering of all of the important circuits in the r.f. unit. From left to right, the jacks connect the 100-m.a. meter to the plate of the tritet oscillator, the plate of the 6L6 doubler, the grid of the RK-37, the grids of the RK-38's, when the left-hand plug is used. The right-hand plug connects the 300-m.a. meter to the plate circuit of the RK-37 and the plate circuit of the Class "C" amplifier, when the last two jacks are used, respectively. It will be noted from the photographs that the two high-voltage plate circuit jacks are mounted on a small bakelite sub-panel which is separated from the front of the main panel by at least one-half inch from any ground point, because these jacks are carrying very high voltage at any time that the transmitter is on. The large round aperture at the extreme right of the front of the chassis permits the manipulation of the front, C-15, neutralizing condenser. A similar aperture at the rear permits like adjustment of the rear, C-16, neutralizing condenser. These neutralizing condensers are mounted in a very novel fashion, resulting in extremely short leads. The details will be covered when we get to the mechanical layout.

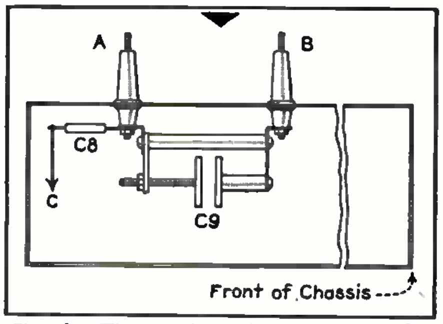


Fig. 1. The mechanical arrangement for mounting the neutralizing condenser to the lower ends of the feedthru insulators A and B.

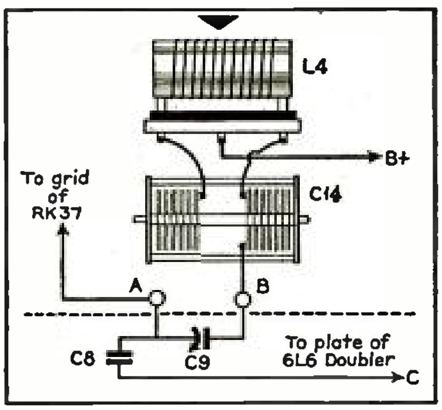


Fig. 2. A better understanding of the circuit arrangement of the neutralizing condenser, C9, may be had from this sketch.

In his design, James Millen, suggested the use of a typical triode crystal oscillator arrangement. In order to reduce the number of stages, so as to conserve both power and space, we have, as the circuit indicates, found it desirable to use the tritet oscillator. Our use of this type of circuit does not mean that we disagree with the arguments that have been advanced in favor of the more straightforward circuit, but, for our particular purpose, the tritet seems to fill the bill admirably and the results which have been obtained from the transmitter were considerably beyond our expectations. There are those who will contend that the use of the tritet circuit will make it necessary for us to clean the crystal more frequently than would otherwise be the case and there are, theoretically, certain other disadvantages which are brought up as objections to this type of circuit, not the least of which is the idea that the crystal will heat abnormally, if enough power is going to be taken out of it to provide suitable functioning for the remainder of the circuit. Our experience with this arrangement indicates that most of these theoretical objections have not been severe obstacles and if the transmitter continues to function as it is functioning at present, we believe it will more than fill the bill for the average amateur.

Most of the difficulty experienced in connection with a tritet oscillator results from an attempt to use comparatively low capacity and high inductance in the oscillator cathode circuit. Reference to C-1 in the diagram and C-1 in the parts list will indicate that a fixed capacity of 200 mmfd. is shunted across the two 25-mmfd. trimmer condensers, which are a portion of the plug-in tank circuit unit, L1. The tank L1 for the crystal circuit is made up by winding 8 turns spaced out to ⅞" on the R-39 coil form, supplied with the FXTB unit, and the two trimmer condensers, mounted inside the unit, are connected in parallel. Definite mention is made of this arrangement because the tank used in the plate of the doubler stage and designated as L3 comprises a coil of 5 turns spaced out ⅞" but *only one* of the two trimmer condensers contained in the unit is used. In every case the plug-in tanks have been indicated in the diagram by the dotted lines surrounding the inductors and variable capacitors. Even though the first two tanks are made with the two trimmer condensers connected in parallel the diagram shows but a single condenser.

The unit connected in the plate circuit of the 6L6 tritet oscillator and characterized as L2 in the circuit diagram, is made by using both the trimmer condensers in parallel and winding 11 turns spaced out 1" on the coil form. The coils in these three plug-in units are wound with No. 22 d.c.c. copper wire.

The inductors L4 and L5 comprise 6 turns each of No. 18 enameled wire, spaced approximately half an inch—that is, consecutive turns *in each coil* are spaced one-half an inch or approximately one-quarter of an inch between adjacent turns—on the UR-13 buffer coil form. These two coils are, as mentioned previously, inter-wound.

The final tank circuit comprises the variable condenser, C17, and an inductance made up of 6 turns of No. 12 copper wire, approximately 2½ inches in diameter, with the turns spaced approximately one-half inch. It will be almost impossible to determine in advance the exact spacing of the turns which go to make up this coil, and the functioning of the entire transmitter, including the type of antenna circuit and the coupling used in conjunction with it will play a large part in the final functioning of the Class "C" stage.

Too much stress cannot be placed upon the advisability of tuning this tank circuit *with reduced power*. Off resonance, this circuit will carry a tremendous amount of power and it is quite likely that the tubes would be seriously overloaded. Furthermore, it will be found that resonance in this circuit is particularly sharp and the dial on the variable condenser will have to be moved with great precision. Also, the ultimate efficiency of the transmitter will, to a large extent, depend upon the efficiency of the coupling between the two-turn antenna coupling coil and the final tank circuit, to say nothing of the desirability for an efficient transmission line and an efficient antenna.

Some of the pictures show that a final tank coil, made of one-quarter inch copper tubing was employed, while others show the small wire suggested in the text. The smaller wire has been found to be more efficient, due to the lower distributed capacity between turns and a No. 12 wire is large enough to carry all of the power that will be used in this tank circuit, if proper attention is given to that portion of the preceding paragraph which deals with suitable coupling, transmission line and antenna.

As an indication of the conservative manner in which the various components of the radio-frequency portion of this transmitter are operating, the following table will be of interest.

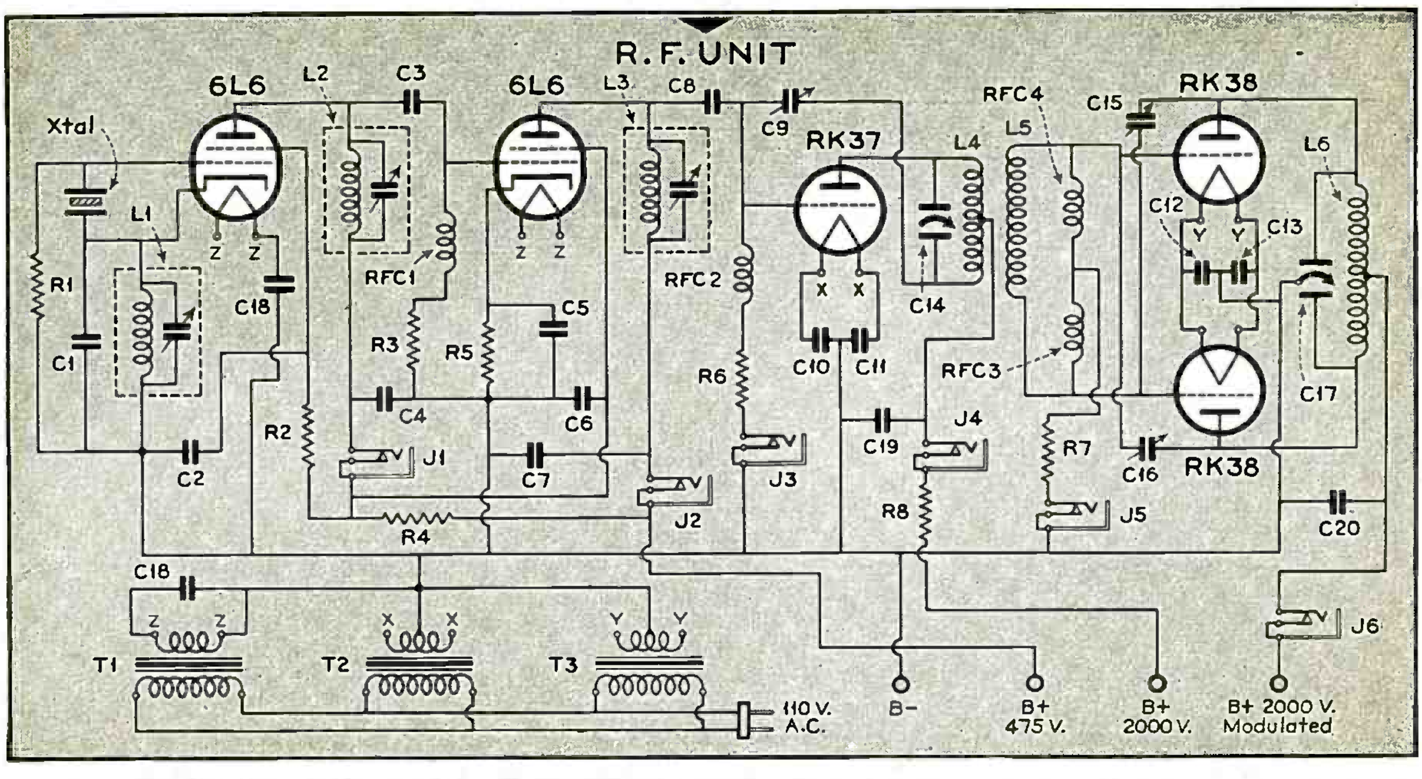
Tube	Plate Volts	Plate Mils	Rectified Grid Mils
6L6 Osc.	300	34	..
6L6	400	46	..
RK-37	1000	85	20
RK-38	2000	200	46

Mechanical Details

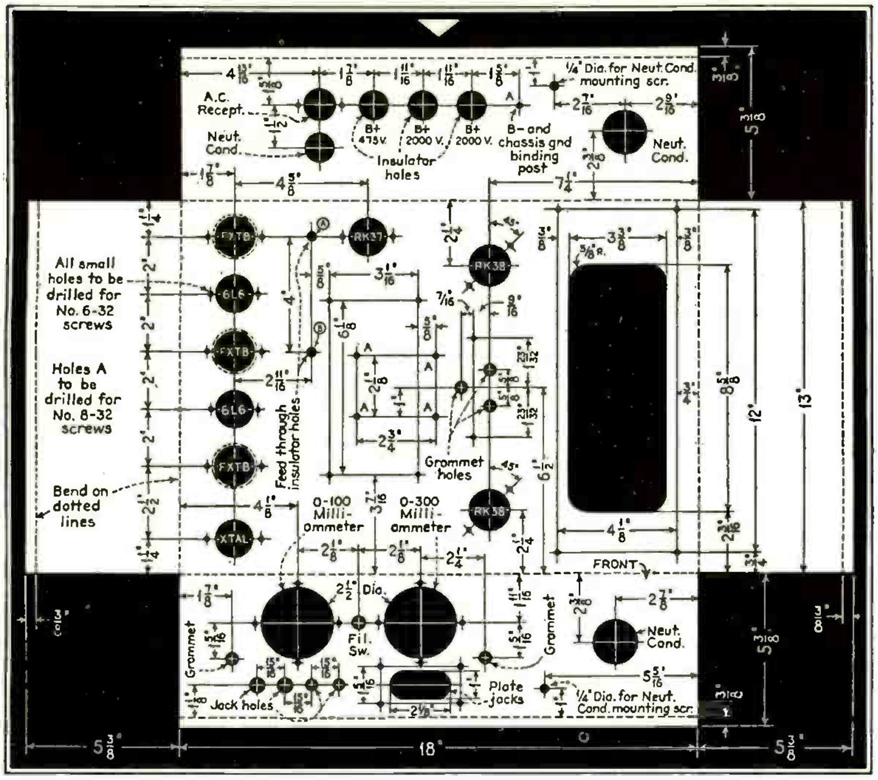
In one of the accompanying drawings all of the information necessary for the duplicating of the chassis for the radio-frequency unit will be found. Where the chassis is to be home constructed, a careful study of the chassis layout, the photos of the assembled unit, the circuit diagram and the parts list will save a great many headaches in the attempt to duplicate this transmitter. It should also be kept in mind that the chassis should be only 17 inches in length if the unit is to be mounted in a cabinet or standard relay rack.

One of the unusual features in this chassis design is the large well, cut out of the upper surface of the chassis itself, which permits the fixed plates of the two large neutralizing condensers to be attached directly to the stator plates of the final tank tuning condenser. This performs the dual service of simplifying the assembly, reducing the length of leads as well as simplifying the tuning. Apertures at the front and rear of the chassis make the adjusting screws for the variable portions of these condensers readily accessible. (These adjustments should be made with a very well insulated screw driver, or with the *heat off*.)

The under view of the chassis illustrates the manner in which the neutralizing condensers have been changed about so as to provide simplicity of mounting. The long insulators, supplied with the neutralizing condensers, are removed. (They may be used to support the two-turn antenna coupling coil, if mounted on angle brackets.) One plate is attached to the triangular-shaped



Complete schematic diagram of the "Flexible 400" r.f. unit. Circuit values are given in the parts list on page 126.



Chassis specifications for the "Flexible 400" r.f. unit. Length should be 17 inches if chassis is to be mounted in a cabinet or rack.

bracket shown in the photo and the smaller insulators are attached to the front and rear portions of the chassis, as illustrated. The large adjustable plate is unscrewed entirely from the supporting arm and the adjusting screw is re-inserted from the other side. This results in the flat surface of the supporting arm coming in direct contact with the end of the smaller insulator which is furthest away from the chassis. The arrangement for this entire assembly is obvious from a study of the picture of the underside of the chassis.

When the two neutralizing condenser stator plates, with their mounting brackets, have been attached to the inside extremities of the two series of fixed plates on the tank condenser, the method for attaching this entire unit to the chassis becomes almost obvious, from a perusal of the illustrations. All this assembly is completed before the tank tuning condenser is attached to the chassis. The fixed plates of the neutralizing condensers are dropped down into the well at the right-hand end of the chassis and then the entire unit is rotated ninety degrees, which places it in position for permanent mounting. The adjustable plates can then be attached to the front and rear portions of the chassis, as outlined above.

And while we are on the subject of neutralizing condensers, it will be seen that care has been taken to keep the leads in the RK-37 circuit as short as possible. Two small stand-offs as well as feed-through bushings, as shown on the chassis layout, are employed to carry the lead from the grid grip on the RK-37 tube through the chassis to one terminal of the neutralizing condenser, C-9, and another lead from the rear end of the front section of condenser C-14 to the opposite end or fixed plate of the neutralizing condenser C-9. The entire assembly, C-9, is suspended directly from the lower extremities of the feed-through insulators by means of small angle brackets. Details for the arrangement of this circuit are shown in Figs. 1 and 2.

Wiring

While most of the important mechanical dimensions for the assembly of the unit may be had from a study of the illustrations, there are a few pointers in connection with the assembly and the wiring which will result in a material saving of time. First of all, it is desirable to leave off all of the filament transformers until the rest of the wiring underneath the chassis has been completed.

The original wiring was done with high tension cable. In some instances we found that it broke down. Better results have been obtained by the use of Giant-Killer cable. It will handle any of the voltage developed in this chassis and it offers the desirability of two conductors in a heavily protected case. The heavy drain circuits required for the filaments are best made by using the two conductors in the Giant-Killer cable in parallel.

Another, and rather important consideration, is that the filament transformer for the RK-38's is a comparatively heavy device and it would tend to place too much weight on the center of

(Continued on page 167)

PARTS FOR R.F. UNIT

AEROVOX
- 2—100,000 ohms, 1 watt (R1-3)
- 1—15,000 ohms, 10 watt, wire wound (R2)
- 1—5000 ohms, 10 watt, wire wound (R4)
- 1—250 ohms, 2 watt (R5)
- 1—5000 ohms, 20 watt, wire wound (R6)
- 1—5000 ohms, 50 watt, wire wound (R7)
- 1—10,000 ohms, 75 watt, wire wound (R8)

CORNELL-DUBILIER
- 5—type 3L-5S1 mica, .01 mfd., 400 v. (C2-4-6-7-18)
- 4—type 4-6D2 mica, .002 mfd., 1000 v. (C10-11-12-13)
- 2—type 5W-5T1 mica, .001 mfd., 400 v. (C3-5)
- 1—type 5W-5T2 mica, .0002 mfd., 400 v. (C1)
- 1—type 5W-5Q5 mica, .00005 mfd., 400 v. (C8)
- 1—type 4-12D2 mica, .002 mfd., 2000 v. (C19)
- 1—type 4-25D2 mica, .002 mfd., 5000 v. (C20)

NATIONAL
- 1—NC-800 neutralizing condenser (C9)
- 1—TMC-100D 100-100 mmfd.. 3000 v. (C14)
- 2—NC-150 neutralizing condensers (C15-16)
- 1—TMA-40DC 40-40 mmfd., 12000 v. (C17)
- 4—R-100 r.f. chokes (RFC1-2-3-4)
- 1—XR-13 Isolantite coil form
- 1—PB15 coil form plug-in base
- 1—XB15 coil form socket
- 3—FXTB tanks with plug-in bases (L1-2-3)
- 2—type O dials
- 5—GS-1 stand-off insulators
- 2—GS-3 stand-off insulators
- 3—XS-1 h.f. bushings
- 2—octal sockets for 6L6s (S1-2)
- 4—five-prong sockets (S3-4-5-6)
- 1—four-prong socket (S7)
- 2—XM10 sockets for RK-38s (S8-9)

PAR-METAL PRODUCTS
- 1—special chassis, 5" x 17" x 13"

RAYTHEON
- 2—6L6
- 1—RK-37
- 2—RK-38

THORDARSON
- 1—filament transformer type T6185 (T1)
- 1—filament transformer type T6413 (T2)
- 1—filament transformer type T7424 (T3)

TRIPLETT
- 1—milliammeter 0-100 mills, 3" square type (MA1)
- 1—milliammeter 0-300 mils, 3" square type (MA2)

YAXLEY
- 6—closed-circuit jacks (J1-2-3-4-5-6)
- 2—plugs (P1-2)

This R. F. Unit has been thoroughly tested and has given satisfactory performance. The parts listed or their equivalent will give satisfactory results. Substitutions should be made with care.

"IT'S A SYSTEM!"

Whereby the Ham Can Call His Shots and Multiply His QSO's

BY NAT POMERANZ • W2WK-W2APD

AMATEUR RADIO today and Amateur Radio as it existed ten years ago shows changes which, when comparing the old and the new, proves that it stands far above any other hobby for rapid strides made in its development. It is a credit to the Amateur that he has been able to create so many radical changes in so short a period.

Many newcomers somehow take for granted the equipment now used and cannot easily appreciate the difference in using a 6L6 tube as an oscillator over the old UV-202, the highest powered triode (5 watts) available at one time. A modern superheterodyne receiver with all of its crystal frills, super de-luxe bandspreading and R meters is a far cry from the "three-circuit detector" and "one-step audio" of the old days even though the "blooper" pulled in that sixth continent once in a while!

So, too, have the methods of operating an amateur station changed with the advancing times. Take this matter of signal reports; in the old days the QSA system seemed good enough but the cry for efficiency changed it to the not-too-easily-forgotten R system which, in turn, gave way to the R-S-T method now in use, through sheer necessity. That Amateur Radio has benefited by these self-imposed changes is an opinion that only you can answer—and it has got to be in the affirmative!

The writer has been toying with an idea for quite some time, having gone so far as to present it in the pages of the now discontinued Radio Section of the New York *Telegram*. It appeared on Saturday, March 12th, 1927 and was titled: "NU-2APD's Novel CQ-ing Arrangement." (Yes, sons, "nu" was once a prefix attached to call letters meaning "n" for North American and "u" for United States. Its use was compulsory and has since been replaced by our more familiar "W," "K" and "N"—time marches on.)

Three-Letter CQ

The article then appearing suggested the change of the CQ to a three-letter call, the third letter designating a distinct portion of the short-wave spectrum. CQA was suggested for that portion below the 20-meter band, CQB for the 20-meter band, CQC for wavelengths above the 20-meter band, CQD for the space below the 40-meter band, CQF for the lower portion of the 40-meter band, CQG for the upper half, and so on.

Call	Will Listen Between:
CQA	— 1715 to 1800 (amateur c.w.)
CQB	— 1800 to 1900 (amateur phone)
CQC	— 1900 to 2000 (amateur phone)
CQD	— 2000 to 3500 (commercial)
CQE	— 3500 to 3700 (amateur c.w.)
CQF	— 3700 to 3900 (amateur c.w.)
CQG	— 3900 to 3950 (amateur phone)
CQH	— 3950 to 4000 (amateur phone)
CQI	— 4000 to 7000 (commercial)
CQJ	— 7000 to 7100 (amateur c.w.)
CQK	— 7100 to 7200 (amateur c.w.)
CQL	— 7200 to 7300 (amateur c.w.)
CQM	— 7300 to 14000 (commercial)
CQN	— 14000 to 14150 (amateur c.w.)
CQO	— 14150 to 14250 (amateur phone)
CQP	— 14250 to 14400 (amateur c.w.)
CQQ	— 14400 to 28000 (commercial)
CQR	— 28000 to 29000 (amateur phone)
CQS	— 29000 to 30000 (amateur c.w.)
CQT	— 30000 to 56000 (commercial)
CQU	— 56000 to 58000 (amateur phone)
CQV	— 58000 to 60000 (amateur phone)
CQW	— 60000 to 110000 (commercial)
CQX, CQY, CQZ	— reserve for freq. above 110000 kc.

Perhaps you didn't know it, but the American Amateur did enjoy a few years when all foreign stations operated *outside* of the American Amateur bands. For instance, the 40-meter band once started at 37.5 meters and ran up to 42.8 meters. Foreigners using the so-called 40-meter band were found on frequencies from 32 to 37.5 meters. They invariably could be found around and near the American bands but only in rare cases actually in them. That was one pleasure this writer will never forget. But—times change.

The advantages of using a three-letter CQ in preference to just the letters CQ, as explained at that time, propounded inter-band QSO's, same band but opposite-edge QSO's, and eliminated the danger of hearing and calling a station that would never answer because what you heard was a forced oscillation or harmonic as the term is mis-applied.

Harmonic QRM

You might think that this last-named point was of trivial importance. The writer once received a letter from a Sixth District amateur complaining that he had called his head off (coloquial) for U-2APD (don't let the "U" fool you, it was once used as a prefix, too) in the 20-meter band but nary an answer was received even though he worked East Coast stations consistently. The writer never pushed one dote or dash or phonetic HI into the ether on 20 meters. It later developed that it was a "forced oscillation" or harmonic from the 40-meter rig which, at that time, ran at a cool kilowatt powered by a "sync" on 37.5 meters or thereabouts. True, it was the fault of the equipment and more pointedly the fault of its operator, but little or nothing was ever done at that time for the suppression of the spurious signals. So, the new CQ-ing arrangement was meant to overcome this.

Now, this subject of inter-band QSO's and same band opposite-edge QSO's is something which deserves the consideration and ear of every enterprising amateur. One could wax loquacious over its possibilities, its newness, its beneficence, its awakening power to the Amateur, its practicability—and one would be right on all counts!

What law states that amateurs transmitting on one band cannot communicate with amateurs transmitting on another except by pre-arranged schedule? What law states that any amateur transmitting on one end of one band cannot communicate with another transmitting on the other end? The answer is "None." What does prevent these operations at the present time is the lack of system, the lack of efficiency. If you operate on 7310 kc and call CQ you usually

(Continued on page 167)

Automatic Noise-Silencing Circuit

New System Adapts Itself to Signal Level

BY JAMES E. DICKERT • W9PEI

THE diode-type noise silencer outlined by Watzel in the November issue of ALL-WAVE RADIO, has as its principal features the elements of simplicity and practicability—aside, of course, from its ability to reduce if not eliminate in a received signal auto-ignition impulses and other forms of man-made interference. It is easy to install in a modern superheterodyne and in no way interferes with existing circuit performance.

But it has the drawback of the original Lamb silencer in that the noise control bias must be adjusted manually to the signal level. In either system the silencer tube will trigger off on a high signal level or on positive modulation peaks if the noise-control bias is too low, or function only on noise impulses considerably in excess of the signal level if the bias is too high. Following varying signal levels by means of a manual control is out of the question.

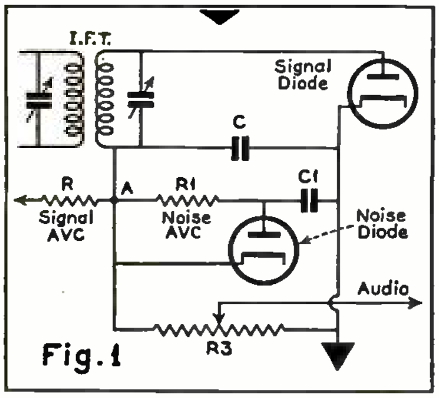


Fig. 1

Fundamental circuit of automatic noise silencer. This arrangement provides maximum suppression.

But the fact remains that the idea of "poking holes of silence in a signal at points where noise once dwelt" is neat, and has the qualities of an inspiration. It is not surprising, therefore, that others have put their minds to the task of improving the circuit action.

In the February, 1936 issue of ALL-WAVE RADIO, G. S. Granger suggested the application of avc control to a noise-silencer circuit so that the bias would automatically adjust itself to the signal level, the advantage being that maximum silencing action would be obtained irrespective of actual alterations in signal voltage. That the idea is practical has been demonstrated by the system to be outlined.

The new system, which is similar in principle to the Watzel silencer, may be adjusted to provide maximum silencing action at the expense of positive modulation peak suppression, or with slightly less noise control but minus the suppression of these modulation peaks. The system is therefore perfectly adaptable to a communications receiver, where slight modulation-peak suppression is of no consequence, or to a receiver designed for the quality reception of broadcast programs.

The advantages of the arrangement are:

(1) Automatic adjustment of silencing bias for all carriers and for fading signals.

(2) Elimination of shock to avc system by noise impulses of high amplitude.

(3) Negligible signal distortion.

(4) May be adjusted so that modulation peaks are not suppressed.

(5) Perfectly stable and does not interfere with normal performance of the receiver.

Basic Circuit

The basic circuit of the system is shown in Fig. 1. Resistor R and its associated capacity (not shown) are a part of the audio filter in the signal avc leg. Capacity C is indicated as an intermediate-frequency filter. Resistor R1 and condenser C1 comprise the filter of a separate avc leg which is employed to maintain the plate of the noise diode at the same approximate voltage value appearing in the signal avc circuit. Potentiometer R3 is the signal diode audio load.

The signal avc leg has a high time constant whereas the noise avc leg has a low time constant. The cathode of the noise diode is subject to signal potential whereas the plate of the noise diode is subject to the noise avc bias. The result is that if an incoming carrier after rectification has built up a potential of say minus 10 volts at point A, this value will also appear on both the cathode and the plate of the noise diode. But if the carrier is supplemented by an intermittent noise peak of short duration, having a value of say 40 volts, this potential will appear instantaneously at point A and also at the cathode of the noise diode. However, since the time constant of the noise avc leg R1-C1 is low, the plate of the noise diode will remain at the carrier potential of 10 volts, creating a differential of 30 volts between cathode and plate. Under these conditions it may be assumed that the impedance of the noise diode is lowered to something in the vicinity of 200 to 2000 ohms—depending on the value of the noise voltage—and that the amount of noise suppression at this point is a function of the ratio of the instantaneous diode impedance to the audio load resistor R3 which it effectively shorts.

If in the meantime the signal carrier level should rise or fall, the time constant of the noise avc leg is not so low that it cannot continually adjust itself to a change in carrier level. As a consequence the plate of the noise diode is always maintained at a bias equal to that of the signal voltage.

"High-Fidelity" Circuit

Thus far nothing has been said regarding the suppression of positive modulation peaks or the matter of frequency distortion. The time constant of the R1-C1 combination is such that it is longer than the lowest frequency potential which it is desired to suppress, and also lower than the lowest audio frequency. A third of a second for the noise avc filter is a good average value. It is possible to prevent the suppression of positive modulation peaks by means of the circuit shown in Fig. 2 where the noise cathode voltage value is reduced by the inclusion of an additional audio load resistor, R2.

In this case points A and D assume the carrier potential of 10 volts while point C is at zero potential. If resistors

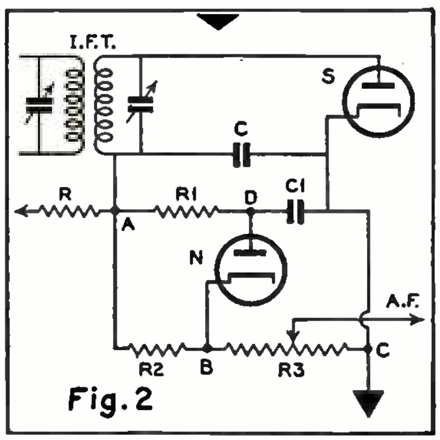
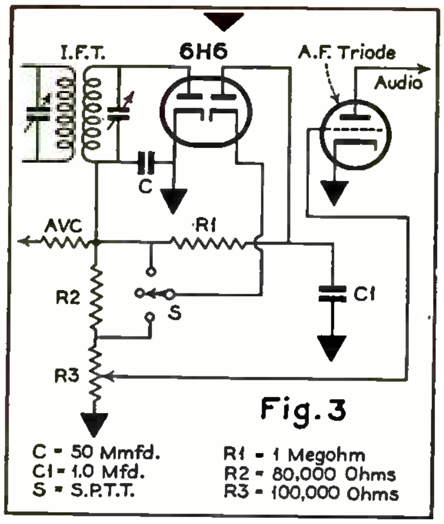


Fig. 2

With this arrangement suppression is obtained without also suppressing positive modulation peaks.



The automatic noise silencer system applied to a superheterodyne employing a 6H6 second detector.

R2 and R3 are of equal value, then the carrier potential at point B will be 5 volts. The noise control bias is therefore effectively twice the value of the signal voltage since the signal-induced bias on the noise cathode is only one-half that of the plate. Since the rectified carrier provides the control voltages for both the plate and cathode of the noise diode, the voltage ratio is constant regardless of signal level.

Under these conditions all noise down to 100-percent modulation is suppressed without introducing modulation distortion. If the noise impulse has a value of 40 volts, the potential at point A will be 40 volts but the potential at point B, which is the cathode connection, will be 20 volts due to the drop in resistor R2. The total instantaneous voltage values are then: 10 volts on the noise plate, this being the signal level; and 25 volts on the cathode, this being one-half the combined signal and noise voltages. The differential between plate and cathode is therefore 15 volts, and though the degree of suppression is less pronounced than if the differential were increased by eliminating the load resistor R2, it has been found in practice to be sufficient where modulation and signal level are up, which is generally the case in broadcast program reception.

Practical Circuit

The practical circuit is shown in Fig. 3. The nature of the coupling to the second detector diode is not important; a typical intermediate-frequency transformer is shown since this is the usual medium. Neither is it necessary to use a 6H6 tube, but it is convenient since it has a separate diode which may be used as the noise suppressor.

There is no call for altering the existing signal avc system in the receiver to which the silencing system is applied, although it is preferable that the intermediate-frequency filter condenser, C, should have a comparatively low capacity, as indicated in the diagram. It is advantageous to keep the wave shape of the noise as steep-sided and sharp as possible, which will not be the case if the i.f. filter capacity is of a high value. If the capacity of this condenser is in the vicinity of 50 mmfd. high audio frequencies and high-frequency noise impulses will not be attentuated. This is desirable from the viewpoint of fidelity, and as far as the noise impulses are concerned, the silencer will take care of them, and more effectively than if they were partially suppressed by the inclusion of a large capacity in the intermediate-frequency filter.

It has been pointed out that the noise avc filter should have a low time constant. A value of one megohm for the resistor, R1, and a capacity of one microfarad for the condenser, C1, seems to be the best compromise. If R1 is too low a value, a measurable amount of audio frequency will be by-passed to ground through C1. On the other had, if C1 is too low in capacity the low-frequency noise diode load impedance will be increased with a resultant reduction of low-frequency suppression. Obviously condenser C1 should have no measurable leakage resistance and should therefore be chosen with care.

The circuit of Fig. 3 is arranged so that suppression may be controlled by the switch S. In the upper position, which is preferable for reception in the amateur bands, maximum suppression is obtained. In the middle position the suppressing action is eliminated. In the lower position noise suppression is slightly reduced but the silencer tube cannot trigger off on positive modulation peaks; this is the desirable condition for broadcast program reception.

Application Notes

Though not essential, it is preferable that the a.f. voltage amplifier be a low-gain tube. Moreover, it is desirable that the grid of this tube be diode biased, as indicated in the diagram. Diode biasing, coupled with low audio gain will do much toward the elimination of a "springy" audio response artificially induced by the series of "noise holes" which produce an interruption frequency. This form of excitation is particularly annoying if the interruption frequency hits some resonance point of the loudspeaker or cabinet.

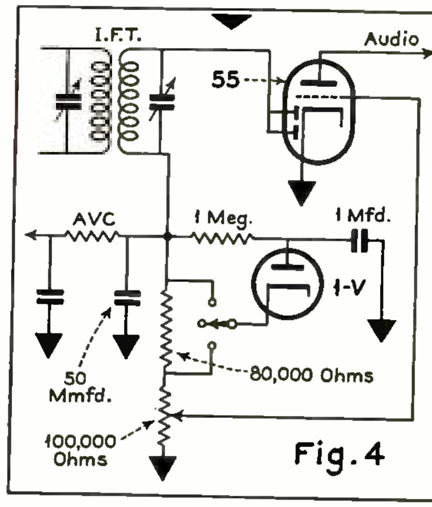
The effectiveness of the noise suppression, which takes place in the audio circuit, is materially reduced if the receiver in which the suppressor is installed has a tone control in the grid circuit of the first audio tube, of the type consisting of a series condenser and potentiometer in parallel with the volume control. In such a case the tone control potentiometer becomes a part of the audio load, which is undesirable in itself, aside from preventing the use of diode biasing on the grid of the first audio tube.

Fig. 4 shows the adaptation of the noise silencer to a superheterodyne employing a type 55 tube as second detector and audio amplifier. A type 1-V power rectifier is used as the silencer tube. It has a lower impedance at the same voltage than the 6H6 and is therefore preferable, although a 6H6 in this position is satisfactory. The rest of the circuit is identical to Fig. 3.

Results

The automatic noise silencer described has been installed in a number of receivers in the east and the middle west and has provided the same consistent results in all instances. It has given complete satisfaction, and though it cannot effectively cope with all forms of noise, any more than other noise silencers can, it reduces auto-ignition interference and the like to a negligible quantity. The most striking performance of its capabilities was had with a high-fidelity receiver with wide-band audio system feeding a woofer and tweeter through a frequency-dividing network. The sharp noise peaks so bothersome in high-fidelity reception were as good as wiped out. Inter-carrier noise is practically a zero quantity since the inherent set noise only determines the "residual" noise bias, any peaks above that value being suppressed, including off-frequency key clicks and off-channel sideband splatter.

Aside from its value as a suppressor of noise in standard broadcast and short-wave receivers, the system also finds application in aircraft and auto-radio receivers. Motor shielding and spark-plug suppressors can be dispensed with as the silencing circuit alone is sufficient to eliminate ignition interference. There are other applications of the system, too numerous to mention here.



Silencer adapted to super using a type 55 tube. The noise-suppressor tube is a type 1-V half-wave rectifier.

Globe Girdling

By J. B. L. Hinds

AMONG the many fine letters we receive from short-wave listeners are those requesting that we clear up the mystery of our DXing achievements and also outline the equipment used to make these "remarkable" catches.

There is, of course, no mystery at all, unless patience and cautiousness are considered to be mysterious elements of behavior. And there is nothing "special" about the equipment we use; the receiver and the antenna are good, but neither has any feature not found in the receivers and antennas usually employed for short-wave reception.

Yet as many times as we repeat that we turn to no "tricks," use no special equipment, and manage to get in our sleep, readers respond by pointing out the rare veri cards we obtain, which are used to grace these pages, as prizes beyond the reach of the average listener.

If the matter were to be summed up, we suppose that the difference between DX and no DX is a matter of experience. But of what does the experience constitute? Primarily a matter of patience, and also a bit of caution, and the recognition that certain distant stations can be heard only in the morning, others during the day and still others only after dark.

Patience is merely a matter of sticking with a station carrier until intelligibility can be squeezed out of it—and that is the most difficult thing for a newcomer to do. But patience is necessary—and is usually rewarded—for a carrier that may be extremely weak one moment more often than not will be strong the next. This is a point many listeners fail to remember.

Caution is a matter of slow and precise tuning to begin with, and thereafter a case of sticking with a station until adequate verification data is secured. Remember that a station is not apt to issue a verification unless there is positive assurance that the station was actually received. Also remember that the more data you provide—particularly data such as signal level, degree of fading, etc.—of value to the engineering staff of the station, the better are your chances of obtaining a veri.

dx mystery solved . . . mexican changes . . . japanese schedules . . . tahiti breaks through . . . spanish war news . . . new ham fones

The final element is common sense. Listen for stations at the right hours. If you are after a particular catch, refer to the Short-Wave Station List published in each issue of ALL-WAVE RADIO and determine the station's schedule. Listen for it over a range of 50 to 100 kilocycles on your tuning dial, for there is always the chance that your receiver is not perfectly calibrated.

Yes, it takes patience and time to hook the real catches, but that's a part of the game. It's worth it in the long run.

Radiophone and Experimental Stations

IUC, 11955 kc, Addis Ababa, Ethiopia, heard phoning Rome 1:45 A.M. Reported by J. Saxton, New York City. Also reported by J. W. Partner, Tacoma, Wash., phoning IAC nightly at midnight.

NEW STATIONS

Kc	Meters	Call	Location
21450	13.99	OLR	Prague, Czechoslovakia
20910	14.35	PSB	Rio de Janeiro, Brazil
18640	16.09	PSC	Rio de Janeiro, Brazil
17760	16.89	W2XE	Wayne, New Jersey
17755	16.90	ZBW5	Hong Kong, China
17280	17.36	FZE8	Djibouti, Africa
15300	19.61	XEBM	Mazatlan, Mexico
15190	19.75	ZBW4	Hong Kong, China
15070	19.91	PSD	Rio de Janeiro, Brazil
14485	20.71	HRL5	La Ceiba, Honduras
13410	22.37	WCT	San Juan, P. R.
12300	24.39	CEB	Santiago, Chile
11895	25.22	XEXR	Mexico City, Mexico
11880	25.25	XEXA	Mexico City, Mexico
11840	25.34	OLR	Prague, Czechoslovakia
11800	25.42	OER2	Vienna, Austria
11800	25.42	OAX5A	Ica, Peru
11740	25.55	HP5L	David, Panama
11595	25.87	VRR4	Stony Hill, Jamaica
10660	28.14	PSG	Rio de Janeiro, Brazil
10380	28.90	EAJ43	Santa Cruz de Tenerife, C. I.
10120	29.64	PSI	Rio de Janeiro, Brazil
9525	31.49	ZBW3	Hong Kong, China
9520	31.51	XEDQ	Guadalajara, Mexico
9300	32.27	YNGU	Managua, Nicaragua
8505	35.27	YNLG	Managua, Nicaragua
7935	37.81	PSL	Rio de Janeiro, Brazil
7200	41.67	YNAM	Managua, Nicaragua
6850	43.80	TIOW	Port Limon, Costa Rica
6270	47.85	YV5RP	Caracas, Venezuela
6200	48.39	XEXS	Mexico City, Mexico
6140	48.86	ZEB	Bulawayo, Africa
6125	48.98	CXA4	Montevideo, Uruguay
6110	49.10	XEPW	Mexico City, Mexico
6090	49.26	ZBW2	Hong Kong, China
6090	49.26	HJ4ABC	Ibague, Colombia
6075	49.38	XECU	Guadalajara, Mexico
6065	49.46	XEXR	Mexico City, Mexico
6050	49.59	XEXF	Mexico City, Mexico
6030	49.75	OLR	Prague, Czechoslovakia
6030	49.75	XEBQ	Mazatlan, Mexico
6010	49.92	OLR	Prague, Czechoslovakia
5905	50.80	TIMS	Puntarenas, Costa Rica
5800	51.72	ZEC	Salisbury, Africa

STATION CHANGES

New Frequency	New Call	Old Call	Old Frequency
9500	HI5G *	HI5E	9500
8190		XEME	9520
6780		HIH	6814
6690		TIEP	6710
6672		YVQ	6720
6635		HC2RL	6668
6545	YV6RB	YV11RB	6545
6535		YN1GG	6580
6520	YV4RB	YV6RV	6520
6479		HI8A	6480
6400	YV4RH	YV9RC	6400
6375	YV5RF	YV4RC	6375
6300	YV4RD	YV12RM	6300
6160		VPB	6050
6156	YV5RB	YV3RC	6156
6133		XEXA	6182
6070	YV1RD	YV7RMO	6070
6015		XEWI	5975
6000		HJ1ABC	6005
5910	YV4RH	YV15RV	5910
5880	YV3RA	YV8RB	5850
5850	YV1RB	YV5RMO	5850
5800	YV5RC	YV2RC	5800
5710	YV2RA	YV10RSC	5710

* Location to La Vega.

STATIONS DELETED

Kc	Meters	Call	Reason
17775	16.88	PHI	Not in service
11000	26.26	XBJQ	Not in service
8750	34.29	ZBW	Not in service
8190	36.63	XEME	Not in service
7100	42.25	HKE	Not in service
6230	48.15	HJ4ABJ	Not in service
5410	55.45	ZBW	Not in service

NON-AUTHENTICATED STATIONS

Frequency	Call	Location
15740	TFM	Reykjavik, Iceland (Dec.)
14000	PZ1AA	Paramaribo, Dutch Guiana (Dec.)
11895	HP5I	Aguadulce, Panama (Dec.)
10520	GOA	Shanghai, China (Jan.)
9590	VK6ME	Perth, W. Australia (Dec.)
9540	CB954	Santiago, Chile (Dec.)
9490	XTV	Canton, China (March)
9440	HCNA	Guayaquil, Ecuador (Mar.)
9340	OAX4I	Lima, Peru (March)
7580	HI9J	Cia. Trujillo, R. D. (Dec.)
6500	YV1RM	Cristo de Aranza, Venez. (Feb.)
6250	YV5RJ	Venezuela (March)
6210	YV5RI	Venezuela (March)
6164	OAX1A	Ica, Peru (March)
6120	HP5Z	Panama City, Pan. (July)
6075	HI3E	Puerto Plata, R.D. (Nov.)
5930	YV1RK	Venezuela (March)
Various	......	Peru (Dec.)
Various	......	Czechoslovakia (Jan.)
Various	......	Costa Rica (July)
Various	......	Norway (Jan.)

IUG, 15450 kc, Addis Ababa, Ethiopia, heard phoning Rome 9:45 A.M. Reported by J. L. West, Cleveland, Ohio.

ZLS, 8900 kc, Wellington, New Zealand, heard working with London 1:30 A.M. Reported by J. L. West, Cleveland, Ohio.

SUX, 7860 kc, Cairo, Egypt, reported by J. V. Saxton, New York City, as calling GCB Rugby 4:15 P.M. Sunday.

IRY, 16117 kc, Rome, Italy, reported by A. B. Wood, Jr., Bangor, Maine, on Sunday mornings phoning and sending musical programs of 2RO.

HSP, 17740 kc, Bangkok, Siam, phones JVD, 15860 kc, Nazaki, Japan, nightly between 7 and 11 P.M. Reported by Joseph Brown, Houston, Texas.

FZE8, 17280 kc, Djibouti, French Somaliland, Africa, reported by Dick Bruce, Greenfield, Mass., as irregularly heard phoning Paris. Mr. Bruce has veri of reception. Address—Ministere des Postes, Telegraphs et Telephones, Station Intercoloniale, Djibouti. The verification letter advises that FZE9, same location, works on code daily from 2:30 to 8:30 A.M. which may be news to c.w. listeners.

ZMBJ, TSS *Awatea,* mentioned in this block in February issue is reported by Paul R. Henniger, San Francisco, Calif., as broadcasting on 8820 kc during trips between Wellington and Sydney on Sundays and Wednesdays' between 1 and 3 A.M. They broadcast musical numbers and permit the passengers to converse with friends on shore. The address is: Union Line S.S., Coy Head Office, Wellington, New Zealand.

VOWN, 8675 kc, Northwest River. Labrador, the new station of Northwestern Skyways, Ltd., appears to be one of several stations being operated by that company. VOWM, 4850 kc, reported by Charles L. Lord, Cranston, R.I., as contacting CZ5M on about 4840 kc daily at 8:15 A.M. VOWQ near 8630 kc reported heard by Roy Waite, Ballston Spa, New York, calling CZ9U between 7 and 8 P.M. Here is a chance to receive a veri card from Labrador, where there are no short-wave broadcasting stations.

XTV, 9490 kc, a new Chinese phone at Canton is reported calling between 7 and 10 A.M. by Lyle Nelson, Yamhill, Oregon.

HRL5, 14485 kc, La Ceiba, Honduras, WCT, 13410 kc, San Juan, Porto Rico, and VRR4, 11595 kc, Stony Hill, Jamaica, reported by H. Wilson, Ithaca, New York, as phoning WNC, Hialeah, Florida, week days at 5:45 P.M. and 10:30 A.M. Sundays. It is understood that WNC takes the daily roll call of all stations connected with this chain in various countries at the hours mentioned.

KWU, 15355 kc, Dixon, Calif., phones JVD, 15860, or JVE, 15660, at 9:30 P.M., PLE, 18830, at 8:30 and 10 P.M., KAX, Manila, 19980 kc, near 10:30 P.M. and XGM, Shanghai 17260 kc 7 to 7:30 P.M. Reported by Joseph Brown, Houston, Texas.

FVA, 8960 kc, Radio Algiers, is reported by J. W. Partner, Tacoma, Wash., as working with Paris midnight to 4 A.M., also special broadcasts irregularly to France on 12120 kc.

Mexican Stations

Many changes have been made according to the latest list received from the Mexican Government, and although we are not able to reconcile all noted, there is given below a list of the changes and additions noted.

Frequency	*Call*	*Location*
15300	XEBM	Mazatlan
11895	XEXR	Mexico City
6065	XEXR	Mexico City
11880	XEXA	Mexico City
6133	XEXA	Mexico City
7380	XECR	Mexico City
6200	XEXS	Mexico City
6120	XEFT	Veracruz
6110	XEPW	Mexico City
6100	XEBT	Mexico City
6075	XECU	Guadalajara
6050	XEXF	Mexico City
6030	XEBQ	Mazatlan
6020	XEUW	Veracruz
6015	XEWI	Mexico City

From this it would seem that XBJQ 11000 kc, XEWI 11900 kc, XEFT 9505 kc and XEME 8190 kc have been dropped; that XEWI has been changed from 5975 to 6015 kc, XEBT 6000 to 6100 kc, XEXA from 6182 to 6133 and the following stations added: XEBM 15300 kc, XEXR 11895 and 6065 kc, XEXA 11880, XEXS 6200, XEPW 6110, XECU 6075, XEXF 6050 and XEBQ 6030. The following stations remain as last reported: XECR 7380 kc and XEUW 6020 kc.

The dropping of the frequencies 11900 and 9505—XEWI and XEFT, respectively—and the change of XEBT from 6000 to 6100 are questionable, as the first two mentioned stations have been recently heard on those frequencies and the last named station is being heard nightly near 6000 kc as always.

XEDQ, 9520 kc, Guadalajara, is not listed but it is possible that assignment was made after the list was prepared. XEDQ is being heard nightly with good signal and is called "Radio-Fonografica de Guadalajara." It rebroadcasts the programs of XED on 1160 kc with 500 watts power and opens and closes its transmissions with a Mexican dance called "Jarabe Tapatio." Address is 16 de Septiembre 170, or Apartado 197, Guadalajara, Jalisco, Mexico. Senor Mario E. Bozzano is Station Manager. Hours on the air are shown in station list.

OER2, Vienna, Austria, has changed frequency from 6060 to 11800 kc or 25.42 meters. Letter from them advises they rebroadcast the programs of

Last-Minute Flashes

OLR, Prague, advises that they are now broadcasting on 6010, 9550, and 11840 kc, but still testing on several other frequencies, before definite assignment is made. Time on the air is as follows: Daily 2:25-4:30 P.M., 8:55-12 noon, except Sunday. Thurs. & Sat. 5-7:30 A.M. Sunday 2-7:30 A.M., Mon. & Thurs. 1-3 P.M.

GSA 6050 and GSL 6110 have been replaced by GSD 11750 kc.

PHI 17775 and 11730, are said to be on the air while PCJ is being rebuilt.

French West Indies—A new station on about 9445 kc., located at Fort de France, Martinique, is being heard and reported by many.

HBL, 9595, and HBP, 7797 kc., is now broadcasting a program to Swiss citizens abroad each Saturday 7-8:30 P.M. in addition to the regular Saturday listed program at 5:30 P.M.

ZTJ, Johannesburg, So. Africa, is now on 6097.56 kc.

XEUZ (about 6117 kc.) Radio Nationales, Mexico City, is new station relaying XEFO, long-wave station.

HP5I. 11895 kc., Aguadulce, Panama, is on the air.

YV5RI, 6210 kc., Coro, Venezuela, is now broadcasting nightly.

HC2RA, about 9440 kc., located at Guayaquil, Ecuador, is being heard with fine signal. Same station reported in non-authenticated section in February.

Just plain black and white, but a very striking card—as you will see if you hook VPD.

the long-wave station "Bisamberg" week days from 9 A.M. to 5 P.M. and on Saturdays from 9 A.M. to 5:30 P.M., E. S. Time. From this it would seem that they do not broadcast on Sundays. OER2 (short wave) transmits with a power of 1½ kw. Address: Osterr. Radioverkehrs A.G., Wien, 1., Johannesgasse 4b.

YNVA, 8590 kc, Managua, Nicaragua, has been changed to YNLG with frequency of 8505 kc.

YNGU, 9300 kc or 32.27 meters, Managua, Nicaragua, is shown in lists in this issue.

TIOW, 6850 kc, Port Limon, Costa Rica, is listed in this issue. This station is being reported by many listeners. Department of Commerce bulletin lists it as TI6OW.

TIPG, 6410 kc, San Jose, Costa Rica, is being reported by many as broadcasting on 9550 kc mornings. If any reader receives report from station please forward to this department.

OAX1A, 6164 kc, Ica, Peru, reported heard by R. B. Oxrieder, State College, Pa. Spanish announcements. Signed at 11 P.M., E. S. Time, with "Good-night Song."

W2XAF, 9530 kc, and W2XAD, 15330 kc, are transmitting the Saturday afternoon Metropolitan opera programs beginning at approximately 2 P.M., E. S. Time.

HI8A, 6479 kc, Ciudad Trujillo, Dominican Republic, advise they open and close their programs with the Mexican march "General Alvaro Obregon." Each fifteen minutes announcements are made in Spanish and English, being preceded by two strokes of a bell. The owner of station is Senor Jaime A. Rodriguez. G. Address, Apartado 1312.

PCJ, 15220 kc, Eindhoven, Holland, was heard by Edwin Granger, Syracuse, N. Y., on January 20th announcing PCJ would be off the air for several weeks, while constructing a new transmitter with increased power, which will be located at Hilversum. The new station will operate on the same frequencies. In the announcement they were heard to say that the Wednesday night broadcast on 9590 kc (20th) would also be the last for the time being and programs would be heard on PHI.

VPG, Colombo, Ceylon, advises they are on 6160 kc or 48.70 meters instead of 6050 kc and change has been made in station list. Copy of monthly folder "Ceylon Radio Times" published by the "Radio Club of Ceylon and South India" and containing complete programs, shows VPB on the air from 6:30 to 9 and 10 A.M. daily, E. S. Time. No mention is made of the power of the transmitter on short waves. Reports on reception are invited by the Radio Club mentioned with advice that reports should be addressed to them, P. O. Box 282, Colombo, Ceylon.

Japanese Stations

JZI, 9535 kc, Tokyo, Japan, is reported as broadcasting overseas programs to various parts of the world daily from 9 to 10 A.M., 2:30 to 3:30 P.M., 7 to 10 P.M. and 10.30 P.M. to 1:30 A.M.

JZJ, 11800 kc, daily from 4 to 5 P.M. and 12 to 1 A.M.

JVN on 10660 kc being used simultaneously with JZJ.

JZL, 17785 kc, between 12 and 2 A.M.

JZK, 15160 kc, 11:30 A.M. to 12:30 P.M., 7 to 8 P.M. and 10:30 P.M. to 1:30 A.M.

No reports of time on the air have been received for JZM, 21520 kc, JZB 10960 kc or JZH, 6095 kc, the other assigned frequencies.

It should be understood that these are tentative schedules and may be changed at any time. We are grateful to Harry Honda, Los Angeles, Calif., for the greater part of this information which was received from a reliable source at the time of receipt. Reports of changes in schedules would be appreciated.

JVT, 6750 kc, is now broadcasting the morning programs between 4 and 7:40 A.M. which are coming in with a fairly good signal.

JVP, 7510 kc, is reported as transmitting programs from 9 to 10 A.M. and 2:30 to 3:30 P.M.

In making reports on the Overseas transmissions they should be forwarded to Broadcasting Corporation of Japan, Overseas Section Atagoyama, Shiba-Ken, Tokyo, Japan.

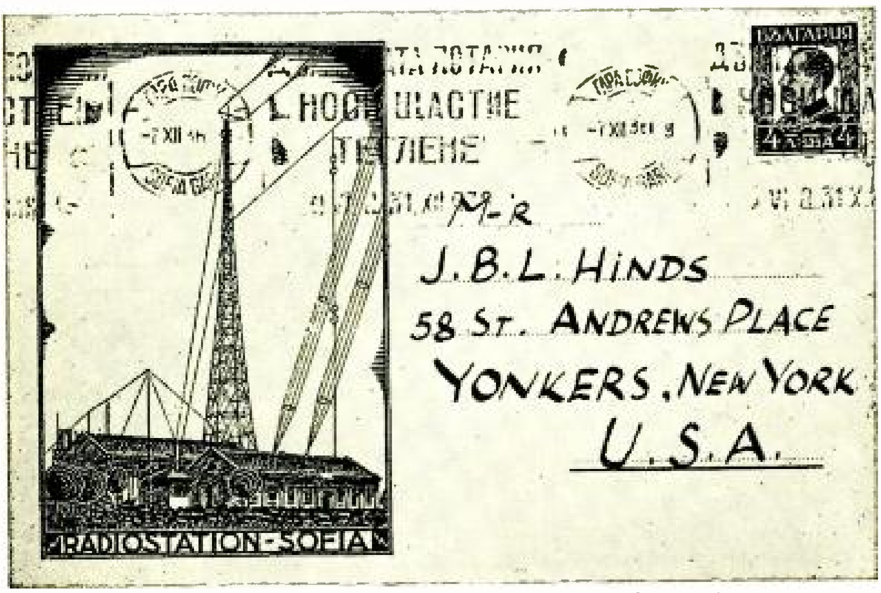
In connection with these overseas broadcasts, it is the opinion of the writer that sufficient power is not being employed to bring these programs into Eastern United States consistently. The signals are shaky and unstable and do not gain strength until the hour's program is well advanced, and at the peak is not a reliable signal. It is understood that they have been using about 20 kw on these tests. The writer recently had an opportunity to check the signals on some of these tests, having received a cable request for information from Tokyo. As these tests proceed the power will be increased to the full 50 kw according to advice received from Japan.

ZBW, Hong Kong, China, sends veri card covering reception report 9525 kc-station ZBW with frequency 9525 printed on card. No mention of its being ZBW3, or are other frequencies shown on card, so it is not known whether they furnish separate cards for each call and frequency mentioned in February issue or not. Information has been received that they have four frequencies and calls as mentioned, which are to be used according to seasonal conditions. ZWB3, 9525 kc, is at present used mostly with occasional broadcasts on ZBW4, 15190 kc. English announcement at 8 A.M. with news in English following. The frequencies of 8750 and 5410 have been discontinued.

RAN, 9600 kc, Moscow, U.S.S.R., is now transmitting daily from 7 to 9 and 9:15 P.M.

EAJ43 "Radio Club Tenerife" is shown in station list on 10380 kc or 28.90 meters and the location as Santa Cruz de Tenerife, Canary Islands. They are transmitting three separate broadcasts between 2:15 and 8 P.M. daily E. S. Time.

CEB, 12300 kc, Santiago, Chile, is being heard and reported and is listed tentatively on the frequency mentioned. It is said to be called "Radio Cerve" and is on the air as late as 11 P.M., E. S. Time, signing off usually with Sousa's "Washington Post March." Address is



A veri signed by M. Topalov, Chief Engineer of LZA, Sofia, Bulgaria.

reported as Casilla 761, Santiago, Chile.

OAX5A, 11800 kc, Ica, Peru, is now being heard by many listeners. The Department of Commerce bulletin shows this station as "Radio Ica" (Universal) and rebroadcasting the programs of long-wave OAX5B on 1250 kc. Both stations are owned and operated by Macchiavello and Umbert S. C., Tacna 112, Ica, Peru.

CXA4, Montevideo, Uruguay, is a new station listed in this issue on 6125 kc or 49.98 meters and relaying the programs of long-wave CX6 on 650 kc. It is understood that it is a low-powered station and it may be difficult to receive in its present location on the 49-meter band. Station is called "Radio Electrico de Montevideo." Address as given this department—Director Hector M. Laborde Mercedes, 823, Montevideo, Uruguay.

HJ1ABE, 9500 kc, Cartagena, Colombia, is to have a "twin" station in Medellin, Colombia, before long. Information received is that Senor Antonio Fuentes owner and operator of HJ1ABE, is to install a 1000-watt transmitter at Medellin which will work in chain with HJ1ABE. We have not as yet been advised as to the call of the new station.

HJU, Buenaventura, 9510 kc, advise they announce every five minutes in English and Spanish. Programs are opened and closed with the march "Palmira" which is the official march of the station.

HJ3ABD, 6050 kc, "Colombia Broadcasting" is now called "Emisora Nueva Granada." Programs are opened with "Rio Rita" and closed with the Colombian National Anthem. Announcements in English are made after 10 P.M.

OAX4D, Lima, Peru, begins their transmissions by giving their identification OAX4D in Morse code.

CSW, Lisbon, Portugal, 9940 kc, has been testing and broadcasting between 11000 and 11100 kc on several occasions, although it has been maintaining its regular scheduled programs on 9940 kc.

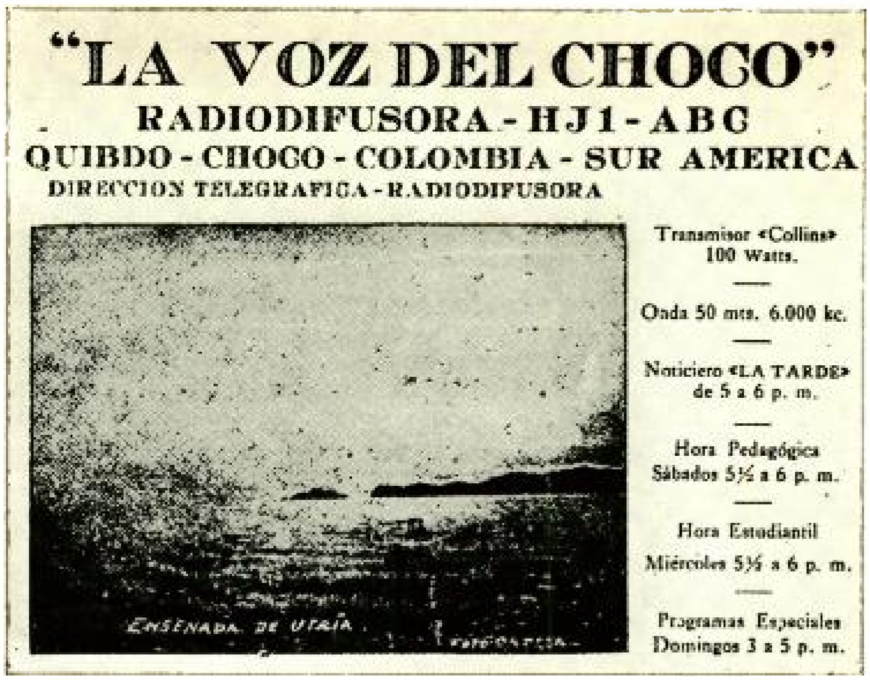
CB615, Santiago, Chile, 6150 kc, will soon increase its power. Only one report has been received of this station being heard since shown in station list.

CB954, Santiago, Chile, shown in non-authenticated block was reported by several West Coast listeners some time ago as being heard but it apparently has not come on the air with regular programs.

VE9BK, 4795 kc, Vancouver, B.C., Canada, is off the air temporarily undergoing repairs to transmitter.

HRP1, San Pedro de Sula, Honduras, is shown in station lists on 6351 kc. Edward Hughes, Long Branch, N. J., reports receiving card from them on 7030 kc or 42.67 meters.

HCK, Quito, Ecuador, 3750 kc, in list also reported by Mr. Hughes as being on 5885 kc according to card received. Reports from listeners would be appreciated.



An attractive veri from HJ1ABC. Acknowledgement of reception on reverse side.

VP3BG, 6132 kc, Georgetown, British Guiana, reported by Morgan Foshay, Montclair, N. J., as being on the air at 4:45 P.M. and signing off with "God Save the King" at 6 P.M. Will any one securing the schedule of this station please forward to this department.

HP5L, David, Panama, is now broadcasting on 11740 kc or 25.55 meters. Verification letter for reception on test programs brings the information that station will transmit at the beginning from 4 to 7 P.M. and later increase the hours. This station also expects to work in conjunction with the Police Department of Panama City and this work will go on from 12 midnight to around 7 A.M. This is a novel innovation for a commercial broadcasting studio, as there will be considerable educational work going on during the night on these broadcasts. David is about 300 miles from Panama City. Power of station is 350 watts. Address of station is Apartado 129, David, Chiriqui, Rep. of Panama.

HCNA, 9440 kc, "La Voz de Almos", Guayaquil, Ecuador, reported heard nightly between 10 and 11:15 P.M. Further reports would be appreciated.

F3ICD, 11730 kc, Saigon, Indo-China, is reported as operating as "Radio Philco." Veri card received by R. Simpson, Australia, from Establissement Boy-Landry 211-213D Rue Catinat, Saigon.

OAX4J, 9340 kc, Radio Nacional, Lima, Peru, reported heard between 6.30 and 7:30 P.M. by W. H. Stark, Wauwatosa, Wisconsin. The Department of Commerce reports Radio Nacional OAX4J 1100 kc long-wave with short wave transmitter OAX4I 9520 kc or 31.51 meters and states that stations are located at Lima, and operated by Radio Internacional S.A. Address Ed. Mineria 6 piso.

HJ1ABP, Cartagena, Columbia, 9600 kc, has new schedule in station list. Robert Behm, Philadelphia, states he has letter from them advising their intention to close down unless more reports are received. It is hoped that readers will submit reports as this is an exceptionally good station. An American hour (English) is broadcast nightly from 10 to 11 P.M. E. S. Time.

YV1RM, 6500 kc, YV5RJ, 6250 kc, YV1RI, 6210 kc and YV1RK, 5930 kc, are new Venezuelan stations soon to be on the air. The new calls for the old stations are now shown in the station lists.

HIH, San Pedro de Macoris, has changed frequency from 6814 to 6780 kc. HI8Q said to have changed to long wave only is reported as being heard around 6200 but retained in station list on 6240 kc. HI9B, 6040 kc, is reported as being heard near 5880 kc. It is expected that a correct list will soon be received from the Director of Radio Communications of the Dominican Republic which will enable this department to correctly revise the frequencies being used.

HJ4ABC, 6090 kc, Ibague, Colombia, is back on the air with 1000 watts power, and performing a fairly good job of covering the signal of CRCX, Bowmanville, Canada, on the same frequency. HJ4ABC is operated by Lamus Rivera and Company.

OLR, Prague, Czechoslovakia—6010 kc, 6030 kc, 11840 kc, 21450 kc. These frequencies have been added, which now increases the assigned frequencies to

(Continued on page 160)

Night-Owl Hoots

By Ray La Rocque

etheric beauty contest . . . new venezuelan calls . . . contest news mexico and cuba dot band . . . changes in power . . . station barometer

IN the city of Santiago de Leon de Caracas, known familiarly as Caracas, Venezuela, birthplace of the famous liberator Simon Bolivar, radio broadcasting is now enjoying tremendous popularity and new stations are constantly springing into the ether. This growing interest in broadcasting has been, in our opinion, the deciding factor in the government's proposal of a complete re-assignment of call letters to all stations. Under the present system, call letters are more or less stereotyped. Every station in the city bears the same call, with only a number inserted between the letters distinguishing one station from another. Now, when the stations have become numerous and the numbers are beginning to run into more than one digit, the government has proposed a plan for improvement of call letters.

Under the proposed system, the Republic of Venezuela has been divided into nine radio districts and each call assigned will bear the district number after the prefix "YV." The last two letters will be varied by government assignment. The new plan also provides a separate set of call letters to broadcast band stations relaying the programs of a sister station on the short waves. The stations now broadcasting in Venezuela with the old and proposed calls given are:

Old	*Proposed*	*Location*	*Kc.*	*Watts*
YV1RC	YV5RA	Caracas	960	2500
YV3RC	YV5RD	Caracas	1200	1000
YV4RC	YV5RE	Caracas	1110	200
YV9RC	YV5RG	Caracas	1100	100
YV5RMO	YV1RA	Maracaibo	1500	100
YV7RMO	YV1RE	Maracaibo	1153	75
....	YV1RF	Maracaibo	1120	250
YV6RV	YV4RA	Valencia	1350	500
YV11RB	YV6RA	Ciudad Bolivar	1400	250
YV12RM	YV4RG	Maracay	1153	100

Credit for the above list of stations and proposed call letters is due J. B. L. Hinds. While we're giving our short-wave chief credit we will also credit him with the information that HJ1ABK is now broadcasting on long wave only, using 1350 kc. The pictures of HJ1ABK (one is shown) were forwarded to us by the same J. B. L. Hinds. According to information with the pictures from C. Vassaco Gomez of HJ1ABK the station's schedule is as follows: Daily from 11 A.M. to 1 P.M., 3 to 5 and 6 to 11 P.M. On Sundays from 9 A.M. to 1 P.M., and 6-9 P.M.

Station Changes, U.S.A.

New Stations: KYCA in Prescott, Arizona to operate with 100 watts on 1500 kc with unlimited time; and a new station in El Paso, Texas for the same channel with 100 watts.

Changes in call letters: W1XBS to WBRY, W2XR to WQXR, W6XAI to KPMC, W9XBY to KXBY, and KVL to KEEN.

Call letters assigned to new stations: KVGB to Great Bend, Kansas (1370 kc); KAND to Corsicana, Texas (1310 kc); KAWM to Gallup, New Mexico (1500 kc); and KSRO to Santa Rosa, California (1310 kc).

KDAL (1500 kc) moves from Moorhead to Duluth, Minn. . . . KFJM changes frequency from 1370 to 1410 kc and increases power to 500 watts. WBIG also increases power from 500 to 1000 watts.

Station Changes, Foreign

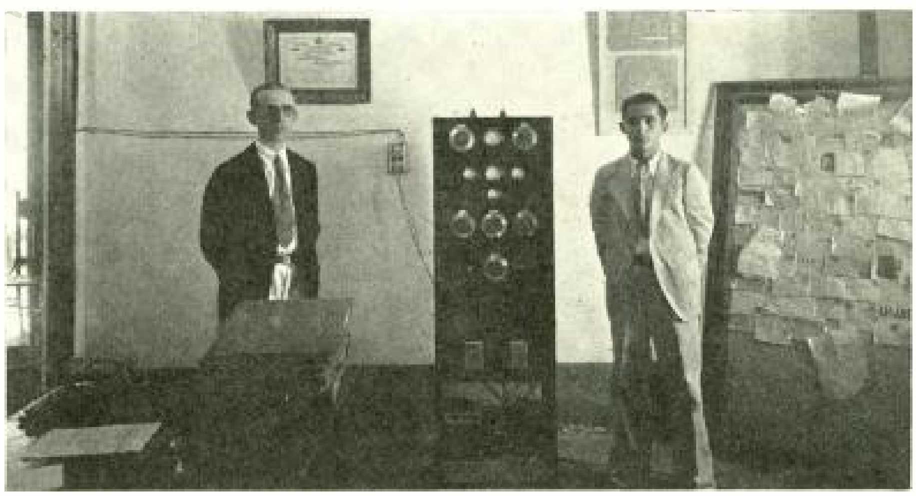
New Stations: The following list includes the latest stations to come on the air.

CA63	Iquique, Chile (IDA)..	630	——
CB96	Coquimbo, Chile (IDA)	960	——
CC127	Chillan, Chile (IDA)..	1270	——
CMJX	Camaguey, Cuba.......	830	500
CRCY	Toronto, Ontario.......	1420	100
HJ1ABK	Barranquilla, Colombia.	1350	——
TIPG	San Jose, Costa Rica..	625	——
VOCM	St. Johns, Newfoundland	1006	——
YV11RB	Ciudad Bolivar, Venez..	1400	250
2LM	Lismore, Australia.....	900	500
2RG	Murrumbridges, Aus....	1470	50
3YB	Warnambool, Australia.	1270	50
4VL	Charleville, Australia (IDA)	1130	50
6WB	Katanning, Australia (UDXC)	1070	2000
....	Burghead, Great Britain (IDA)	767	60000

Changes in frequency: CMKW 1330-1350, CFRN 1260-960, CJGX 580-1390, CMCU 1460-1280, CMCQ 1420-1410, XEFC 560-550, XEF 980-1450, XEH 1150-720, YV4RC 1100-1110, VY9RC 1010-1110, YV5RMO 1300-1500, XEPN 595-730, 2LV 820-1170 (IDA), 2MO 1360-1370 (IDA), 3MB 1490-1390 (IDA), 3SH 1080-1130, 4AY 980-860, 4CA 1470-1390, 4MK 1160-1080, 4TO 1170-1080 (IDA) 4WK 900-1360. Station 2XN on 1340 should be crossed from the books as it is no longer operating.

Call letters changed: YV1RG to YV1RF and HSP1 to HSPJ.

Changes in power: CMBZ (1000) 150-500, CMCY (1030) 1000-8000, CMCO (1200) 150-250 (IDA), CMKM (1120) 50-200 (IDA), CMJA (1010) 50-300 (IDA), XEPN (730) 50,000-100,000, XERA (840) 250,000-350,000, YV1RC (960) 5000-2500, YV3RC (1200) 3000-1000, YV4RC (1110) 100-200, YV9RC (1100) 100, YV5RMO (1500) 150-100, YV7RMO



Transmitter at HJ1ABK—The Voice of the Country—at Barranquilla, Colombia. At left, the builder and proprietor; at right, the general manager.

(1153) 500-75, YV1RF (1120) 250, YV6RV (1350) 350-500, 2LV (1170) 100-1000 (IDA), 2CH (1050) 500-2000 (IDA), 2FC (610) 1000-3500, 2GF (1210) 50-100, 2GN (1390) 100-200, 2MO (1360) 50-100, 2TM (1300) 50-1000 (IDA), 2WL (1430) 50-600, 3HS (1370) 50-1000 (IDA) 3BO (970) 200-1000 (IDA), 3GL (1350) 50-100, 3MA (900) 50-100, 4BH (1380) 600-1000, 5MU (1340) 100-200 (IDA), YV12RM (1153) 100, and CKX (1120) 100-1000.

Contest News

During December a total of 363 reports were received on 56 different stations. The standing of the first four contestants remained unchanged and it became apparent that the Quaker City DXer, George Brode, is the DXer to overtake if any of the other contestants have championship hopes. Fifth place was occupied by Carl Forestieri who showed very well in his first month of scoring. The standing of the leaders is as follows:

George Brode, Philadelphia, Pa...	2292
Bernard Ahman, Jr., Baltimore, Md.	1987
Joe Lippincott, Tufts College, Mass.	1168
Enrique Hidalgo, Cienfuegos, Cuba	1002
Carl Forestieri, New York, N. Y.	664
Earl Lever, Worcester, Mass. ...	528
Charles Hesterman, Saskatoon, Sask.	400
Carroll Weyrich, Baltimore, Md.	186
John Gardner, New York, N. Y.	166
Bob Beadles, Salt Lake City, Utah	150
Kendall Walker, Yamhill, Oregon	100
Carl Sylvester, Yale, Michigan ..	83
Fred L. Van Voorhees, Miller Place, N. Y.	45
Leroy F. Nice, Souderton, Pa. ..	33

High scorer for the month was, of course, Night Owl Brode with 1182, followed closely by Ahman with 1018 and Hidalgo with 1002. The most "bullseyes" (100 pts.) were scored by Brode also, with six to his credit. They were CMCY, KWSC, CMKW, WCOP, CMCD, WHAZ. Other "bullseyes" were scored as follows: Hesterman 4, KGU, KGMB, KHBC, 3AR; Hidalgo 4, XEMX, XEU, WJAG, and XEL; Ahman 3, CMCJ, CMK, CMGH; Forestieri 3, WJAX, Paris PTT, Poste Parisien; Lippincott 2, XEBK, CMBS; Lever 2, CMCB, WOPI; Weyrich 1, XEYZ.

The border Mexicans continue the most popular among the contestants. Only LR1 with a total of 18 reports approached the border stations. As a matter of note, the following tabulation of stations reported with the number of times reported should prove a very good barometer of what stations are being heard by DXers. Those reported most frequently naturally are those which are easiest to hear. The stations: XEAW 58, XERA 56, XENT 46, XEPN 44, XELO 32, LR1 18, CMQ 8, WNEL 7, XEW 7, XEB 7, WKAQ 6, CMBZ 6, Rennes 5, Belfast 5, XEMO 4, TGW 4, XEP 4, Radio Normandie 4, CFCN 3, WLAC 3, CMHJ 3, XEK 2, XEU 2, XEFO 2, CMBY 2, CMBN 2, XEBG 2, CMCB 2, CMX 2, CMCF 2, CMOX 2, CMCD 2, and one report each on stations WJAG, CMGH, CMK, XEMX, CMCJ, WOPI, Paris PTT, XEBK, CMBS, WJAX, Poste Parisien, XEYZ, KGU, KGMB, KHBC, 3AR, CMKW, WCOP, KWSC, and WHAZ. Credit for the best catch of the month goes to Charles Hesterman for reception of 3AR.

ALL-WAVE RADIO'S
Time Table of DX Programs

(All time is given in Eastern Standard Time)

Specials

Wednesday Morning, Feb. 24		
KHBC, Hilo, Hawaii (NNRC)	1400 kc.	3:00-4:00
Friday Morning, Feb. 26		
KTEM, Temple, Texas (NNRC)	1370 kc.	4:00-6:00
Sunday Morning, Feb. 28		
CFLC, Prescott, Ont. (GCDXC)	930 kc.	2:00-5:00
KWSC, Pullman, Washington	1220 kc.	3:00-7:00
Thursday Morning, March 4		
CMHJ, Cienfuegos, Cuba (For All-Wave Radio)	1160 kc.	2:00-3:00
Friday Morning, March 5		
KTEM, Temple, Texas (NNRC)	1370 kc.	4:00-6:00
Sunday Morning, March 7		
WJBO, Baton Rouge, La. (For All-Wave Radio)	1420 kc.	2:00-4:00
KGDY, Huron, S. Dak.	1340 kc.	4:00-4:30
Thursday Morning, March 11		
4IP, Ipswich, Australia (IDA)	1440 kc.	5:30-7:00
Saturday Morning, March 13		
KOTN, Pine Bluff, Ark.	1500 kc.	3:00-....
Sunday Morning, March 14		
WLVA, Lynchburg, Virginia	1200 kc.	1:00-1:20
Monday Morning, March 15		
KGFW, Kearney, Nebr.	1310 kc.	6:00-6:30
Tuesday Morning, March 16		
WHAZ, Troy, N. Y.	1300 kc.	12:30-1:30
Thursday Morning, March 18		
CMHJ, Cienfuegos, Cuba (CDXR)	1160 kc.	5:00-6:00
Friday Morning, March 19		
CKSO, Sudbury, Ontario	780 kc.	3:11-3:19
KTEM, Temple, Texas (NNRC)	1370 kc.	4:00-6:00

Regulars

Every Sunday Morning		
TGW, Guatemala City	1210 kc.	12:00-6:00
XED, Guadalajara, Mex.	1160 kc.	12:01-2:00
WLAC, Nashville, Tenn.	1470 kc.	12:45-1:00
CMCW, Havana, Cuba	750 kc.	1:00-3:00
XEP, Juarez, Mex.	1160 kc.	2:00-4:00
KFBB, Great Falls, Mont.	1280 kc.	2:00-5:00
Every Tuesday Morning		
LR-1, Buenos Aires, Argentina	1070 kc.	2:15-3:30
KMAC, San Antonio, Tex. (NNRC)	1370 kc.	5:30-6:00
Every Thursday Morning		
——, Belfast, Great Britain	977 kc.	1:30-3:00
LR-1, Buenos Aires, Argentina	1070 kc.	2:15-3:30
Every Friday Morning		
CFCN, Calgary, Alberta	1030 kc.	12:00-2:00
Every Saturday Morning		
CMKW, Santiago, Cuba	1330 kc.	1:00-2:00
LR-1, Buenos Aires, Argentina	1070 kc.	2:15-3:30
KMAC, San Antonio, Tex. (NNRC)	1370 kc.	4:30-5:00
WTMV, East St. Louis, Ill.	1500 kc.	12:00-3:00

With the Night Owls

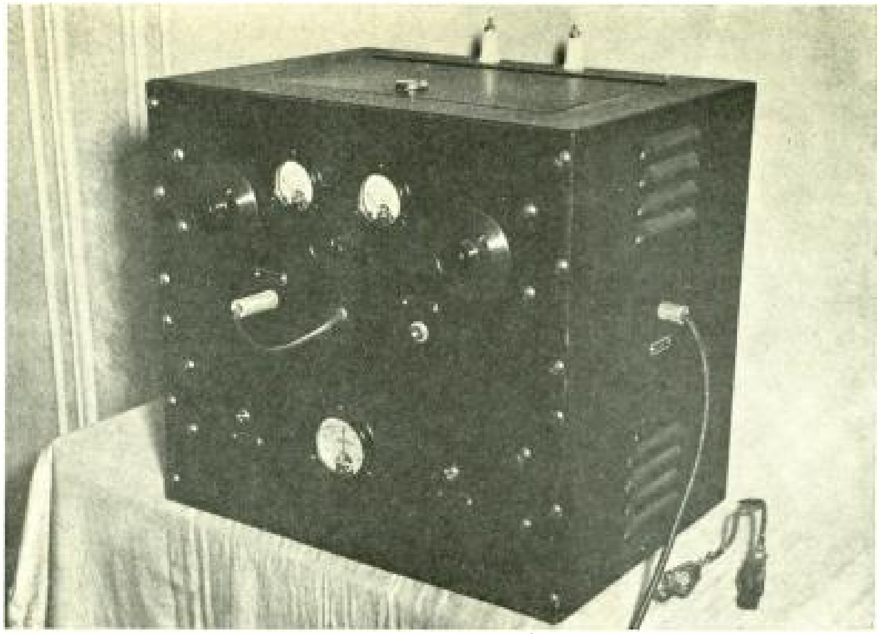
From the potential champion of the present season, George (Steve) Brode we have quite a bit of interesting information: "Station CJCS of Stratford, Ontario has been putting in a good signal on Sunday mornings between 1-1:30 A.M. in the Quaker City. They say they use a little better than 50 watts with a four-wire flat top antenna. WHAZ says in their verification that they broadcast every Monday evening from 6 P.M. to midnight. CMBZ sends out a nice veri with a Gold Seal in the lower right corner. Just got mine—and also received a Christmas card from CMHJ."

Elmer Samson of Hudson, Wisconsin informs the Chief Night Owl that the Twin Cities now have two NBC outlets. KSTP carries the Red Network programs while the Blue hookup features are presented over WTCN. . . . Quoting from a note from an active contestant in our contest, Earl Lever, we learn of his first experience with TA reception: "After 2:13 for a few minutes I heard some very weak shaky foreign station on 1040 kc. I hope this was Rennes. At about 2:20 I heard some weak station on 1070 kc playing marches. I didn't listen long enough to get any announcements but I hope it was LR1. Maybe our set is getting better with age. If it keeps getting better this way, by 1940 KHBC should come in loud enough to blot out WAAB at noon in the summertime!" And perhaps even during an electrical storm, huh? . . . "WTMV, East St. Louis announces a DX program every Saturday at 11 P.M. until 3:00 A.M. Sunday." This is passed on to fellow Night Owls by Fred Van Vorhees of Miller Place, N. Y.

Barney Ahman says, "I think I heard LR9 this A.M. I have a definite number and heard Argentina mentioned several times, but I wasn't sure enough to send you a report in the bunch. There is a Mexican or Cuban on every BCB frequency at night now." And judging from Barney's contest reports not many of these Mexicans and Cubans are escaping his ear! . . . "The WCOP programs are to be discontinued for the present. The only hope is for DXers

(Continued on page 162)

QRR! *QRR!*



THE COMPLETED 6-VOLT, 20-WATT EMERGENCY TRANSMITTER

20-WATT EMERGENCY TRANSMITTER

BY ALVIN G. ABRAMS • W2DTT

As THIS article is being written, sections of the country are experiencing one of the worst floods in history. Communication and transportation facilities have been disrupted, and again, as in the past, the radio amateur is rendering a public service by stepping in and bridging the broken gaps of communication.

But in the present emergency, and at times of other disasters brought on by natural causes, many amateurs who have wished to lend assistance have been caught totally unprepared. And most likely there have been instances when the services of an amateur and his station have been sorely needed, but have not been available because of the absence of emergency equipment.

Radio magazines, clubs and authorities stress the importance and emphasize the need for reliable emergency transmitters for those amateurs located in rural districts in order that valuable aid can be given when an emergency arises. The flood of last spring focused attention on this subject, and so impressed the author that he commenced the design of a compact, semi-portable transmitter that would meet all the specific requirements of an emergency unit. The details of the finished job is the subject of this article.

Transmitter Requirements

Many leading authorities were consulted regarding the essential characteristics of such a transmitter. It was unanimously agreed that the unit should be powered from a source completely independent of commercial light lines so that the transmitter would not be made useless in the event of local power failure. It was also agreed that, for the sake of complete reliability, communication should be by means of code rather than phone, and that the transmitter should be designed to operate in the 80-meter c.w. band which is satisfactory for both short- and long-haul traffic. Lastly, the importance of frequency stability and fool proof construction were emphasized. All these points were taken into consideration when the first plans were drawn up.

The Power Supply

One has the choice of three sources of independent power—the gasoline engine-driven generator, the storage battery, and B batteries. The gas generator was ruled out because of its prohibitive cost, and B batteries were dropped because of their inability to produce a satisfactory output. This left the storage battery as the actual source of power—but also left the question as to the type of voltage step-up device to use in conjunction with it. The genemotor was finally chosen as the most practical device for this purpose. One particular type seemed to be the best compromise between price and output. This is the 350-volt, 100-milliampere genemotor operating from a 6-volt source and drawing 11.3 amperes at full load. Thus with an available input of 35 watts, an output of 20 watts is assured, and this was considered ample to meet all requirements.

With the problem of power supply settled, it was then a comparatively simple matter to design the transmitter incorporating the necessary features for satisfactory performance.

Transmitter Design

It was highly important to make the set as foolproof as possible, and this could only be accomplished by eliminating trick circuits and reducing controls to a minimum.

It was also considered of paramount importance to construct the transmitter as rigidly as methods would permit. In the transmitter pictured, all parts are bolted into place securely, with all connections mechanically tight. On actual trials in the author's home, several tests were taken to determine the strength or possible weakness of any connections in the set. With the transmitter tuned up, several lusty blows were administered to the cabinet. No detuning was observed nor did the connections break or sparks fly. The next test was picking up the front of the cabinet and letting it drop. However, this test, although successful, was soon abandoned because of the tendency of the floor to break down before the transmitter. These tests actually simulate the treatment which may be given the rig under emergency conditions.

Crystal control was considered essential for frequency stability because under working conditions, particularly in a severe wind storm, the antenna will swing considerably and vary the frequency if crystal control is not used. Capacitive coupling was used because it is simpler than any other method and obviates the necessity for an additional control if link coupling were to be used.

Tube Selection

The 6L6 has been on the market for some time now, and it can no longer be classified as being in the experimental stage. This tube was thought to be ideal for use in the final amplifier stage because it would give the maximum output at the voltage available. The excitation requirements are small, approximately 3 milliamperes of grid current being sufficient for full output. It was then only necessary to pick out a tube suitable for an oscillator.

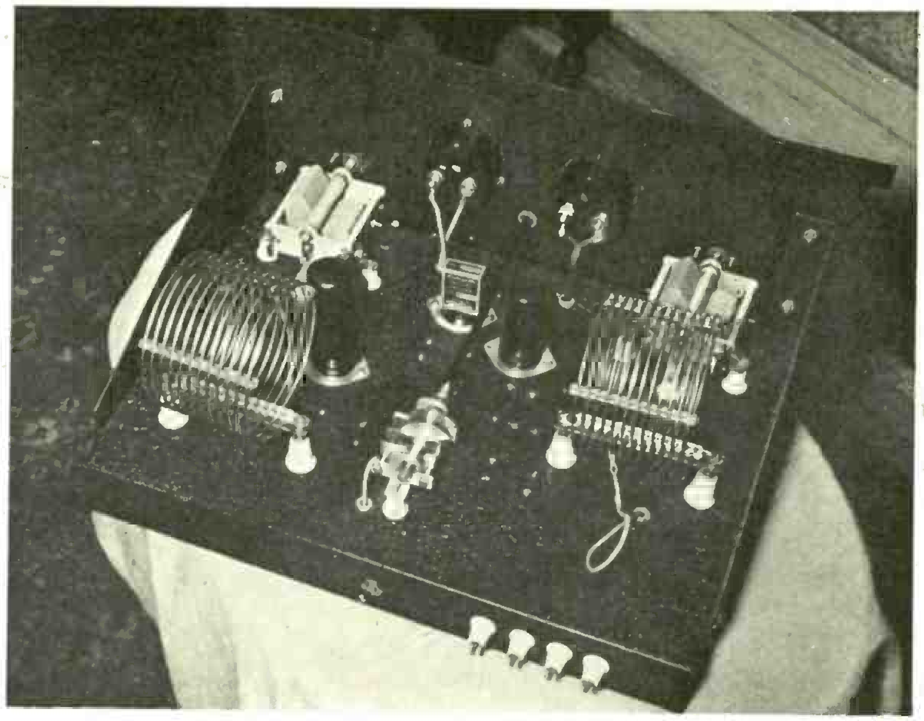
The requirements for the oscillator circuit are that the tube should preferably be a pentode, be economical of filament current and produce the small output necessary to drive the amplifier. The 6F6, which is the metal equivalent of the 42, fills the requirements perfectly.

Construction

The cabinet consists of two compartments each with a separate panel. All the power-supply components are arranged on the bottom shelf and the transmitter proper is situated on the top shelf.

To preclude any possibility of the genemotor giving trouble due to vibration, this particular type of genemotor is supplied by the manufacturer already mounted on a small base, mechanically insulated with rubber cushions. The output of the generator is essentially direct current, but contains a small ripple. This ripple can be removed by means of a filter consisting of a double 8-mfd. condenser and a 30-henry, low resistance choke.

This combination worked excellently, but it was noticed that a strong generator hash was present in the receiver. With a little experimenting, it was found that a pair of 0.1-mfd. condensers connected across the generator and grounded to the frame cut the noise out completely. Naturally, neither battery lead is grounded.



Rear view of the crystal-controlled r.f. unit which is designed to operate in the 80-meter band.

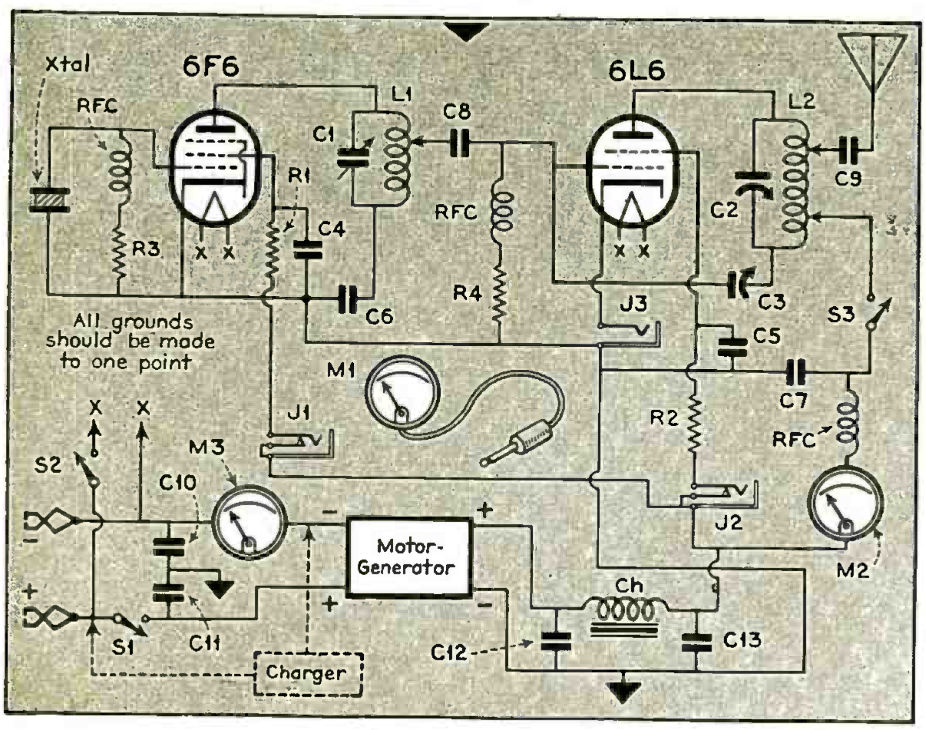
Three meters are used, one in conjunction with two closed-circuit jacks and a patchcord to read the oscillator plate current and the amplifier screen current. The other is connected permanently in the amplifier plate circuit, and the third reads the amperage drawn from the battery. This meter is connected so that the charging rate of the battery may also be read.

The jack for the amplifier screen current was considered a necessity because the current for this tube is rather critical. About 6 to 8 milliamperes is correct. If a higher plate voltage were used on the 6L6, trouble might be experienced from creeping plate current, but since the voltage at maximum is 350 volts, no trouble will be had on this score.

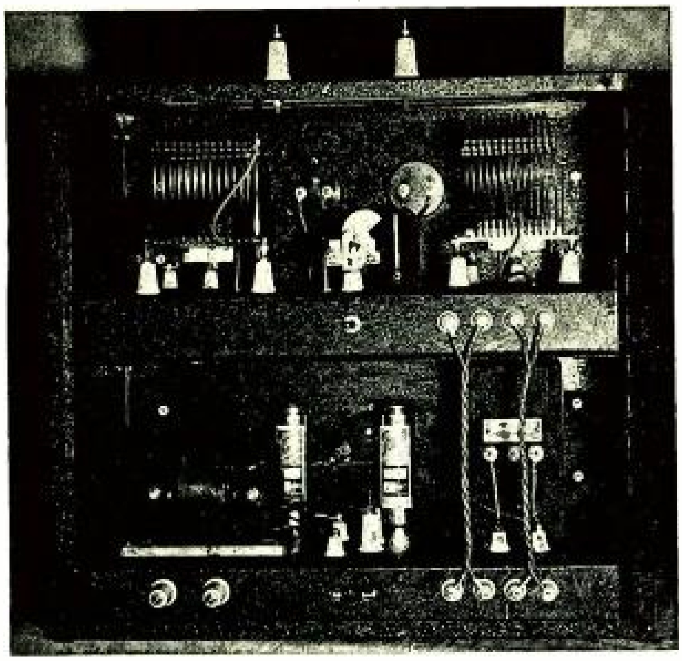
It may be necessary—particularly when the two stages are close together—to shield the oscillator coil from the amplifier coil in order to prevent radio-frequency feedback.

The value of the grid leak is 20,000 ohms. With a higher value it was found that the plate current would not go very high when the stage was out of resonance.

It is well to note the method in which the variable condensers are mounted to prevent the shafts from turning too freely. This is done by pushing a 3/16" rubber grommet over the condenser shaft and slipping the grommet into a hole in the front panel. This provides sufficient shaft friction to prevent the condensers from bing jolted out of adjustment.



Circuit diagram of the emergency transmitter. Dotted arrows indicate connection points for the battery charger.



Rear view of the emergency transmitter showing the r.f. and power supply units. Note genemotor in lower left corner.

Tuning Up

The transmitter is easy to tune, requiring only the usual amount of care to get all circuits functioning at highest efficiency. The first step in tuning up is to throw on the generator supply and tune the oscillator for maximum stability. The excitation tap should be put on the oscillator coil about four turns from the cold end. The B switch should be opened but the screen voltage to the amplifier left on.

The final stage should then be neutralized. A reliable method that the author uses consists in coupling a turn of wire in series with a flashlight bulb to the amplifier and then tuning the tank condenser. If the stage is neutralized, no alteration in the intensity of the light will be observed when the condenser is rotated. If the bulb does flicker, the capacity of the neutralizing condenser should be altered and this process repeated until no flicker is apparent.

It is also desirable to watch the crystal oscillator plate current. It will remain constant when the tank condenser is adjusted, if the stage is properly neutralized.

When adjustments are completed, the B switch may be turned on after connecting the aerial. In keeping with the general simplicity of the circuit, a single wire, voltage-fed Hertz type antenna is used. A small-capacity fixed condenser is inserted in series with the feeder to isolate the antenna from the high voltage. The clip may be placed about three turns from the plate end of the coil.

Battery Charging

In designing the transmitter, it was thought that it would be desirable to so construct it that it could be used for general amateur communication work in addition to emergency work. With a single charge the storage battery will last approximately nine hours with the key down and running with full input. This means that 25 to 50 contacts can be made on a single charging.

As to keeping the battery in a good condition at all times, several methods can be used. The best, by far, is to use an automatic windcharger. These chargers are available to amateurs at a reasonable price. No doubt, many amateurs will be able to construct their own by picking up a used automobile generator at a junkyard and fashioning a propeller to fit it. The device can then be attached to a metal or wooden support. Another method is to use a tungar charger, but of course this necessitates the use of a 110-volt alternating current line.

On 80 meters, the effective range of the transmitter is 500 miles. Very good reports have been received which indicate that signal stability and tone are excellent.

R.S.S.L. MEMBERS!

GET set for the R.S.S.L. Nationwide Survey Drill—full particulars in the R.S.S.L. News department next month. The task of selecting the Sectional Managers has been a long and tedious procedure, with the result that the hoped-for information was not complete in time for this issue.

Data on the R.S.S.L. Reception Report Forms, and their use, will also be presented next month, together with methods of reporting for those who do not wish to use the blanks.

If you are not already a member of the R.S.S.L., join now. Application blanks on request.

Acting Director

LIST OF PARTS

American Radio Hardware
- 2—phone plugs No. 128
- 7—bushings No. 642
- 1—single fuse block No. 130
- 2—giant battery clips No. 1503

Amphenol
- 2—octal sockets
- 1—five-prong socket

Birnbach
- 20—white porcelain feedthru insulators 5/8" high
- 8—white porcelain feedthru insulators 1¼" high

Bud Radio
- 1—neutralizing condenser No. 567 (C3)

Cardwell
- 2—MR-260-B variable condensers (C1-C2)

Carter
- 1—type 351 genemotor, 350 v., 100 m.a.

Coto Coil Co.
- 2—type 80-A inductors (L1-L2)

Cutler-Hammer
- 1—S.P.S.T. toggle switch, 250 v., 10 amps. (S1)
- 2—S.P.S.T. toggle switches 125, v., 3 amps. (S2-S3)

Hammarlund
- 3—type CHX chokes (RFC)

RCA Radiotron
- 1—6F6
- 1—6L6

Sangamo
- 2—type A .006 mfd. (C4-C5)
- 2—type A .002 mfd. (C6-C7)
- 2—type A .0001 mfd. (C8-C9)

Triplett
- 1—model 221 milliammeter, 0-50 m.a., d.c. (M1)
- 1—model 221 milliammeter, 0-100 m.a., d.c. (M2)
- 1—model 321 d.c. ammeter (M3)

Wholesale Radio Service Co.
- 1—crystal holder
- 1—80-meter crystal
- 2—10-watt 15,000 ohm wire wound resistors (R1-R2)
- 1—1-watt 50,000 ohm carbon resistor (R3)
- 1—2-watt 20,000 ohm carbon resistor (R4)
- 2—inverted can, stud mounting 8 mfd., 450 v. (C12-C13)
- 2—tubular 0.1 mfd, 200 v. (C10-C11)
- 1—filter choke, 30 Henry, 125 m.a. (Ch)
- 1—two-panel plack crystalline steel cabinet, top and rear doors, 17½" high, 13" deep
- 2—steel sub-bases, 11" wide, 17" long, 2" deep
- 2—steel panels, 8¾" wide, 19" long, ⅛" thick
- 2—pairs steel brackets for 11" sub-bases, 1/16" gauge

Yaxley
- 2—type A2 closed-circuit jacks (J1-J2)
- 1—type A1 closed-circuit jack (J3)

Miscellaneous
- 2—scales 3¼" dia. 0-100
- 2—knobs 2" dia. with skirts
- 1—knob 1⅝" dia.
- 5—nameplates
- 3—coil clips
- 1—bakelite rod and ¼" coupling
- 20 feet No. 8 cloth-covered wire for battery cable

This transmitter has been thoroughly tested and has given satisfactory performance. The parts listed or their equivalent will give satisfactory results. Substitutions should be made with care.

Hamfest

By W8QMR

ex-2PI • LU4S

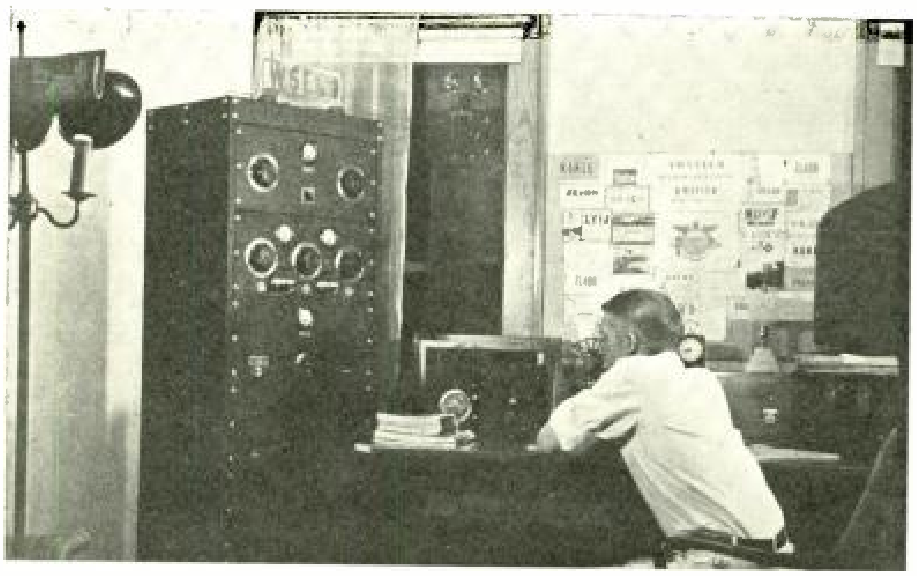
old timer fires up . . . bc harmonic invasion . . . all-continent radiofone round table . . . 7 mc transition . . . ether binges . . .

WE take pen in hand—or rather the mill—to edit this department with mingled feelings. W8QMR is obviously not a call sanctified under the dust of antiquity. It's as new as a Grand Rapids dining room suite or an 807 beamer. And considering the fact that as far as one of the purposes of this column is concerned the FCC might have slipped and made it 8QRM, perhaps a word of background is in order.

While the call W8QMR is definitely in its primary childhood—its owner is rapidly approaching his second. He blossomed forth as an operator in the heyday of the E. I. Co. to the crackling tune of the one-inch spark coil and the rat-tat-tat of the decoheror. His first call was issued by Gernsback in his wireless league of America, and his first code was Morse. (We can still copy it, and in QSOs with any old timers, or landline man, we'll be glad to swing back into the old staccato.) We dropped out of the transmitting end of the game upon moving to New York City in 1912. Landlords in those days were lightning conscious, and no janitor would permit you to erect an aerial even if you crossed his palm with a sawbuck and called him superintendent. Immediately following the war we acquired an original two-letter call, a Thordarson 1-kw transformer and a Murdock rotary gap. A little later, when the navy ops started peddling VT-2s pilfered from the fleet, we opened up the second or third fone station on Manhattan Island. We junked the microphone around 1924, and operated consistently, on cw, until about 1929 when we dropped our license, hocked the rig and concentrated on the serious business of making a living in radio. But like malaria, the bug is never altogether dead—and it will out. Hence W8QMR!

The point is this—This department comes to you with a full appreciation of the finer things in amateur radio tradition, as well as with a perspective, contributed by a hiatus of half a decade that displays vividly the good and bad that has happened to the game—a combination that will, we hope, enable us all to see things pretty much as they are. Your letters, comments on controversial matters, photos of stations, technical kinks, etc., will all be appreciated.

◆



W5FIY—"the powerful little 60-watter of Okemah, Oklahoma," with John Stanbery at the mike.

JOHN F. STANBERY, W5FIY, sent in a photo (on this page) of "the powerful little 60-watter of Okemah, Oklahoma," which he excites with his southern accent (no wonder—he's ex W4DPI) on 14.176 mc. That 60 watts has since been boosted to 72, with a pair of RK-39s in the final modulated by a pair of 6L6s in Class AB.

The antenna at FIY is three half-waves 58 feet high running SE-NW with NW half wave slanting toward ground at an angle of 40 degrees. Change-over relay in series with plate relays permits antenna to be used for receiving.

FIY lacks Africa for WAC on fone, but maybe the additional 12 watts will do the trick. He worked 41 VKs in 40 days, with a gob of R9 reports, so we expect he'll be able to knock off at least one Z in the diamond country.

◆

ONE HEARS PLENTY of kicking on the part of the BCLs regarding ham harmonics on the 12-mc international broadcast band. Such complaints, in the majority of instances, are legitimate. But we have never heard the amateur make any kind of a formal protest against broadcast station harmonics in ham territory and they can be received in every band from 1715 kc up. Legitimate congestion in these all-too-narrow spectra is bad enough without contamination from such spurious sources. We invite reports from readers logging BC station harmonics in any of the ham bands.

◆

SPEAKING OF CONGESTION, the 7-mc region hasn't changed much in the last six years—with the exception of a notable improvement in the technique of the individual operators. The percentage of bum fists is way down, speed is up, and the average bug operator, with nicely cadenced dots, gets through without falling all over himself. We credit this improvement largely to the desertion of the fone ops from the ranks. It does not necessarily follow that all fone ops have poor fists or never get above the

(Continued on page 165)

Channel Echoes

By Zeh Bouck

the name of the law . . . televisionary . . . winkley, brinkley and nod . . . the ears have it . . . so watt?

THE police bands of late have become strangely emasculated. Knifings which were delicate tidbits, are few and far between, while drunks apparently find more comfortable places than the gutter in which to park their soggy carcasses. Even "family trouble" seems to be on the wane, and ears that once tingled to the tune of "The wagon's on the way!" now listen listlessly to uninspired orders to car number eight to replace a manhole cover at the corner of First and Grand Street or a riot call to subdue a gang of small boys who are peeking in windows. (Which, by the way, was our first intimation that Winchell was even married.)

◆

JUST TO KEEP a few impulsive folks from investing their hard-earned cash in television during the present recrudescence, we publish the accompanying photograph showing that perennial art in one of its former reincarnations—back in the twenties. The picture was taken in the laboratory of the Pilot Radio and Tube Corporation, with Chief Engineer Geloso playing wet-nurse to a photo-electric cell. Everything is there in 1928 version, oscilloscope, iconoscope—except the periscope (needed to see just around the corner).

◆

THIS IS THE third month running that we have dragged Doc Brinkley into this column. We had figured that we were through with that enterprising medico who describes and recommends himself as "a doctor who don't get drunk, who has a reputation for sobriety and who is sober." (We take it he doesn't drink.) However our present listening location, on the Gulf of Mexico, is such that the Doc's own station XERA (820 kilocycles) and his supplementary Mexican mouthpiece XEAW on 960 kilocycles pound in day and night and he is literally forced upon our attention.

The Doc cordially admits that now, after eighteen years of experimentation, he finally feels that he can do a pretty good job on an enlarged prostate. We wonder if he informed his patients that he was experimenting on them ten years ago—five years ago—or even last year. And if in 1944 he refers to twenty-five years of experimentation, it occurs to us that it may be somewhat tough on his human guinea pigs of 1937!

We have been wondering why Doc Brinkley speaks an abominable, almost illiterate, English. There are two possible explanations, and we leave the choice to him. Primo—he may not know any better. Such a thought is not incompatible with the degree of education that might characterize a man who calls himself a doctor, and yet gives medical examinations by mail.

Secundo—he may be talking down to his audience. This is a tacit admission that only the ignorant are gullible enough to respond to his ballyhoo broadcast from his sanctuary across the Rio Grande, and that the average person, with a good grade school education prefers to be doctored by his family physician or a specialist of recognized and unquestioned attainments. It is, of course, quite possible that Doc Brinkley has such M.D.s on his Del Rio staff—but so has Johns Hopkins and the Cornell Medical Center.

◆

THE DAILY BULLETINS from the Brinkley Hospital, via XERA and XEAW, are interesting if not enlightening—"Mr. and Mrs. John Doe arrived today and are resting comfortably. They send greetings to their friends in Ashcan Center. Richard Roe left for home today completely cured. He will be greeted by his friends at the station in Bohunkus. Charles Moe sends greetings to his friends in Imfrom, Mo., and reports that he is recovering rapidly. Etc., etc."

We know that the Doc is a pretty busy man, so we'll write a couple of bulletins for him—or any hospital that wants to use them—

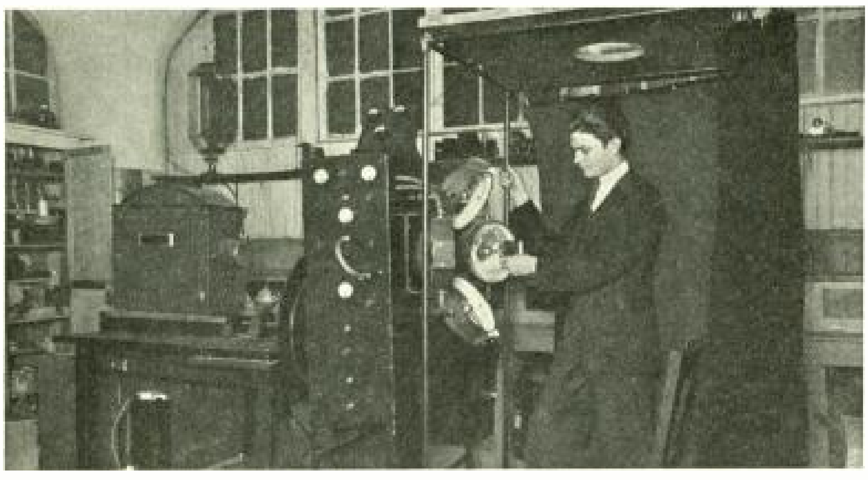
"Henry Woe has left the hospital today and is on his way home. He is travelling comfortably in the baggage car. Harry Loe also left the hospital today. Mr. Loe was one of our most illustrious patients, and was formerly mayor of his home town. He will be greeted at the station with flowers, and the flag on city hall is at half mast."

◆

TO LISTENERS IN the southern states, we recommend LRU, Buenos Aires, as a consistently good station from morning to night. LRU is on 15.28 megacycles, and according to our own log commences the daily schedule at 6:00 A.M., Eastern Standard Time, rather than at 7:00 as most call-lists have it. (Brother Hinds, kindly note.) The carrier goes on about a half hour earlier, a thousand-cycle tone at 5:50, and two dots are transmitted at precisely 6:00 A.M. followed with an introductory orchestral selection, and then the station announcement.

◆

(Continued on page 166)



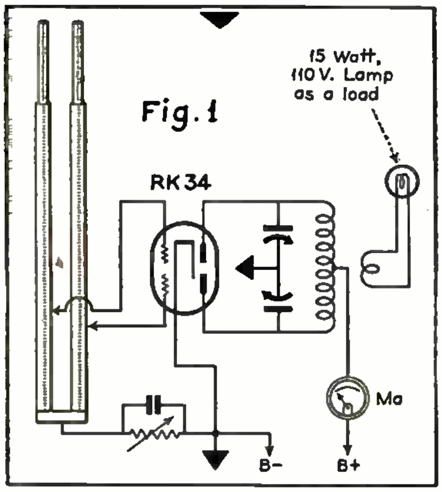
Early television at the labs of the Pilot Radio and Tube Corp., with chief engineer Geloso watching the birdie.

DEVELOPMENTS IN FREQUENCY STABILITY OF ULTRA-HIGH FREQUENCY OSCILLATORS

BY DAVID L. ELAM W9FPP

Amateur Radio Division, Montgomery Ward & Co.

PART 1



Circuit of long-lines oscillator used in experiments.

THIS is an account of a series of experiments which began about a year and a half ago. The object of these experiments was, first, to discover what factors are important in maintaining frequency stability; and second, to find out what could be done to improve the frequency stability of ultra-high-frequency oscillators.

Experimental Set-Up

To begin our studies, we set up what is recognized as one of the most stable, practical oscillators for frequencies above fifty megacycles. This is what is commonly known as the linear, or long-lines oscillator, as shown in Fig. 1. It was a push-pull oscillator with a pair of four-foot brass tubes spaced twice their own diameter, from center to center, and connected at the base to form a "high Q" circuit for the grids, and a conventional balanced condenser-coil resonant circuit in the plate leads. The grid circuit was made variable by having short sections of tubing telescope into the ends of each of the main tubes. The grid excitation was varied by varying the distance of the grid taps from the base, or ground end, of the grid rods.

The plan of the experiment was to determine the amount of frequency control the grid circuit had over the oscillator. To do this we made adjustments in the grid circuit, then varied some other part of the circuit and measured the frequency change which resulted. In our experiment we did this by varying the plate circuit capacity a certain amount to each side of resonance. In order to make our measurements as consistent as possible, we were always careful to start with exactly the same frequency and keep everything in the circuit, except the part under observation, constant. The frequency measurements were made with a fairly stable, well-shielded, electron-coupled autodyne oscillator. The grid leads were kept constant by having them terminate in two collars mounted rigidly on insulators, and adjustments were made by sliding the rods themselves through the rigid collars.

Measurements were first made of the frequency change caused by varying the distance of the grid taps up and down the rods. The length of the rods was kept the same and the plate circuit resonant. The results were about as shown in Fig. 2. As the distance was increased, the frequency went down at a uniform rate. The measurements were made from a maximum grid tap distance of 16 inches to a minimum of 2 inches, where we were forced to stop because the plate current became dangerously high and the oscillator tube over-heated. The wavelength of the oscillations was considerably more than four times the length of the grid rods at the maximum grid tap distance but came nearer to the natural frequency of the rods as the grid tap distance was reduced. At the minimum, the wavelength was close to four times the rod length, but still about 16 inches over.

Grid Capacity Loading

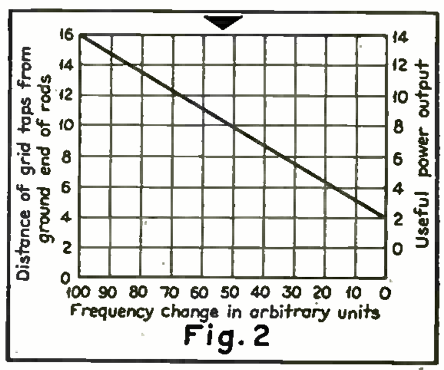
This experiment demonstrated the loading effect the grid capacity of the tube was having on the resonant grid circuit. In good engineering practice, it is desirable to have the frequency of an oscillator as nearly independent of the effect of the tube elements as possible. This would indicate that the thing to do would be to work the grid taps very low on the rods. But, due to a constantly decreasing amount of grid excitation, the tube efficiency also dropped off. The maximum safe plate dissipation of the tube was reached at between four and six inches. The lowest position possible, with a fair amount of power output, was at eight inches, and the grid taps had to be located twelve inches up the rods before the rated output of the tube could be obtained.

This experiment furnishes the answer to a question that has been puzzling some of the amateurs for a long time. That is, why must they cut their rods so much shorter than a quarter wavelength in order to produce a given frequency? It also explains why the man using a pair of 801s in his oscillator has to have grid rods of a different length from those used by the man with a pair of 45s, or an RK-34. The answer is, of course, the different grid-to-filament capacities of the tubes and the different amounts of grid excitation necessary. We can, furthermore, conclude from this experiment that tubes with low internal capacities will have less effect on the frequency of an oscillator than tubes with higher capacities.

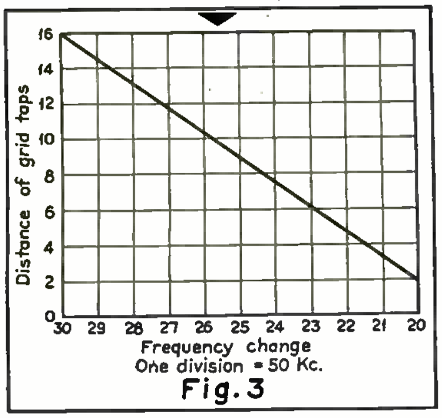
Super-Regenerative Effect

The next thing tried was to vary the grid-leak resistance through wide limits. This didn't seem to have much effect on the frequency, but something quite startling did turn up. With very low values of resistance in the grid circuit, the tube was under-biased and the no-load plate current went up. The efficiency was very poor and the output dropped off sharply. When the resistance was raised, the tube efficiency soon went back to normal and the output went up again. The efficiency was restored at about 1800 ohms.

After this, nothing further seemed to happen until the resistance was made



Change in frequency caused by varying the distance of the grid taps on the parallel rods.



Change in frequency caused by a change in plate-circuit capacity.

quite high. Then suddenly the output dropped to about one-fourth of its normal amount and a high-pitched squealing noise was heard in the receiver. Tuning the receiver showed up a great number of signals a kilocycle or so apart covering the full tuning range of the receiver.

With the regeneration backed down, the receiver gave out a loud, rushing noise as if it were super-regenerating. What was happening was that the power oscillator was super-regenerating or quenching itself. We found we could stop this either by reducing the grid resistance or by lowering the grid taps on the rods which reduced the grid excitation. Further study of this condition brought out the following facts which cleared up the mystery of self-quenched oscillators for us.

With high excitation, the grid is driven quite far positive with respect to the cathode and a large amount of grid current flows. When the grid resistance also is made high, the grid current flowing through it builds up such a large negative charge across the grid condenser that the tube becomes blocked and stops oscillating. With no further excitation, the grid stops drawing current and the negative charge soon leaks off the grid condenser until the tube can start oscillating again. This happens over and over again at a super-audible rate. We found that we could vary the quenching rate by changing either the capacity of the grid condenser or further increasing the grid resistance. Both changes varied the time required for the negative charge to leak off, which is the controlling factor governing the quenching frequency.

In the quenching state, the oscillator produced a wide band of frequencies which completely blanketed the whole tuning range of our receiver, which was about 5,000 kilocycles. We had no way of measuring how much more of the radio spectrum was being splashed.

The findings of this experiment bring to light what is happening when some amateur station goes "hog wild" and has half a dozen major peaks and whole families of minor ones distributed across a large portion of the band. We have known amateurs who worked for weeks on end trying to remedy this condition and, when it was finally cured, they did not know why or how it was stopped. The vicious disturbance caused by five-meter transceivers and self-quenched receivers is where the phenomena explained above does the most damage. In order to quench itself, this kind of receiver has to oscillate excessively hard. And to be very sensitive, it must be coupled quite closely to the antenna. Some of these receivers have been known to blanket the whole five-meter band and render strong signals from other stations unintelligible to listeners within several miles of the offending receiver. This situation is improving now because most amateurs soon find out that they are spoiling reception for others and get better equipment.

Control of Frequency

The next experiment attempted was to determine the degree of frequency control exercised by the grid rods when the position of the grid clips was varied from the ground end of the rods. The set-up was the same as in Fig. 1. This time we kept the frequency constant for each grid-tap setting by varying the length of the grid rods. This was done so that we would be always working with the same amount of capacity in the plate circuit. The plan was to vary the plate tuning condenser from five points minus to five points plus the amount of capacity necessary to tune the plate circuit to resonance; then measure the total frequency change with the shielded autodyne receiver.

Three complete sets of measurements were made on all these experiments, the idea being that if several tests do not show about the same results, something is not being done right and the findings are useless. If several different trials get approximately the same results we can feel pretty sure that we are on the right track and are keeping all factors under control.

The results of the frequency control experiment are shown in Fig. 3. With the grid taps 16 inches up the rods we were able to vary the frequency 1500 kilocycles by changing the plate circuit capacity ten points on the dial. With the taps set lower on the rods, the amount of frequency change was less and less until at two inches, the frequency change was 1,000 kilocycles. The reduction of frequency change represents a decrease in the importance of the plate tuning as a factor in the control of the frequency. Or, it can be interpreted as an increase in importance of the grid circuit in the control of the frequency.

Analysis

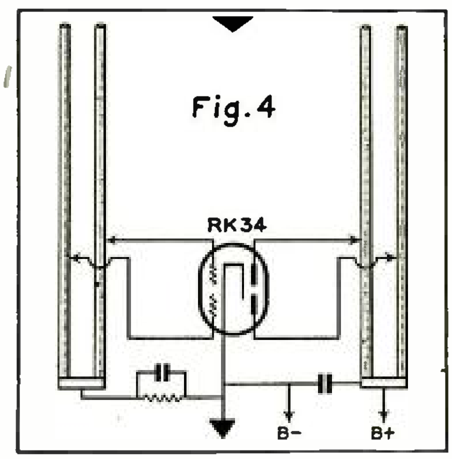
When we compare the findings of experiment No. 3 with those of experiment No. 1, we discover there is a close relation between the loading effect of the grid-filament capacity of the tube and the frequency stability of the oscillator. It seems logical to assume from this that, when we tend to eliminate the effect of the grid-filament tube capacity as a factor for frequency control, we also reduce the importance of other circuit constants in affecting the frequency. The probable reason is that reducing the distance of the grid taps from the ground end of the rods tends partially to isolate, and reduce, the coupling between the grid rods and the rest of the circuit.

It is quite possible that, if we used two sets of rods, one in the grid circuit and another in the plate circuit, as shown in Fig. 4, we could obtain a very high degree of frequency stability. But if we should try to couple a load to this arrangement we would load up the plate circuit until it would lose any stabilizing effect it had and we would not be any better off than with the arrangement shown in Fig. 1. This explains our contention that those who put "high Q" rods in both grid and plate circuits are only kidding themselves and would be just as well off if they used the conventional condenser-coil system in their plate circuits.

Summary

In summarizing, we find that we have discovered three important facts concerning frequency stability: First, increasing the grid resistance beyond a certain critical value will throw the oscillator into a condition where it quenches itself, or super-regenerates, causing bad disturbance over a large part of the radio spectrum. The best value of grid resistance lies somewhere between the point where the oscillator starts to quench itself and the point where the

(Continued on page 166)



Another arrangement tried to obtain frequency stability—parallel rods in both grid and plate circuits.

Queries

VERNIER TUNING DIALS

Question No. 25:

"I have an all-wave receiver with a large dial and a needle pointer. Surrounding the shaft of the tuning control is a small dial, reading from zero to one hundred. The large dial is calibrated in kilocycles and megacycles. Is there any way of calibrating the small dial so that it too will read in terms of frequency? As this small dial makes about one-half a revolution between the 9.5 and 10.0-megacycle marks on the main dial, and there is only one intermediate point at presumably 9.75 megacycles on the large dial, the small dial would be very useful indeed if the arbitrary numbers meant anything.—*J. O. H., Asbury Park, N. J.*"

Answer:

There are quite a number of receivers which have this double dial arrangement, and very few operators make the most of its possibilities. In the better sets, this secondary dial mechanism is geared to the main dial—rather than being friction driven—so that it can be used for positive identification in logging. For instance, GSB, Daventry, England, on 9.51 megacycles will always be tuned in with the main pointer slightly above the 9.5 mark on the large dial and with the small dial reading perhaps 28. GSB should be written down on a permanent log as "9.5 + 28."

The secondary or vernier dials are rarely calibrated directly in kilocycles or megacycles due to the fact that in most receivers the rate of frequency change, as the tuning knob is turned, varies in the different bands and over different parts of a single band. In the neighborhood of 30 meters, the movement of the small dial may cover 10 kilocycles per degree or mark. However, at shorter wavelengths the variation may be higher than 15 kilocycles for each graduation.

The rate of variation should be determined over at least three separated portions of each wave band—usually at both ends and the middle of the band. Of course, the more sections over which the rate of variation is established, the more useful will be the small dial. In determining these rates, the frequency markings on the main dial can be used.

For instance, taking the case of J. O. H., the small dial turns through 50 graduations between 9.5 and 10.0 megacycles—a difference of 500 kilocycles. Thus, in the neighborhood of 30 meters, each marking on the small dial means a change of 10 kilocycles. It should be easy to read to within half a degree on the vernier dial—in other words to within 5 kilocycles. At 9.5 megacycles this is an accuracy of about *one-twentieth of one percent,* which is very good, and much better than the accuracy of a good oscillator—which is about two-tenths of one percent—and vastly better than could be read on the main dial alone.

The utility of the small dial, aside from logging, should now be fairly apparent. For instance, if GSB is tuned in at 9.5 + 28, and an unknown station is located at 9.5 + 31, this second station is obviously transmitting on a frequency of 30 kilocycles higher than GSB, or 9.4 megacycles (assuming, of course, that we have established a 10-kilocycle per degree variation in the neighborhood of 30 meters). Reference to the ALL-WAVE RADIO short-wave station list immediately identifies the 9.4 mc station as either DJN, Germany, or (as you may hope) VPD2, Suva, Fiji Islands.

Where the small dial is not gear-driven by the main dial, it cannot be used for logging, as it will not return to the same setting each time. However, the rate of variation over any given portion of the tuning range will remain constant, and it can, therefore, be employed in identifying unknown stations and establishing frequencies when one station in the general neighborhood can be identified. GSB will always be on 9.51 megacycles, regardless of where the small dial points, and DJN will similarly continue to be found three degrees, or 30 kilocycles, higher up.

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.

NOISE IN A-C, D-C SETS

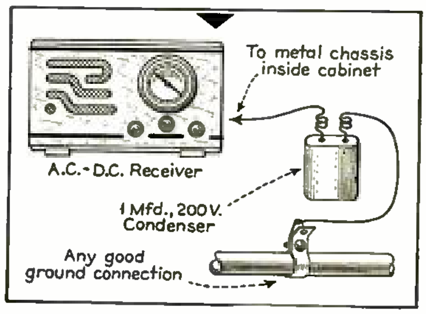
Question No. 26:

"I have a small a-c, d-c receiver operated from d.c. I find it quite noisy, and am wondering if this is a characteristic of these receivers. Can you suggest any way of reducing this noise? *R. A. D., Boston, Mass.*"

Answer:

There are still enough d-c districts in the country to warrant the manufacture of a-c, d-c sets and to justify a public discussion of this noise problem—for, as R. A. D. has almost guessed, these sets are characteristically noisy. There are three main reasons for this. First: These receivers obtain their operating potentials directly from the line, without the intermediary of a transformer with electrostatically shielded primary and secondaries (a form of shielding that tends to reduce the transfer of noise impulses, coming in over the power lines, to the receiving circuits). Second: The majority of these sets operate with "built-in" antennas. These are not really built-in—but consist of twenty feet or so of flexible wire which is

(Continued on page 163)



Proper method of grounding an a.c.-d.c. receiver; a condenser is used to prevent a short circuit.

"BARB" AND "ERNEST"—
Second Series

Recapitulation

Dear Gerald:

So you're going to explain circuits at last. Barb and myself have been yelling "wolf" for so long that we figured you'd commenced to ignore our yelps for help in understanding the surrealist drawings you radio experts call "schematic diagrams." They're schematic all right—schemes to prevent Embryo Hams from getting the hang of circuit wiring.

But maybe the joke is on you, because we have slowly accumulated a speaking acquaintance with the lines that represent coils, condensers and resistors—not to forget vacuum tubes—so our yelp is of a different breed now. We don't claim to be able to read off a complete diagram and trace every action and circuit, but we have a general idea of things. After all, boss, you've been casting diagrams in our path for a long while, so we ought to know something about 'em. I guess you've made us soak them up against our better judgment!

But our yelp is this—your letters have covered bits of information that explained lots of radio functions, but never in such a complete way that we could get the hang of what takes place in a transmitter and receiver—and in between! So, before you get all involved in your schematic diagrams, *please,* mister, give us a complete picture of radio as she is worked, and by means of simple illustrations of some sort. We can understand regeneration and oscillation and amplification and a lot of other things, but for once we'd like to see all of them sort of hooked together and working. How about it? If it will delay the examination a bit, okay. We've waited this long, so a few weeks more or less won't make a great difference.

Barb and Ernest

◆

Restatement of Fundamentals

Dear Barb and Ernest:

Your wishes are mine, so I will attempt to summarize the points we have previously covered by means of simple block diagrams, and leave the schematics for another time.

I have resorted to the "plumbing" analogy; therefore, all you need do is visualize the electrical currents as the flow of water through pipes from one tank to another.

You are acquainted with the abbreviations used—a.c. for alternating current, d.c. for direct current, a.f. for audio frequency, r.f. for radio frequency, etc. In the sketch, a.c. is indicated by stippling, d.c. by the black areas, a.f. by lines slanting to the left, and r.f. by lines slanting to the right.

In Fig. 1 a radiophone transmitter and a receiver are shown in this block diagram form. Sound waves fed into the transmitter via the microphone are converted into electrical currents of audio frequency. These are amplified and subsequently impressed on the radio-frequency current generated in the transmitter. The combined wave is radiated into space by the aerial and eventually intercepted by the aerial connected to the receiver. In the receiver the combined r.f. and a.f. currents from the transmitter are amplified and then rectified or "detected." This process eliminates the r.f. currents and leaves only the a.f. The a.f. is then amplified to a degree sufficient to actuate a loudspeaker which in turn converts the electrical sound into mechanical sound.

That is the action in brief—sound waves are converted into electrical waves, combined with radio-frequency waves which serve only to carry the electrical sound, the waves then radiated, and eventually turned back into mechanical sound at the receiver.

The Transmitter

The transmitter is shown in three tiers. The first tier is the power supply which provides the operating voltages for the vacuum tubes. This consists of two units. The first is the high-voltage transformer which boosts the 110 volts a.c. from the light line to a value in the neighborhood of 500 volts or more, depending upon the power of the transmitter and the type of tubes used. There is, of course, another transformer which supplies filament current for the tubes. It has been left out to simplify the diagram.

The high-voltage a.c. is then fed into the rectifier and filter unit where it is converted into a direct current and filtered to remove the ripple. The resultant d.c. is smooth flowing and uniform. This current is fed to the tubes in the various units of the transmitter, and where lower voltages are required, a voltage-dividing resistor is connected across the output of the filter and a tap made on this resistor at the point which supplies the proper potential. In the sketch the power tubes are fed with 1000 volts while the smaller tubes are run at 500 volts.

The second tier in the transmitter includes all of the audio-frequency equipment — the microphone, the speech amplifier and the modulator. When the microphone is spoken into, electrical currents are produced which correspond to the original sound waves in form. These audio-frequency currents are built up in strength by the speech amplifier which is nothing more than the common type of audio amplifier. The amplified currents are then fed to the modulator which is a power audio amplifier. The power build-up in this unit is usually large, and the a.f. output may be in the vicinity of a few hundred watts—far in excess of the power delivered from the output amplifier in a receiver. This audio power is in turn fed into the output of the r.f. unit of the transmitter which occupies the third tier.

The r.f. unit, in the simple form shown, consists of an oscillator and an r.f. power or "final" amplifier. The oscillator generates the radio-frequency currents, the frequency of which is dependent on the oscillator tuning. These oscillations are of comparatively low power, and though they could be fed directly into the aerial and radiated, the total power of the transmitter would be governed by the power of the oscillator alone. It is customary, therefore, to build up the output of the oscillator by means of an r.f. power amplifier and feed the output of this stage into the aerial. If the oscillator is tuned to, say, 3900 kc, then the r.f. power amplifier is tuned to the same frequency. The radiated wave will therefore have a frequency of 3900 kc (in the 75-meter phone band).

The diagram shows that the a.f. from the modulator combines with the r.f. in the output of the final amplifier. This mixing of the two frequencies is indicated by the cross hatching—the a.f. superimposed on the r.f. The radiated wave is therefore a combination of r.f. and a.f.

The process of superimposing the audio currents on the radio currents is known as "modulation." The r.f. current may be considered as having a constant amplitude. When it is modulated by the audio-frequency currents its amplitude is altered in conformance with the a.f. currents. The degree of change in amplitude is dependent upon the per-

EMBRYO RADIO HAMS
Gets Under Way

centage of modulation—which is another way of saying that greater audio power will make more of a dent in the r.f. current. The resultant r.f. wave assumes somewhat the same shape as the audio current variations created by the original sound waves.

The r.f. wave is the carrier for the audio frequencies in radio transmission. The combined currents are radiated into space by means of the aerial.

Radio Waves

Radio waves are rather complex, but it is not necessary that you understand all of their characteristics to pass the examination. It is enough that you know they travel through space in practically the same way sound waves travel through air and energy waves travel over the surface of a body of water.

If a stone is thrown into a pond, waves travel out in ever-widening circles. The height (amplitude) of all of these waves will not be the same, the ones further away from the source of disturbance being weaker. But the distance from the crest of one wave to the crest of the next will be the same in all cases. This is the "wavelength" or, if expressed in the number of waves that pass a given point in a given time, the "frequency." The relation between the wavelength and the frequency never varies.

We usually picture radio waves as wavy lines, which is the way the cross-section of a water wave would appear. However, were we able to see radio waves, a bird's-eye view of one would be quite similar to the bird's-eye view of a water wave on a pond. It is easy to understand, then, why the signal from a radio transmitter can be intercepted at one point as readily as another. The condition changes only in the event that the transmitted signal is "beamed" as light waves are from a searchlight, or in the event that the signal leaves the earth altogether.

A transmitting antenna radiates a "ground wave" and a "sky wave." The ground wave follows the surface of the earth but dies out very rapidly. The sky wave is radiated at an angle, travels upward, and eventually strikes a layer of electrically charged particles (known as the ionosphere) above the earth from which it is reflected back, much in the same way that a mirror reflects a beam of light. There are areas of the earth, therefore, where the signal does not strike at all, though it will appear again possibly a thousand miles or more distant from the transmitter. In other words, it "skips" certain portions of the earth entirely. The distance from the source of the sky-wave signal to the point where it again reaches the earth is known as the "skip distance." The skip distance is not constant; it varies with changes in atmospheric conditions, and is different for various frequencies. Thus, there may be "short skips" or "long skips" in any of the ham bands. (See your handbooks).

The Receiver

The receiver in Fig. 1 is of the tuned radio-frequency type, with a regenerative detector. The power supply is identical to the one in the transmitter except that the voltages used are lower. It should be noted, however, that the power supply is also used to energize the dynamic loudspeaker.

The signal from the transmitter intercepted by the receiving aerial is, of course, very weak. Consequently it is amplified so that it will at least be strong enough to properly actuate the detector tube. It is therefore passed through a tuned radio-frequency amplifier and then fed to the regenerative detector. A portion of the r.f. signal in the detector is fed back and re-amplified, as explained in my last letter. This is indicated by the additional feed line from the output to the input of the detector marked "Signal Feedback."

Up to this point we are dealing only with r.f. currents on which are superimposed the audio currents. In the process of detection (which is really rectification) the r.f. carrier is eliminated and only the a.f. component of the wave is left. This is indicated in the change from cross-hatching to the slanting lines representing a.f. only. The a.f. at the output of the detector is sufficient to actuate a pair of headphones but not a loudspeaker. Therefore an audio amplifier is used to further amplify the audio signal

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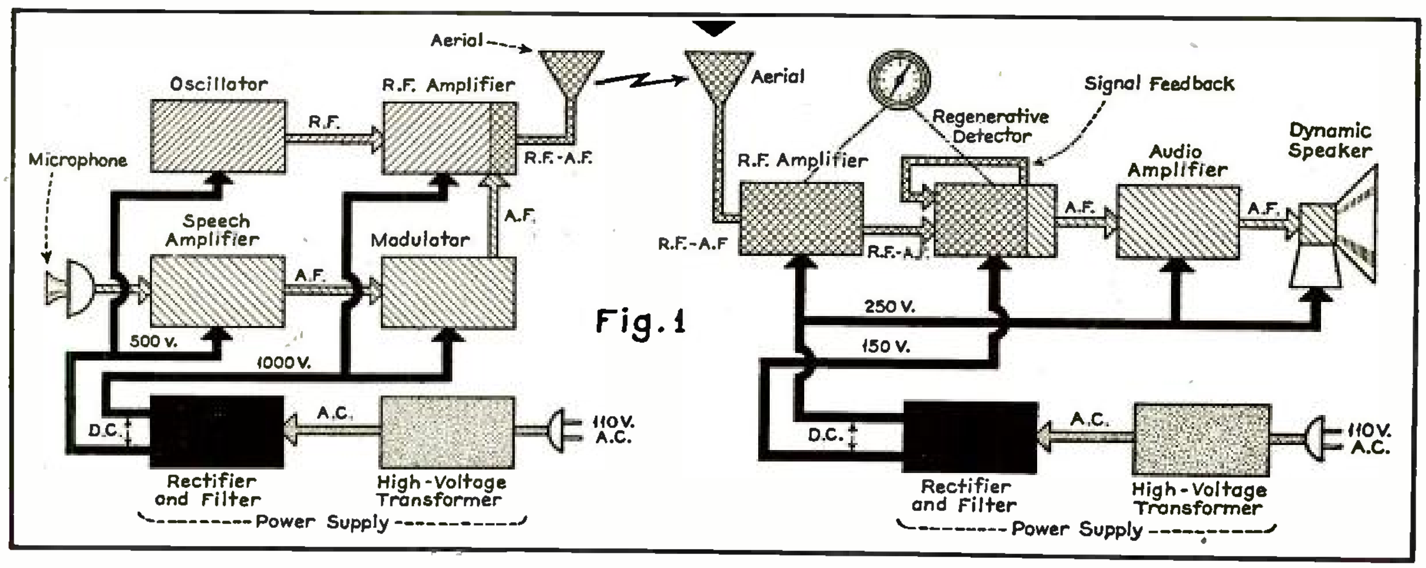

"Animated" block diagram of a complete transmitter and receiver in operation.

RADIO PROVING POST

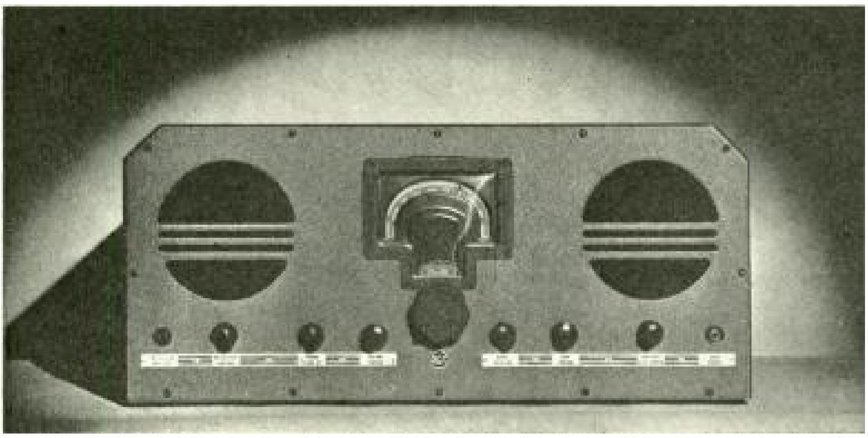

FIG. 1. THE RCA MODEL ACR-155 AMATEUR COMMUNICATION RECEIVER

RCA MODEL ACR-155 RECEIVER

THE RCA Amateur Communication Receiver Model ACR-155 is a refreshing departure from past designs—such as the ACR-136 which it replaces—and includes a number of circuit features that contribute to operating stability and efficiency.

A front view of this receiver is shown in Fig. 1. The physical design, which has the modern touch of the latest RCA broadcast station control units, is the work of the celebrated artist, John Vassos who, aside from his creations in the field of industrial design, is well known for his illustrated conceptions of Oscar Wilde's "The Ballad of Reading Gaol," "Salome," and other books. We mention this only because Vassos' illustrations are, without exception, two-tone "wash drawings" of contrasting grays and blacks and of a highly imaginative character. He has translated the effect into his industrial designs, and the cabinet of the ACR-155 shows this influence. The entire casing is steel, the top, sides and rear having a dark gray wrinkle finish. The dial escutcheon and large tuning knob are of the same shade, but the front panel is a lighter gray wrinkle finish. The circular grilles and small control knobs on the other hand are jet black, while the two long nameplate strips are pure white with black lettering. The contrasts are so well graduated that the general effect is pleasing rather than startling to the eye.

Mechanical Features

The receiver is moderately priced yet is especially large—25⅝" long, 10⅞" high and 12⅜" deep. It is, in fact, the largest communication type receiver we have so far had the privilege of testing, but it is large not because the space is required for the chassis and speaker, but because the increased ventilation and "acoustic space" provide an improvement in the operating efficiency of the receiver, as we will point out later.

The speaker grille at the left of the panel is a blank and is included principally for the sake of symmetry. The 6-inch dynamic speaker is mounted behind the right-hand grille.

The tuning mechanism at the center of the panel has a main, selector-type of dial which shows the calibration for the range in use only, and a calibration-spread dial, geared to the main dial. The main dial scale ranges are brought into position by turning the range-selector switch. The large tuning knob is cast aluminum and has a 100 to 1 ratio with respect to the rate of travel of the pointer over the main tuning scale. A crank handle on this knob provides a means of rapid scale coverage.

The toggle switch at the left on the panel throws the beat-frequency oscillator in and out of circuit by making or breaking the screen and plate voltage supply but not the heater. The knob to the right of the toggle switch is the heterodyne control which provides a variable audio pitch of the beat note during c.w. reception. The knob next in line controls the power and stand-by switch which has three positions: left, receiver power off; middle, receiver power on; right, tube heaters energized but plate and screen voltage off for stand-by during transmission. The next knob is the audio volume control.

On the right side of the panel, the first knob controls the range-selector switch as well as the mechanism that changes the main tuning scale for each of the three receiver waveband ranges. The next knob in line is the two-point tone control, and to the right of this the combined sensitivity control and avc switch. This latter control is so arranged that avc action is introduced when the control is in the position for maximum sensitivity. In all other positions the avc is off and the r.f. gain or sensitivity of the receiver may be controlled manually. The headphone jack is at the extreme right of the panel. Additional contacts are included so that the dynamic speaker is made inoperative when the headphones are plugged in.

The receiver has a continuous frequency coverage from 520 to 22,000 kc in three ranges, as follows: Range A—520 to 1720 kc; Range B—1720 to 6300 kc; Range C—6300 to 22,000 kc. All calibrations on the dial scales are in megacycles, but the amateur bands are also indicated in meters and the width of each band shown by black areas. The principal short-wave broadcast bands are also spotted on the main tuning scales.

A partial interior view of the receiver is shown in Fig. 2. This clearly shows the central r.f. unit which includes the r.f., first detector and oscillator circuits, and to the left of this unit the power-supply equipment. The i.f. and audio stages are grouped around the rear and right side of the central r.f. unit.

The Circuit

A road-map type circuit diagram of the receiver is shown in Fig. 3. The tube line-up is as follows: 6K7 r.f. stage, 6L7 first detector, 6J7 high-frequency oscillator, 6K7 i.f. stage, 6H6 second detector and delayed avc, 6F5 audio voltage amplifier, 6F6 audio power stage, 6J7 beat-frequency oscillator, and 5W4 full-wave, high-voltage power-supply rectifier.

The input circuit of the receiver is designed to accommodate either a grounded or doublet type antenna system. Though the coupling in this circuit, as well as in the detector stage, appears to be of the tuned impedance type, it is actually a unique coil-switching system wherein the portion of the single tapped inductance that functions as the secondary in one band becomes the primary in the next higher frequency band. Thus, in Range A (at C-2 in diagram), L5 is the primary while L4, L3 and L2 combined are the secondary. In Range B, L4 becomes the primary while L3 and L2 function as the secondary; L5 is shorted out. In Range C, L3 is the primary and L2 the secondary, L5 and L4 being shorted out.

The switching system in the detector circuits (at C-6) is similar to that described above, but a bit more complicated. For instance, coils L9 and L13 are always connected in series with the plate circuit of the 6K7 r.f. tube. In Range A position L12, L11 and L10 are connected in series and function as the secondary. The ground of the coil system in this case is at the lower end of L12. L13 is used as the primary and is resonated at the proper frequency by the condensers C18 and C19 which shunt this coil. In Range B position L11 and L10 are connected in series as the secondary, and the ground end of the coil appears between L12 and L11. L12 is used as the primary and is resonated by the shunt condenser C18. Condenser C19 in this case transfers the r.f. energy from the plate circuit to the primary L12. In the Range C position L10 is the secondary and the ground is now between L11 and L10. L11 is the primary in this case and is resonated by C18. In addition, L9 acts as a high-frequency primary which resonates at about 20 mc and improves the gain at

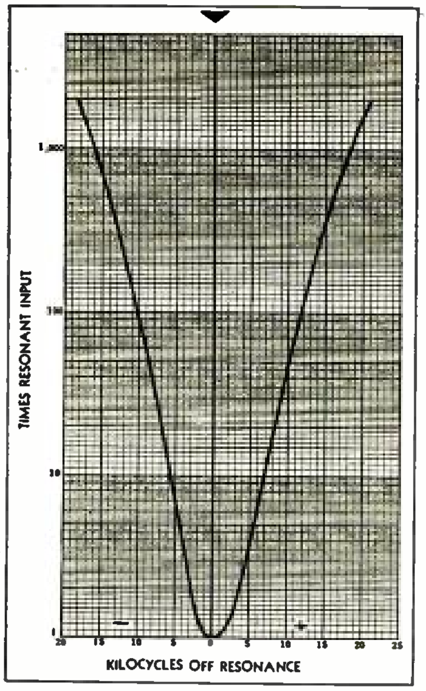

Fig. 4. Selectivity curve of the ACR-155.

the high-frequency end of Range C. Coil L12 is shorted by the range switch.

Separate coils are used in the oscillator stage (K-4) for each of the three ranges.

All trimmers and padders used in the r.f., detector and oscillator circuits are of the air type. The capacity of these condensers is adjusted by means of brass plungers, a number of which can be seen protruding from the chassis of the central r.f. unit illustrated in Fig. 2.

The i.f. stage (B-11) is of the usual type except that both the i.f. transformers are tuned by adjustable magnetite cores, the primary and secondary shunt condensers being fixed. Aside from improving the gain and selectivity of the i.f. stage, these iron cores provide a precise method of peaking the circuits.

The second detector stage (at B-14) is also more or less standard, except for the method used for providing delayed avc action. In the first place, it should be noted that the cathodes of the r.f., first detector, i.f. and second detector are directly grounded. The initial bias is obtained by connecting the avc line to the arm of the sensitivity control potentiometer, R26 (at K-10) which shunts a portion of a bleeder in the negative leg of the power supply. The negative bias, and therefore the gain of the receiver, may be varied by this potentiometer so long as the control knob is not turned full to the right. When in the latter position the avc switch, S6 (at G-12) (which is in tandem with the sensitivity control) is thrown to the "on" position and the avc line is automatically disconnected from the sensitivity control and therefore its source of negative bias.

Under no-signal conditions this would leave the grids of the r.f. tubes without any initial bias whatsoever—but the circuit is so arranged that in this case the initial bias is supplied by the diode P1-K1 of the 6H6 tube. A study of the diagram will show that K1 is connected to the C-bias resistor in the return circuit of the power supply and is therefore maintained at a constant negative value. The diode plate P1 on the other hand is connected directly to the avc line and is therefore positive with respect to its cathode. Under these conditions, then, this diode draws current which flows through resistors R9, R10 and R11. The resultant voltage developed across the resistors maintains an initial negative bias on the grids of the controlled tubes; namely, the r.f., first detector and i.f.

On the application of a signal voltage above a certain level, however, the initial-bias diode P1-K1 ceases to draw current and the detector-avc diode P2-K2 takes over the biasing function. Since the initial bias is set at the point of maximum sensitivity—as it is in any receiver—avc action is delayed until the signal level

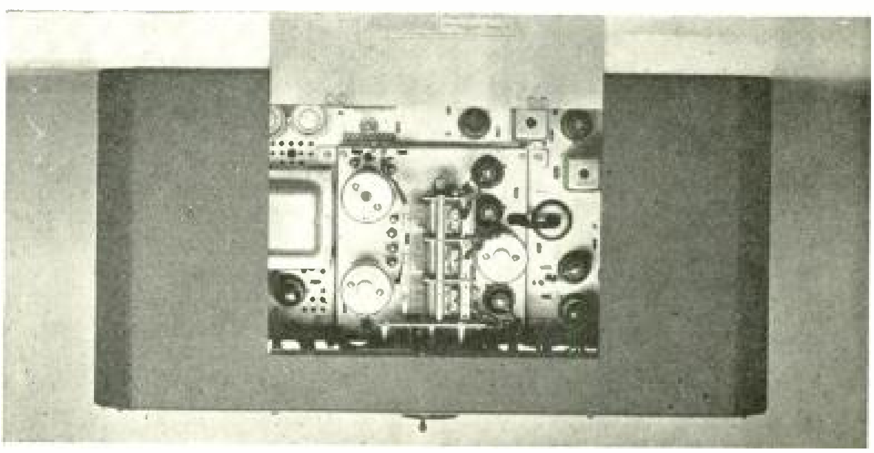

Fig. 2. Interior view of the ACR-155, showing centralized r.f. unit.

is sufficient to overcome the bias developed by diode P1. The sensitivity of the receiver is therefore maintained at maximum for weak signals.

The 6F5 audio amplifier (B-17) is cathode-biased and is resistance coupled to the 6F6 power tube the grid of which obtains a semi-fixed bias from the bleeder resistor in the negative leg of the power supply.

The tone control (E-19) is connected in the plate circuit of the power tube. The higher audio frequencies are attenuated by connecting the condenser C39 between plate and ground. The headphone jack is also connected in this circuit, but blocking condensers are employed to prevent high voltages from getting into the headphone circuit. When headphones are plugged in, the upper contacts of the jack are closed and short the voice coil of the speaker.

The beat oscillator inductance, L20 (at J-16) also has an adjustable magnetite core. This is mechanically coupled to the heterodyne control knob on the front panel of the receiver and provides a wide range of audio pitch on either side of zero beat. Zero beat is obtained at 460 kc, the i.f. frequency of the receiver.

Tests

All the receiver controls are smooth and sure in operation. The feature, however, is the tuning control which responds to the lightest touch and is comparatively free of mechanical play. The vernier or calibration-spread dial, which rotates against a fixed pointer, has large numbers and scale divisions—a boon to poor eyesight. This scale reads from 0 to 100 through a 360° rotation and provides a 16-degree spread in the 20-meter band, 42-degree spread in the 40-meter band, 77 degrees in the 80-meter band and 198 degrees at 160 meters. The fact that there is more spread than required at the higher wavelengths cuts no ice—the important point is that the spread at 20 meters is adequate for all purposes and the scale sufficiently accurate that stations can be logged and found again later at the same setting.

Main-scale calibration is good, which means within about 50 kc or so of actual frequency in Range C. Moreover, the discrepancy is fairly consistent so that actual settings can be easily computed. Few sets, except the more expensive ones, are any better than this.

The frequency drift measured at 14 megacycles from a cold start to temperature stability is surprisingly low—11 kc to be exact. This is undoubtedly due to the use of air trimmers in all r.f. circuits, the excellent ventilation provided (partly by the large cabinet), and the precautions taken to stabilize the high-frequency oscillator.

The next surprise was the dynamic speaker. It has more than usually good tone, is capable of handling the 2 undistorted watts output of the receiver without "breaking up," and shows no inclination toward howling at high volume (also partly due to the large cabinet). Built-in speakers are usually taboo, but this one is an exception to the rule.

The third surprise was anticipated, for we noted the same conditions when testing the ACR-175—and that was the almost foolproof action of the beat-frequency oscillator with and without the avc in action. In the first place, injection of the bfo voltage into the diode detector circuit with avc on has no apparent effect on the sensitivity of the set. Secondly, the bfo may be used with the avc on during c.w. reception without any ill effects. This is a worthwhile convenience when it is considered that the gain of the receiver is little affected. Very slow-speed signals will make the avc buck and cause thumping, but most signals are as clean with avc as they are without. Lastly, strong signals do not over-ride the bfo and destroy the beat.

We were not completely satisfied with the avc action. It is not as extensive as we had anticipated, though it must be remembered that there are but three controlled tubes. Its ratio of swing or change of audio output in relation to large signal swings is probably in the vicinity of about 5 to 1.

Selectivity, sensitivity and image ratio are a bit better than one would expect from a receiver with one r.f. and one i.f. stage. The selectivity curve is shown

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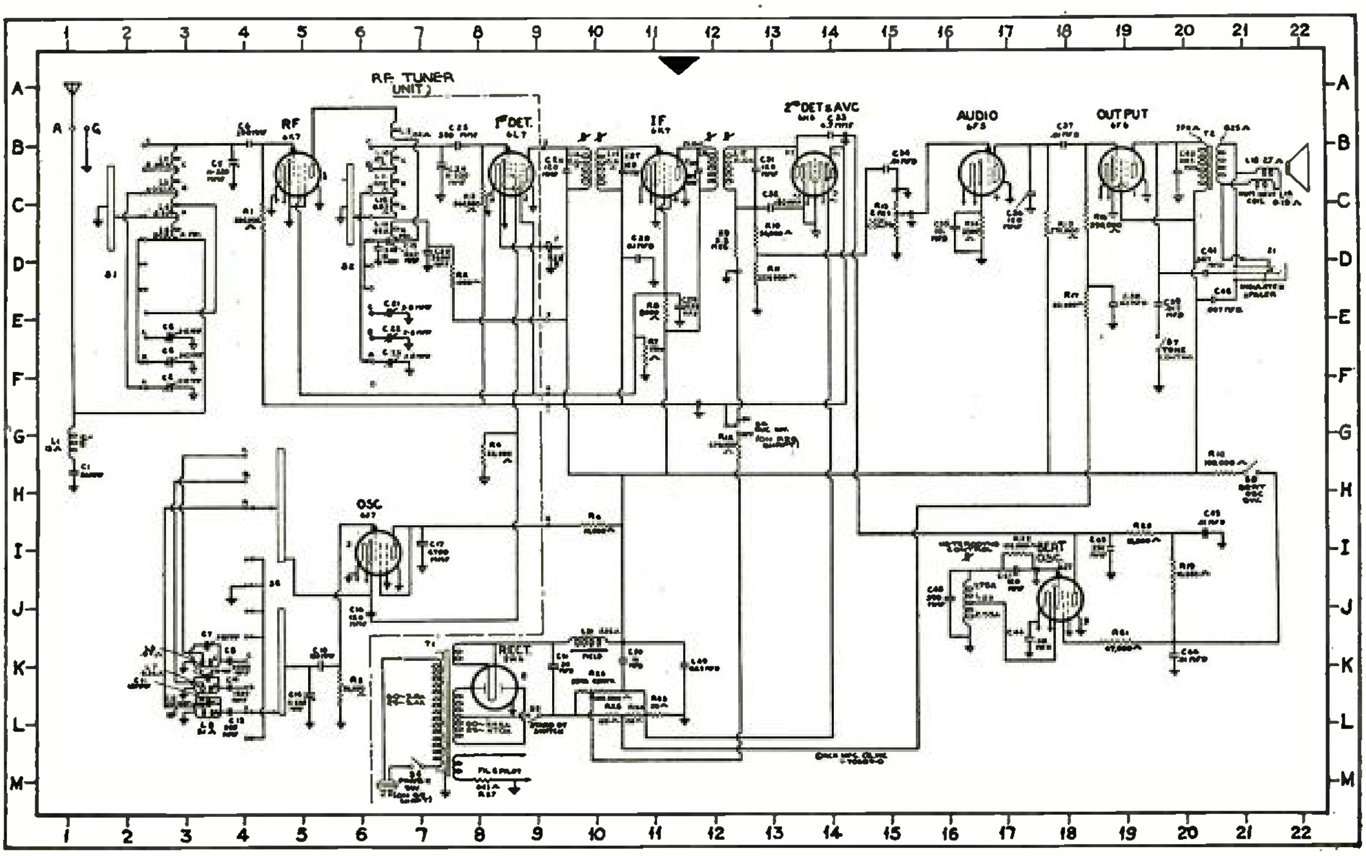

Fig. 3. Road-map circuit diagram of the ACR-155. Note unique coil-switching system.

Backwash

"All The News That's Fit To Print"

Editor, ALL-WAVE RADIO:

I have been reading ALL-WAVE RADIO for almost a year and I can truthfully say that I haven't found any magazine in the radio field that comes anywhere near comparing with it.

Especially do I enjoy Mr. Hinds "Globe-Girdling." He really has the up-to-date news. He does not waste a lot of space telling how Mr. X in Sheba reports that he just received veries from stations X, Y and Z at the North Pole, but Mr. Hinds gets down to what a DX'er in this country is likely to hear. Another thing I like about his column is that they are just as good to us fellows here on the Pacific Coast as they are to East Coast listeners. The Station List, which I presume is arranged by him, is the most accurate and up-to-date that I have yet seen. The address section and identification signals are also a great help.

I also enjoy "Editorial Quotes," the "Queries" and "Backwash" departments. I would be in favor of a club as suggested in the Backwash department in a recent issue.

Another thing for which I would like to express my appreciation is the lack of listening post photos, places for listeners to tell all about the stations they've logged in DX'ing, etc. We buy the magazines to get "tips" as to when to tune for a certain station, and that is what we are now getting in Mr. Hind's column.

LYLE NELSON,
YAMHILL, OREGON

(We appreciate your remarks—Mr. Hinds should love them. And for your information, the widespread praise Mr. Hinds has received has had much to do with the steady improvement in his department material. After all, sincere praise is a motivating force, and reader appreciation is compensated for in greater effort.—Editor)

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Favored Features

Editor, ALL-WAVE RADIO:

A reader of AWR for the past 10 months, I wish to express my appreciation of the fine work you are doing in publishing this magazine.

I like it because it has something of interest for everyone, be he an advanced radio engineer or merely a listener. "Radio and the Atmosphere," by J. L. Richey last spring was very interesting and lots of good dope was to be found in the three articles.

Mr. J. B. L. Hinds' "Globe Girdling" is tops and instead of the usual long lists found in most radio magazines Mr. Hinds has worked DX tips and interesting facts into really interesting reading.

I notice much discussion about the way of testing receivers in the Proving Post, but to my mind the Proving Post in AWR is doing an excellent, fair-minded job without offending either the manufacturer or the potential buyer.

Your editorial in the October issue about a Survey League is something that has long been needed in radio. As a member of similar leagues on the broadcast band years ago, I offer my services and listening post here to any such league you may form. I have been experimenting on u.h.f. for over a year and I know from the pile of letters I have here from engineers of "Apex" stations all over the country that such a league will benefit stations now experimenting in the u.h.f. bands. Those who have the equipment for these bands can render a definite service in collecting data on behavior of stations in their locality. I have any number of letters here from stations requesting complete data and conditions for periods of weeks and I know from experience a Listeners Survey League will be greatly appreciated by those stations who are interested in bettering radio Xmissions.

CLYDE CRISWELL,
PHOENIX, ARIZONA

(Very interesting—and a subject so far overlooked by the R.S.S.L. Thanks for the suggestion.—Editor.)

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Re the GCDXC

Editor, ALL-WAVE RADIO:

In the January issue of AWR on page 35 there appears an article sent in by one Raymond Swenson in re to the GCDXC. Now, that person is in no way connected with my club. The statement giving the club address is *misleading* as to what is on page 49! Now in fairness to all concerned, I would greatly appreciate a retraction on that article.

Thanking you and hoping to hear from you at your earliest convenience,

RAPHAEL GELLER,
BRONX, NEW YORK

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Likes AWR, But—

Editor, ALL-WAVE RADIO:

I have only one criticism to make regarding ALL-WAVE RADIO magazine: technically it is the best radio magazine on the market but it neglects a large group of persons interested in radio.

Having read every issue to date, I have yet to find any article about d.c. receivers. There are numerous users of d.c. in this country and on ships at sea.

Being a commercial radio telegraph operator I do not care for such departments as "Night-Owl Hoots," or J. B. L. Hinds' articles, but doubtless there are lots of people interested in such things. I would like to see more technical articles but as we cannot edit the magazine our way the next best thing is having it edited as is.

RALPH MCVEY,
Radio Operator, M/V *Northern Sun*
PHILADELPHIA, PA.

(The a.c.-d.c. receiver is a nasty animal in any man's language—but we're attempting to design one that will beat a path to our doorstep. When, as and if, we'll dish it up.—Editor)

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Old Timer Returns

Editor, ALL-WAVE RADIO:

Allow me as an old-time brass pounder, to congratulate you on your excellent magazine. As a matter of fact, it was from AWR that I received my second inspiration to return to the fold of hams, my first inspiration having been back in the days of the rock-crusher spark in 1915.

Your feature articles have been of incalculable value to me and I think the "Ham Bands" are just about the last word in spicy personal contacts.

I am writing you in the belief that a magazine editor is entitled to hear the praise as well as criticism (and sometimes condemnation) from his readers.

F. W. MACDONALD, W8QIX,
DETROIT, MICH.

(Greetings and salutations—and thanks. We'll QRX for the condemnation, but trust it stays away from our door.—Editor)

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Police and Commercial Lists

Editor, ALL-WAVE RADIO:

Why don't you have a department for Police and Commercial stations between 1650 and 4000 kc? These stations are distant. They are good DX and many of them verify. I keep a complete list of all on the air, as no radio magazine does. I would suggest a separate department with lists, or to have it a part of the "Globe Girdling" department, although I know that you have plenty to do as it is.

FRED L. VAN VOORHEES,
LONG ISLAND, NEW YORK

(If we remember correctly, the value of a New York Department Store window (just one section) is in the neighborhood of $1000 a day. As a consequence it is important to a store to display merchandise that will "pull the value" of the window. The value of magazine space is based on reader interest and reader demand. If there are a sufficient number of readers who would find Police and Commercial station listings and notes of value, then we shall include them, at the expense, of course, of some other data. So, let's have a vote.—Editor)

SHORT-WAVE STATION LIST

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

KC	Meters	Call	Location	Time
31600	9.4	W1XKA	● Boston, Mass.	Daily 9 A.M.-12 A.M.
31600	9.4	W8XKA	● Pittsburgh, Pa.	3-11 P.M. daily
31600	9.4	W3XKA	● Philadelphia, Pa.	Daily 12-10 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.	6:30 A.M.-9 A.M. daily
21530	13.93	GSJ	● Daventry, England	Not in use.
21520	13.94	W2XE	● Wayne, N. J.	7:30 A.M.-12 noon; 6-7 P.M. daily
21520	13.94	JZM	● Nazaki, Japan	Irregular
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 noon daily
21450	13.99	OLR	● Prague, Czechoslovakia	4 A.M.-9 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
20910	14.35	PSB	Rio de Janeiro, Brazil	(P) Phones N. Y. and Madrid irreg.
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 East A.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
19620	15.29	VQG	Nairobi, Kenya, Africa	(P) Phones GAD 7-8 A.M.
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.
19020	15.77	HS8PJ	● Bangkok, Siam	Mondays 8-10 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 Europe days to 8:30 P.M.
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
18640	16.09	PSC	Rio de Janeiro, Brazil	(P) Phones N. Y. and B. A. irreg.
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 - OCI noon; music irreg.
18410	16.29	PCK	Kootwijk, Holland	(P) Phones PLE - PMC early A.M.
18405	16.30	PCK	Kootwijk, Holland	(P) Phones PLE - PMC early A.M.
18400	16.31	PCK	Kootwijk, Holland	(P) Phones PLE - PMC early A.M.
18388	16.31	FZS	Saigon, Indo-China	(P) Phones FTK early mornings
18340	16.36	WLA	Lawrenceville, N. J.	(P) Phones GAS A.M.
18310	16.38	GAS	Rugby, England	(P) Phones WLA-WMN mornings
18295	16.39	YVR	Maracay, Venezuela	(P) Phones DFB-EHY-FTM mornings
18270	16.42	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. evenings
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	3-5 A.M., 6-8:45 A.M. daily
17785	16.87	JZL	● Nazaki, Japan	Irregular
17780	16.87	W3XAL	● Bound Brook, N. J.	9 A.M.-5 P.M. daily
17780	16.87	W9XAA	● Chicago, Ill.	Not in use at present.
17760	16.89	W2XE	● Wayne, N. J.	12 noon-1 P.M. daily
17760	16.89	DJE	● Zeesen, Germany	12:05-5:15 A.M.; 5:55-11 A.M. daily
17755	16.90	ZBW5	● Hong Kong, China	Daily 11:30 P.M.-1:30 A.M. ex. Sat. Mon. & Thurs. 4-10 A.M. Tues., Wed., Fri., Sun., 3-10 A.M. Sat. 3-11 A.M., 9 P.M.-1:30 A.M.
17750	16.91	IAC	Pisa, Italy	(P) Phones and tests to ships A.M.
17740	16.91	HSP	Bangkok, Siam	(P) Phones DFB 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.
17620	17.03	IBC	San Paolo, Italy	(P) Irregular
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
17280	17.36	FZE8	Djibouti, French Somaliland, Africa	(P) Irregular
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

KC	Meters	Call	Location	Time
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.
16385	18.31	ITK	Mogdishu, Somaliland, Africa	(P) Irregular
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
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.; to KWU 4 P.M. and 4 A.M. daily
15860	18.90	CEC	Santiago, Chile	(P) Phones OCJ A.M.
15810	18.97	LSL	Buenos Aires, Arg.	(P) GAA, A.M.; GCA, PSE, PSF, P.M.
15795	18.99	XOJ	Shanghai, China	(E) Phones GBA 6-7 A.M., JVD 8 P.M. and later
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 eves.
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.
15530	19.32	HSC-2	Bangkok, Siam	(P) Phones JVE late P. M. and early A.M.
15530	19.32	HS8PJ	● Bangkok, Siam	Mondays 8-10 A.M. occasionally
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	8-9 A.M. daily
15330	19.56	W2XAD	● Schenectady, N. Y.	10 A.M.-3:45 P.M. daily
15320	19.58	OLR	● Prague, Czechoslovakia	4 A.M.-9 P.M. daily
15310	19.60	GSP	● Daventry, England	Not in use
15305	19.60	CP7	La Paz, Bolivia	(E) Relays CP4; tests daytimes
15300	19.61	XEBM	● Mazatlan, Mexico	8-11:45 P.M.
15280	19.63	LRU	● Buenos Aires, Arg.	7 A.M.-7 P.M. daily
15280	19.63	DJQ	● Zeesen, Germany	6-8 A.M., 8:15-11 A.M. daily. Sun., 11:10 A. M.-12:25 P.M.
15270	19.64	W2XE	● Wayne, N. J.	1-6 P.M. daily
15260	19.66	GSI	● Daventry, England	12:15-4 P.M. daily
15252	19.67	RIM	Tashkent, USSR.	(P) Phones RKI early mornings
15243	19.68	TPA2	● Pontoise, France	6-11:05 A.M. daily
15230	19.69	OLR	● Prague, Czechoslovakia	4 A.M.-9 P.M. daily
15220	19.71	PCJ	● Eindhoven, Holland	Sun. 7:30-8:30 A.M.; Tues. 4:30-6:30 A.M.; Wed. 8-11 A.M.
15210	19.72	W8XK	● Pittsburgh, Pa.	9 A.M.-7 P.M. daily
15200	19.74	DJB	● Zeesen, Germany	12:05 A.M.-5:15 A.M., 5:55-11 A.M., 11:10 A.M.-12:25 P.M. daily. 8-9 A.M. Sun. only
15190	19.75	ZBW-4	● Hong Kong, China	Daily ex. Sat. 11:30 P. M.-1:30 A.M. Mon. & Thurs. 4-10 A.M. Tues., Wed., Fri., Sun., 3-10 A.M. Sat., 3-11 A.M., 9 P.M.-1:30 A. M.
15183	19.76	RV96	● Moscow, USSR.	Not in use
15180	19.76	GSO	● Daventry, England	3-5 A.M. daily
15160	19.79	JZK	● Nazaki, Japan	Irregular
15150	19.80	YDC	● Soerabaja, Java	5:30-11 A.M., 5:45-6:45 P.M., 10:30 P.M.-1:30 A.M. daily
15145	19.81	RKI	● Moscow, USSR.	Broadcasts irreg. Sun. Phones RIM A.M.
15140	19.82	GSF	● Daventry, England	9 A.M.-12 noon 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., 8-9 A.M., 11:35 A.M.-4:30 P.M. daily. Sunday 6-8 A.M.
15070	19.91	PSD	Rio de Janeiro, Brazil	(P) Phones B. A. irreg.
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	Weekdays 5-6:30 A.M., 12-2:45 P.M. Sundays 12 A.M.-4:30 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. Broadcasts irreg.
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	WOV	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. Broadcasts irreg.
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
14485	20.71	HRL5	La Ceiba, Honduras	(P) Phones WNC 5:45 P.M.
14480	20.72	PLX	Bandoeng, Java	(P) Phones Europe and B.C. irregular to 3 P.M.
14470	20.73	WMF	Lawrenceville, N. J.	(P) Phones England daytime
14460	20.75	DZH	● Zeesen, Germany	Irregular
14440	20.78	GBW	Rugby, England	(P) Phones Lawrenceville daytime
14410	20.82	IBC	San Paolo, Italy	(P) Irregular
14410	20.80	DIP	Zeesen, Germany	(E) Experimental; irreg.
14250	21.00	W10XDA	Schooner Morrissey	(P) Irregular
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
13760	21.80	TYE-2	Paris, France	(P) Phones U. S. days
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	WCT	San Juan, P. R.	(P) Phones WNC 5:45 P.M.
13410	22.37	YSJ	San Salvador, Salvador	(P) Phones WNC days

KC	Meters	Call	Location	Time
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
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	(P) Phones FYB-TYB-FTA near 4 P.M.
12830	23.38	CNR	● Rabat, Morocco	Special broadcasts irreg.
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.
12394	24.21	DAN	Nordenland, Germany	(P) Phones ships irreg. mornings
12300	24.39	CEB	● Santiago, Chile	11 A.M.-1 P.M., 4-8 P.M., 10-11 P.M. daily
12300	24.39	PLM	Bandoeng, Java	(P) Phones 2ME near 6:30 A.M.
12295	24.40	ZLU	Wellington, N. Z.	(P) Phones ZLJ early A.M.
12290	24.41	GBU	Rugby, England	(P) Phones Lawrenceville days
12280	24.43	KUV	Manila, P. I.	(P) Phones early A. M.
12250	24.49	TYB	Paris, France	(P) Phones JVH-XGR and ships irreg.
12235	24.52	TFJ	Reykjavik, Iceland	(P) Phones England days
12235	24.52	TFJ	● Reykjavik, Iceland	English broadcast each 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.	Sun. 6-7 A.M., 10-11 A.M., Wed. 6-7 A.M.
11991	25.02	FZS	Saigon, Indo-China	(P) Phones FTA-FTK early A.M.
11955	25.09	IBC	San Paolo, Italy	(P) Irregular
11955	25.09	IUC	● Addis Ababa, Ethiopia	12-1 A.M.; music at times
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.
11895	25.22	XEXR	● Mexico City, Mexico	6-11:30 P.M.
11885	25.24	TPA3	● Pontoise, France	4-5 A.M., 11:15 A.M.-6 P.M. daily
11880	25.25	XEXA	● Mexico City, Mexico	8-11:30 A.M., 3-5 P.M., 7-11 P.M. ex. Sunday
11875	25.26	YDB	● Soerabaja, Java	5:30-11 A.M., 5:45-6:45 P.M., 10:30 P.M.-1:30 A.M. daily
11870	25.26	OLR	● Prague, Czechoslovakia	4 A.M.-9 P.M. daily
11870	25.26	W8XK	● Pittsburgh, Pa.	7-9 P.M. daily
11860	25.29	GSE	● Daventry, England	Not in use
11855	25.31	DJP	● Zeesen, Germany	Irregular
11830	25.36	W2XE	● Wayne, N. J.	7-10 P.M. daily
11840	25.34	OLR	● Prague, Czechoslovakia	4 A.M.-9 P.M. daily
11830	25.36	W9XAA	● Chicago, Ill.	Weekdays 9 A.M.-6 P.M. Sun. 9-11 A.M., 1-5:30 P.M.
11820	25.38	GSN	● Daventry, England	Not in use
11810	25.40	2RO4	● Rome, Italy	6:43 A.M.-12:30 P.M. (See 9635 kc.)
11800	25.42	OER-2	● Vienna, Austria	Weekdays 9 A.M.-5 P.M. Saturdays to 5:30 P.M.
11800	25.42	OAX5A	● Ica, Peru	Daily 1 A.M.-12 noon, 4-11 P.M.
11800	25.42	JZJ	● Nazaki, Japan	Irregular
11795	25.43	DJO	● Zeesen, Germany	Irregular
11790	25.43	W1XAL	● Boston, Mass.	Daily 4:30-6:30 P.M.
11770	25.49	DJD	● Zeesen, Germany	11:35 A.M.-4:30 P.M., 4:50-10:45 P.M.
11760	25.51	OLR	● Prague, Czechoslovakia	4 A.M.-9 P.M. daily
11750	25.53	GSD	● Daventry, England	12:15-5:45 P.M. daily
11740	25.55	HP5L	● David, Panama	4-7 P.M. daily
11730	25.57	F3ICD	● Saigon, Indo-China	7:30-9:30 A.M. daily
11730	25.57	PHI	● Huizen, Holland	8:30-10:30 A.M. except Tues. and Wed.
11720	25.60	CJRX	● Winnipeg, Manitoba	Week Days 6 P.M.-12 A.M. Sundays 5-10 P.M.
11720	25.60	TPA4	● Pontoise, France	6:15-8 P.M., 10 P.M.-1 A.M. daily
11710	25.62	VK9MI	● Sydney, Australia; "S.S. Kanimbla"	11 P.M.-7 A.M. Irregular
11705	25.63	SM5SX	● Stockholm, Sweden	Weekdays 6:25-7 A.M., 11 A.M.-5 P.M. Sun., 3 A.M.-5 P.M.
11680	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.
11595	25.87	VRR4	Stony Hill, Jamaica	(P) Phones WNC 5:45 P.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.
11435	26.24	COCX	● Havana, Cuba	8 A.M.-1 A.M. daily
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.
11260	26.64	HIN	● Ciudad Trujillo, R. D.	Daily 11:40 A.M.-1:40 P.M., 4:30-6 P.M., 7:10-9:10 P.M.
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.
10975	27.35	OCI	Lima, Peru	(P) Phones CEC-HJY days
10975	27.35	OCP	Lima, Peru	(P) Phones HKB early evenings
10960	27.37	JZB	● Nazaki, Japan	Irregular
10955	27.38	HSG	Bangkok, Siam	(P) Phones irregularly
10940	27.43	FTH	St. Assise, France	(P) Phones So. America irreg.
10910	27.50	KTR	Manila, P. I.	(P) Phones DFC early A.M. irreg.
10850	27.63	DFL	Nauen, Germany	(P) Relays programs afternoons irreg.
10840	27.68	KWV	Dixon, Calif.	(P) Phones Japan, Manila, Hawaii, A.M.
10795	27.79	GCL	Rugby, England	(P) Phones Japan days
10790	27.80	YNA	Managua, Nicaragua	(P) Phones So. America days, irreg.
10770	27.86	GBP	Rugby, England	(P) JYS and XGR irreg.; Phones VLK early A.M. & P.M.
10740	27.93	JVM	● Nazaki, Japan	4-7:30 A.M. irregular
10675	28.10	WNB	Lawrenceville, N. J.	(P) Phones ZFB daytime
10670	28.12	CEC	Santiago, Chile	(P) Phones HJY-OCT daytime
10670	28.12	CEC	● Santiago, Chile	Daily ex. Sat. and Sun., 7-7:20 P.M. (see CED, 10230 KC.)
10660	28.14	PSG	Rio de Janeiro, Brazil	(P) Phones N. Y., B. A., Madrid
10660	28.14	JVN	Nazaki, Japan	(P) Phones JIB early A.M.; Relays JOAK irreg.
10660	28.14	JVN	● Nazaki, Japan	4-7:40 A.M. irreg.; Mon. & Thurs. 4-5 P.M.; Tues. & Fri. 5-6 P.M.
10620	28.25	WEF	Rocky Point, N. Y.	(E) Relays program service irregularly
10620	28.25	EHX	Madrid, Spain	(P) Phones CEC and EHZ afternoons
10610	28.28	WEA	Rocky Point, N. Y.	(E) Tests Europe irreg.
10550	28.44	WOK	Lawrenceville, N. J.	(P) Phones LSN-PSF-PSH-PSK nights
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
10480	28.63	ITK	Mogdishu, Somaliland, Africa	(P) Irregular
10440	28.74	DGH	Nauen, Germany	(P) Phones HSG-HSJ-HSP early A.M.

KC	Meters	Call	Location	Time
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 3:30-4 P.M.
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	EAJ43	● Santa Cruz de Tenerife, C. I.	2:15-3:50 P.M., 6-7 P.M., 7:10-8 P.M. daily
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.; B.C. 3-4 P.M., 6-8:15 P.M.
10350	28.98	LSX	● Buenos Aires, Arg.	Mon., Tues., Fri., 5-6 P.M.
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; broadcasts irreg.
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 7-11 A.M. daily. Phones ORK afternoons
10120	29.64	PSI	Rio de Janeiro, Brazil	(P) Phones LSL irreg.
10080	29.76	RIR	Tiflis, USSR.	(P) Phones RIM-RKI 7-11 A.M.
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
9940	30.18	CSW	● Lisbon, Portugal	4-7 P.M. daily
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.
9860	30.43	EAQ	● Madrid, Spain	Saturday 1-3:30 P.M.; daily 5:15-9:30 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.
9665	31.04	CT1AA	● Lisbon, Portugal	Tues., Thurs., Sat., 3-6 P.M.
9660	31.06	CR6AA	● Lobito, West Africa	3:45-5:30 P.M. Wed. & Sat.
9660	31.06	LRX	● Buenos Aires, Arg.	7-11:30 P.M. daily
9660	31.06	PSJ	Rio de Janeiro, Brazil	(P) Irreg., Argentina
9650	31.09	YDB	● Soerabaja, Java	5:30-11 A.M., 5:45-6:45 P.M., 10:30 P.M.-1:30 A.M. daily
9635	31.13	2RO3	● Rome, Italy	12:30-6 P.M. Mon., Wed., Fri. Amer. Hour, 6-7:30 P.M., Tues., Thurs., Sat. Lat. Amer., 6-7:30 P.M. Sunday, off at 5:30 P.M. and later
9630	31.15	CFA5	Drummondville, Que.	(P) Phones No. America days
9620	31.17	DGU	Nauen, Germany	(P) Phones SUV A.M. Relays irreg.
9620	31.17	FZR	Saigon, Indo-China	(P) Phones Paris early A.M.
9600	31.25	CQN	● Macao, China	Mon. & Fri. 7-8:30 A.M.
9600	31.25	RAN	● Moscow, USSR.	7-9:15 P.M. daily
9600	31.25	HJ1ABP	● Cartagena, Colombia	7-9 A.M., 11 A.M.-1:20 P.M., 6-11 P.M. daily
9600	31.25	CB960	● Santiago, Chile	Daily ex. Sun. 11:30 A.M.-2 P.M., 6-8:30 P.M.; Sun. 3-5 P.M., 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.	12-8 P.M. daily
9590	31.28	VK2ME	● Sydney, Australia	Sunday 1-3 A.M., 5-9 A.M., 9-11 A.M.
9590	31.28	HP5J	● Panama City, Panama	Week days 12-1:30 P.M., 6-10 P.M. Sun. 10:30 A.M.-1:30 P.M., 7-10 P.M.
9590	31.28	PCJ	● Eindhoven, Holland	Sun. 2-3 P.M., 7-8 P.M. Wed. 7-10 P.M.
9580	31.32	GSC	● Daventry, England	4-5:45 P.M., 6-8 P.M., 9-11 P.M. daily
9580	31.32	VK3LR	● Melbourne, Australia	Week days 3:30-8:30 A.M.; Friday also 10 P.M.-2 A.M. Sunday, 3:30-7:30 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.	Weekdays 6:30 A.M.-1 A.M. Sundays, 8 A.M.-1 A.M.
9565	31.36	VUY VUB	● Bombay, India	Thurs. and Fri., 11 P.M.-12:30 A.M.; Sun., 1:30-3:30 A.M.
9560	31.38	DJA	● Zeesen, Germany	12:05-5:15 A.M., 5:55-11 AM., 4:50-10:45 P.M. daily
9560	31.38	HJ1ABB	● Barranquilla, Colombia	7 A.M.-12:30 P.M. daily
9545	31.44	HH2R	● Port-au-Prince, Haiti	Special programs irreg.
9540	31.45	DJN	● Zeesen, Germany	12:05-5:15 A.M., 5:55-11 A.M., 4:50-10:45 P.M. daily
9540	31.45	VPD2	● Suva, Fiji Islands	5:30-7 A.M. daily
9535	31.46	JZI	● Nazaki, Japan	Irregular
9530	31.48	W2XAF	● Schenectady, N. Y.	4 P.M.-12 A.M. daily
9530	31.48	LCJ1	● Jeloy, Norway	5-8 A.M., 11 A.M.-5 P.M. daily
9525	31.49	ZBW-3	● Hong Kong, China	Daily ex. Sat. 11:30 P.M.-1:30 A.M.; Mon. & Thurs. 4-10 A.M.; Tues., Wed., Fri., Sun. 3-10 A.M.; Sat., 3-11 A.M., 9 P.M.-1:30 A.M.
9520	31.51	HJ4ABH	● Armenia, Colombia	Weekdays 8-11 A.M., 6-10 P.M. Sundays 7-10 P.M.
9520	31.51	XEDQ	● Guadalajara, Mexico	Daily 12-4 P.M., 8 P.M.-12 A.M. Occasional Sunday DX 2-4 A.M.
9510	31.55	GSB	● Daventry, England	3-5 A.M., 6-8:45 A.M., 9 A.M.-12 noon, 12:15-5:45 P.M., 6-8 P.M., 9-11 P.M. daily
9510	31.55	VK3ME	● Melbourne, Australia	Mon., Sat. 4-7 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	Irregular. (See 6120 kc.)
9500	31.56	PRF5	● Rio de Janeiro, Brazil	4:45-5:45 P.M. ex. Sun.
9500	31.58	HI5G	● La Vega, 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	11 A.M.-1 P.M., 5-10:30 P.M. Sun. 9 A.M.-3 P.M.
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

KC	Meters	Call	Location	Time
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	Daily 8 A.M.-12 A.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
9350	32.09	HS8PJ	● Bangkok, Siam	Thurs., 8-10 A.M.
9330	32.15	CGA4	Drummondville, Que.	(P) Phones GCB-GDB-GBB afternoons
9300	32.27	YNGU	● Managua, Nicaragua	1-3 P.M., 6-7 P.M. Sundays 12-1:30 P.M.
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 seasonally
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	6:00-7:00 P.M. Sundays
9110	32.93	KUW	Manila, P. I.	(P) Tests and phones early A.M.
9091	33.00	CGA-5	Drummondville, Que.	(P) Phones Europe days
9020	33.26	GCS	Rugby, England	(P) Phones Lawrenceville afternoons
9010	33.30	KEJ	Bolinas, Calif.	(P) Relays programs to Hawaii eve.
8975	33.42	CJA5	Drummondville, Que.	(P) Phones Australia nights, early A.M.
8975	33.43	VWY	Poona, India	(P) Phones GBC-GBU mornings
8960	33.48	FVA	"Radio Algiers" Alger, Algeria, Africa	(P) Phones Paris 12-1 A.M. daily
8950	33.52	WEL	Rocky Point, N. Y.	(E) Tests with Europe irreg.
8950	33.52	W2XBJ	Rocky Point, N. Y.	(E) Tests irregularly
8948	33.53	HCJB	● Quito, Ecuador	7:30-9:30 A.M., 11:30 A.M.-2:30 P.M., 5:30-10 P.M. daily ex. Mon. (8948 kc.) (7-10 P.M. only on 8948 and 4107 kc.)
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
8795	34.13	HKV	● Bogota, Colombia	(E) Tests early evenings and nights; broadcasts news Mon. and Thurs. 7-7:30 P.M.
8790	34.13	TIR	Cartago, Costa Rica	(P) Phones Cent. America daytime
8775	34.19	PNI	Makasser, D. E. I.	(P) Phones PLV early mornings
8760	34.35	GCQ	Rugby, England	(P) Phones ZSR afternoons
8740	34.35	WXV	Fairbanks, Alaska	(P) Phones WXH nights
8730	34.36	GCI	Rugby, England	(P) Phones VWY afternoon
8710	34.44	KBB	Manila, P. I.	(E) 6-8 A.M. special broadcast
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 N. Y. irreg.
8560	35.05	WOO	Ocean Gate, N. J.	(P) Phones ships days
8515	35.23	TAC	Pisa, Italy	(P) Phones irreg.
8505	35.27	YNLG	● Managua, Nicaragua	Daily 1-2:30 P.M., 7:30-9:45 P.M.
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 11:30 A.M.-12:30 P.M., 7-11 P.M. Sundays 3-5 P.M.
8185	36.65	PSK	Rio de Janeiro, Brazil	(P) Phones LSL-WOK evenings. Broadcasts irreg.
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	Shanghai, China	(P) Tests early mornings
7960	37.69	VLZ	Sydney, Australia	(P) Phones ZLT early A.M.
7955	37.71	HSJ	Bangkok, Siam	(P) Phones Berlin, Manila, Java irregular
7935	37.81	PSL	Rio de Janeiro, Brazil	(P) Phones N. Y. and Madrid irreg.
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	IDU	Asmara, Eritrea, Africa	(P) Irregular
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.-2 P.M., 7-11 P.M. daily
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
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, Guate.	(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. Week days, 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 irreg.
7500	40.00	CFA-6	Drummondville, Que.	(P) Phones N. America days
7470	40.16	JVO	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	KEO	Kahuku, Hawaii	(P) Relays programs evenings
7345	40.84	GDL	Rugby, England	(P) Phones Japan irreg. A.M.
7200	41.67	YNAM	● Managua, Nicaragua	Daily 7-10 P.M.
7100	42.25	FO8AA	● Papeete, Tahiti	Tues. & Fri. 11 P.M.-1 A.M.
7080	42.37	PI1J	● Dordrecht, Holland	Sat., 10:10-11:10 A.M.
7030	42.67	EA9AH	● Tetuan, Spanish Morocco, Africa	4-4:25 P.M. daily; 12-2:30 A.M. irregular
7010	42.80	EA8AB	● Santa Cruz de Tenerife, Canary Islands	Mon., Wed., Fri., Sat., 3:15-4:15 P.M.
7000	42.86	PZH	● Paramaribo, D. Guiana	S. A. Sun., 9:45-11:45 A.M.; Mon. and Fri., 5:45-9:45 P.M.; Tues. and Thurs., 2:45-4:45 P.M., 8:45-10:45 P.M.; Wed., 3:45-4:45, 5:45-9:45 P.M.; Sat., 2:45-4:45 P.M.
6990	42.92	JVS	Nazaki, Japan	(P) Phones China mornings early
6977	43.00	XBA	Tacubaya, D. F., Mex.	(E) 6-8 P.M. daily
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.

KC	Meters	Call	Location	Time
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.
6850	43.80	TIOW	●Port Limon, Costa Rica	Week days 10-11:30 P.M. Sun. 2-3 P.M.
6845	43.83	KEN	Bolinas, Calif.	(P) Used irregularly
6830	43.92	CFA	Drummondville, Que.	(P) Phones N. America nights
6820	43.99	XGOX	●Nanking, China	Week days 5:30-8:30 A.M., Sun. 7-9 A.M.
6800	44.12	HI7P	●Ciudad Trujillo, R. D.	Daily 6:40-8:40 A.M., 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M.
6795	44.15	GAB	Rugby, England	(P) Phones Canada irreg.
6780	44.25	HIH	●San Pedro de Macoris, R. D.	Sun. 3-4 A.M., 12:30-1:30 P.M., 4-5 P.M. Week days 12:15-2 P.M., 7-8:30 P.M.
6767	44.33	PMH	Bandoeng, Java	(E) Phone and B.C. early A.M.
6760	44.38	CJA-6	Drummondville, Que.	(P) Phones Australia early A.M.
6755	44.41	WOA	Lawrenceville, N. J.	(P) Phones GDW-GDS-GCS evenings
6750	44.44	JVT	Nazaki, Japan	(P) Phones JOAK and Pt. Reyes irreg.
6750	44.44	JVT	●Nazaki, Japan	4:40-7:40 A.M. daily
6730	44.58	HI3C	●La Romana, R. D.	Week days 12:10-2:10 P.M., 6:10-7:40 P.M. Sun., 12:10-2:40 P.M.
6725	44.60	WQO	Rocky Point, N. Y.	(E) Tests evenings irreg.
6718	44.66	KBK	Manila, P. I.	(P) Phones A.M. seasonally
6690	44.84	TIEP	●San Jose, Costa Rica	7-11 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.
6672	44.96	YVQ	●Maracay, Venezuela	8-9 P.M. Saturdays
6672	44.96	YVQ	Maracay, Venezuela	(P) Phones LSL irreg.
6650	45.11	GBY	Rugby, England	(P) Phones U.S.A. irreg.
6650	45.11	JAC	Pisa, Italy	(P) Phones ships irreg
6635	45.21	HC2RL	●Guayaquil, Ecuador	Sun. 5:30-7:30 A.M. Tues. 9-11 P.M.
6630	45.25	HIT	●Ciudad Trujillo, R. D.	12:10-1:40 P.M., 6:10-8:40 P.M. ex. Sun. 1st Sat., DX 11:10 P.M.-1:10 A.M.
6618	45.33	Prado	●Riobamba, Ecuador	Thursday 9-11 P.M.
6550	45.81	TIRCC	●San Jose, Costa Rica	Daily 12-2 P.M., 6-9:30 P.M.
6548	45.82	XBC	Vera Cruz, Mexico	(E) 7-8 P.M. irreg.
6545	45.84	YV6RB	●Ciudad Bolivar, Venez.	7-10 P.M. daily; 3-6 P.M. Sun.
6535	45.91	YN1GG	●Managua, Nicaragua	6-10 P.M. daily
6520	46.01	YV4RB	●Valencia, Venezuela	11 A.M.-2 P.M., 5-10 P.M. daily
6500	46.15	HIL	●Ciudad Trujillo, R D	12-2 P.M., 6-8 P.M.
6482	46.28	HI4D	●Ciudad Trujillo, R. D.	Mon. & Sat., 11:55 A.M.-1:40 P.M., 4:40-7:40 P.M.
6479	46.30	HI8A	●Ciudad Trujillo, R. D.	Daily ex. Sunday 8:40-10:40 A.M., 2:40-4:40 P.M. Sat., 9:10-10:40 P.M.
6450	46.51	HI4V	●San Francisco de Macoris, R. D.	11:40 A.M.-1:40 P.M., 5:10-6:40 P.M. daily
6420	46.72	HI1S	●Santiago de los Caballeros, R. D.	11:40 A.M.-1:40 P.M., 5:40-7:40 P.M.
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	YV5RH	●Caracas, Venezuela	7-11 P.M. irreg.
6375	47.10	YV5RF	●Caracas, Venezuela	5:30-9:30 P.M. ex. Sun.
6360	47.17	YV1RH	●Maracaibo, Venezuela	6-11 P.M. daily
6351	47.24	HRP1	●San Pedro de Sula, Honduras	12-2 P.M., 7:45-10 P.M. daily ex. Sunday
6345	47.28	YV1RG	●Valera, Venezuela	6-11 P.M. daily
6340	47.32	HIX	●Ciudad Trujillo, R. D.	Sun. 7:40-10:40 A.M. Daily 12:10-1:10 P.M. Tues. & Fri. 8:10-10:10 P.M.
6330	47.39	JZG	●Nazaki, Japan	5-7 A.M. irregular
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	YV4RD	●Maracay, Venezuela	6:30-9:30 P.M. ex. Sun.
6280	47.69	COHB	●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.
6270	47.85	YV5RP	●Caracas, Venezuela	6-11:45 P.M. daily
6243	48.05	HIN	●Ciudad Trujillo, R. D.	(See 11260 kc.) Week days 11:40 A.M.-2:40 P.M., 7:10-9:10 P.M. Sun. 11:10 A.M.-3:40 P.M.
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	8-10:30 P.M., Sundays 4-6 P.M.
6230	48.15	OAX4G	●Lima, Peru	7-11 P.M. daily
6200	48.39	COKG	●Santiago, Cuba	Sundays 12:01-1 A.M., 8 A.M.-10:30 P.M. to 12 A.M. daily
6200	48.39	XEXS	●Mexico City, Mexico	7-11 P.M.
6182	48.53	HI1A	●Santiago de Caballeros, R. D.	Daily 11:40 A.M.-1:40 P.M., 7:40-9:40 P.M.
6170	48.62	HJ3ABF	●Bogota, Colombia	11 A.M.-2 P.M. 6-11 P.M.
6160	48.70	VPB	●Colombo, Ceylon	Daily 6:30-9 and 10 A.M.
6156	48.73	YV5RD	●Caracas, Venezuela	Week days 10:30 A.M.-1:30 P.M., 4:30-10 P.M.; Sundays 8:30 A.M.-12:30 P.M., 2:30-10:30 P.M.
6150	48.78	HJ4ABU	●Pereira, Colombia	Daily 9:30 A.M.-12 Noon, 6:30-10 P.M.
6150	48.78	CJRO	●Winnipeg, Manitoba	Week days 6 P.M.-12 A.M., Sundays 5-10 P.M.
6150	48.78	GBT	Rugby, England	(P) Phones U.S.A. days
6150	48.78	HI5N	●Santiago de los Caballeros, R. D.	Daily 6:40-8:40 A.M., 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M.
6150	48.78	CB615	●Santiago, Chile	4-7 P.M. daily
6140	48.86	W8XK	●Pittsburgh, Pa.	9 P.M.-1 A.M. daily
6140	48.86	ZEB	●Bulawayo, Rhodesia, Africa	Sun. 3-5 A.M.; Tues. & Thurs. 1:15-3:15 P.M.
6138	48.88	HJ4ABD	●Medellin, Colombia	Weekdays 10 A.M.-2 P.M., 4-11 P.M. Sun., 11 A.M.-3 P.M., 7-11 P.M. (see 5900 and 5780 KC.)
6137	48.88	CR7AA	●Lourenco Marques, Africa	Week days 4:45-6:15 A.M., 12:45-3:15 P.M.; Sundays 5:30-7 A.M., 10 A.M.-12:30 P.M.
6133	48.91	XEXA	●Mexico City, Mexico	8-11:30 A.M., 3-5 P.M., 7-11 P.M. ex. Sunday
6132	48.92	VP3BG	●Georgetown, Br. Guiana	6-8:45 P.M. daily
6130	48.94	ZGE	● Kuala Lumpur, S.S.	Sun., Tues., Fri., 6:40-8:40 A.M.
6130	48.94	COCD	●Havana, Cuba	Daily 11 A.M.-1 A.M.
6130	48.94	VE9HX	●Halifax, Nova Scotia	Sun. 3-10:45 P.M., Mon. to Fri. 7:30 A.M.-10:45 P.M., Sat. 11 A.M.-10:45 P.M.
6128	48.96	HJ1ABB	●Barranquilla, Colombia	11:45 A.M.-1 P.M., 5:30-10 P.M. daily
6125	48.98	CXA4	●Montevideo, Uruguay	8 A.M.-12 noon, 2-10 P.M. daily
6122	49.00	HJ3ABX	●Bogota, Colombia	Week days 10:30 A.M.-2 P.M., 5:30-11:30 P.M.; Sundays 12-1:30 P.M., 6-11 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.	10-11 P.M. daily
6115	49.06	OLR	●Prague, Czechoslovakia	4 A.M.-9 P.M. daily
6110	49.10	HJ4ABB	●Manizales, Colombia	11 A.M.-1 P.M., 5-8 P.M.
6110	49.10	GSL	●Daventry, England	9-11 P.M. daily
6110	49.10	VUC	●Calcutta, India	Mon., 8-9 A.M. Wed., 10:30-11:30 A.M.
6110	49.10	XEPW	●Mexico City, Mexico	10 A.M.-12 noon, 2-4 P.M., 8 P.M.-12 A.M.
6100	49.18	Belgrade	●Belgrade, Yugoslavia	1 A.M.-5 P.M. daily
6100	49.18	W9XF	●Chicago, Illinois	Daily ex. Sat. 11:05 P.M.-2 A.M.
6100	49.18	W3XAL	●Bound Brook, N. J.	Mon., Wed., Sat., 5 P.M.-1 A.M.
6097	49.20	HJ4ABE	●Medellin, Colombia	11 A.M.-12 noon, 6-10:30 P.M. daily
6095	49.22	JZH	●Nazaki, Japan	Irregular
6090	49.26	CRCX	●Bowmansville, Ont.	Week days 5:30-11:30 P.M.; Sundays 5-11:30 P.M.
6090	49.26	ZBW-2	●Hong Kong, China	Daily ex. Sat. 11:30 P.M.-1:30 A.M.; Mon. & Thurs. 4-10 A.M.; Tues., Wed., Fri., Sun. 3-10 A.M.; Sat. 3-11 A.M., 9 P.M.-1:30 A.M.
6090	49.26	ZTJ	●Johannesburg, S. Africa	11:45 P.M.-12:30 A.M., 3:30-7:00 A.M., 9 A.M.-4:45 P.M.
6090	49.26	HJ4ABC	●Ibague, Colombia	6-11 P.M.
6085	49.30	HJ5ABD	●Cali, Colombia	11 A.M.-2 P.M., 6-11 P.M. daily
6080	49.34	W9XAA	●Chicago, Ill.	Week days 7:30-9 A.M., 6 P.M.-1 A.M. Sun. 11 A.M.-1 P.M., 6 P.M.-1 A.M.
6080	49.34	ZHI	●Penang, S.S.	6:40-8:40 A.M.
6080	49.34	CP5	●La Paz, Bolivia	11:30 A.M.-1 P.M., 6-7:45 P.M., 8:30-11 P.M. week days; Sunday 3:30-6:00 P.M.
6080	49.34	VE9CS	●Vancouver, B. C.	Sun. 12 noon-1:30 A.M.; Mon., Thurs., Sat., 9:30 A.M.-8:30 P.M.; Tues., Wed., Fri., 9:30 A.M.-2:30 A.M.
6080	49.34	HP5F	●Colon, Panama	Daily ex. Sunday, 11 A.M.-1 P.M., 7-10 P.M.; Sun. 10:45-11:30 A.M., 7-10 P.M.
6079	49.35	DJM	●Zeesen, Germany	Irregular
6075	49.38	XECU	●Guadalajara, Mexico	8-11:30 P.M.
6070	49.42	YV1RD	●Maracaibo, Venezuela	Daily 8 P.M.-12 A.M.
6065	49.46	XEXR	●Mexico City, Mexico	6-11:30 P.M.
6060	49.50	W8XAL	●Cincinnati, Ohio	6:30 A.M.-8 P.M., 11 P.M.-2 A.M. daily

KC	Meters	Call	Location	Time
6060	49.50	W3XAU	●Philadelphia, Pa.	8-11 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., 11:30 A.M.-2:30 P.M.
6060	49.50	OXY	●Skamleback, Denmark	1-6:30 P.M. Sunday 11 A.M.-6:30 P.M.
6050	49.59	GSA	●Daventry, England	6-8 P.M. daily
6050	49.59	HJ3ABD	●Bogota, Colombia	Daily 9 A.M.-2 P.M., 6 P.M.-12 A.M.
6050	49.59	XEXF	●Mexico City, Mexico	8 P.M.-12 A.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., 5:45-6:45 P.M., 10:30 P.M.-1:30 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.	Mon., Tues., Fri., 7:30-9:30 P.M. Sundays 5-7 P.M.
6030	49.75	OLR	●Prague, Czechoslovakia	4 A.M.-9 P.M.
6030	49.75	HP5B	●Panama City, Panama	12 noon-1 P.M., 6-10 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	Week days 9 A.M.-1 A.M.; Thursdays to 2 A.M.; Sundays 12 noon-12:30 A.M.
6030	49.75	XEBQ	●Mazatlan, Mexico	8-11:30 P.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	11:35 A.M.-4:30 P.M., 4:50-10:45 P.M. daily
6020	49.83	XEUW	●Vera Cruz, Mexico	7 A.M.-11 P.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
6015	49.88	XEWI	●Mexico City, Mexico	(Same as 11900 kc.)
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.
6010	49.92	VP3MR	●Georgetown, Br. Guiana	Sunday, 7:45-10:15 A.M. Week days, 4:45-8:45 P.M.
6010	49.92	VK9MI	●Sydney, Australia "S.S. Kanimbla"	11 P.M.-7 A.M. Irregular
6010	49.92	COCO	●Havana, Cuba	8 A.M.-10 P.M. daily
6010	49.92	OLR	●Prague, Czechoslovakia	4 A.M.-9 P.M.
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.	Weekdays 7:45 A.M.-1 A.M. Sundays, 9 A.M.-11:15 P.M.
6005	49.96	VE9DN	●Montreal, Que.	Sat., 11:30 P.M.-1 A.M., Fall, Winter & Spring
6000	50.00	HJ1ABC	●Quibdo, Colombia	Sun. 3-5 P.M.; Wed., Sat. 5-6 P.M.; daily 6-9 P.M.
6000	50.00	XEBT	●Mexico City, Mexico	10 A.M.-1:45 A.M.
6000	50.00	FIQA	●Tananarive, Madagascar	3:30-4:45 A.M., 7 A.M.-1 P.M. daily
6000	50.00	RV59	●Moscow, USSR.	4-5 P.M., Mon., Wed., Fri.
5980	50.17	HJ2ABD	●Bucaramanga, Colombia	Daily 11:30 A.M.-12:30 P.M., 6-10 P.M.
5969	50.26	HVJ	●Vatican City, Vatican	2-2:15 P.M., Sunday 5-5:30 A.M.
5955	50.35	HJN	●Bogota, Colombia	Daily 11 A.M.-2 P.M., 5-10:30 P.M.
5940	50.51	TG2X	●Guatemala City, Guat.	Daily 4-6 P.M.; Mon., Thurs., Sat., 10 P.M.-1 A.M.; Sundays, 1-2 P.M.
5910	50.76	YV4RH	●Valencia, Venezuela	8-11:30 P.M. daily
5910	50.76	HH2S	●Port-au-Prince, Haiti	7-10 P.M.
5905	50.80	TIMS	●Puntarenas, Costa Rica	6-11 P.M. daily
5900	50.85	HJ4ABD	●Medellin, Colombia	Weekdays 10 A.M.-2 P.M., 4-11 P.M. Sundays 11 A.M.-3 P.M., 7-11 P.M. (see 6138 & 5780 KC.)
5880	51.02	YV3RA	●Barquisimeto, Venezuela	Daily 11:30 A.M.-12:30 P.M., 5:30-9:30 P.M.
5880	51.02	IUA	●Addis Ababa, Ethiopia	Used irregularly
5875	51.11	HRN	●Tegucigalpa, Honduras	6:30-8 P.M., 8:30-10 P.M. daily
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	YV1RB	●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.
5830	51.28	GBT	Rugby, England	(P) Phones U.S.A. irreg.
5843	31.33	KRO	Kahuku, Hawaii	(P) Tests early mornings
5830	51.46	TIGPH	●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	YV5RC	●Caracas, Venezuela	Sun. 8:30 A.M.-9:30 P.M.; wek days 10:45 A.M.-1:30 P.M., 4-9:45 P.M. Mon. 10 P.M. Sat. 10:15 P.M.
5800	51.72	ZEC	●Salisbury, Rhodesia, Africa	Sun. 3-5 A.M.; Tues. & Fri. 1:15-3:15 P.M.
5790	51.81	JVU	Nazaki, Japan	(P) Phones JZC early mornings
5780	51.90	CMB-2	Havana, Cuba	(P) Phones and tests irregularly
5780	51.90	OAX4D	●Lima, Peru	9-11:30 P.M. Wed., Sat.
5780	51.90	HJ4ABD	●Medellin, Colombia	Weekdays 10 A.M.-2 P.M., 4-11 P.M. Sunday 11 A.M.-3 P.M., 7-11 P.M. (see 6138 & 5900 KC.)
5758	52.10	YNOP	●Managua, Nicaragua	8:30-10:30 P.M. daily
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.
5713	52.51	TGS	●Guatemala City, Guat.	Sun., Wed., Fri., 6-8 P.M.
5710	52.54	YV2RA	●San Cristobal, Venez.	5:30-9:30 P.M. daily
5705	52.59	CFU	Rossland, Canada	(P) Phones CFO and CFN eves.; 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
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., 5:45-6:45 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. America; 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.

On the Market

Constant-Impedance Output Attenuator

THE LONG-FELT need for a constant-impedance attenuator capable of handling considerable power with low insertion loss, has now been met by the Clarostat Series CIA output attenuator. This control is recommended as an output level control for power amplifiers, or as an input attenuator for individual loudspeakers in a public-address system. It safely dissipates 25 watts of power continuously, regardless of setting, and has a minimum insertion loss of 1.3 decibels. Standard surge or input impedances available are 8, 15, 50, 200, 250 and 500 ohms. Other impedances available to order.

Made by the Clarostat Mfg. Co., Inc., Brooklyn, N. Y., the new attenuator is in the form of a compact control with perforated metal case. It measures 4" long by 3¼" dia., and is provided with black circular metal dial plate and bar type knob. A special detent-action switch selects the 16 attenuation values, and prevents "in between" switch positions with accompanying impedance mis-matches. The three screw terminals are on the rear face. The control is linear up to 45 decibels, in steps of 3 decibels with an end position of infinite attenuation. Impedance from load end is approximately three times the line value.

A power switch is provided as an optional feature, actuated by the bar knob. The S.P.S.T. switch may be used to turn speaker field on or off. ALL-WAVE RADIO.

◆

New RCA Oscillograph and Oscillator

TWO NEW PIECES of test equipment which increase the efficiency and effectiveness of the radio service engineer have been introduced by the RCA Parts Division in the form of a low-cost cathode-ray oscillograph and a greatly improved electronic sweep test oscillator, adaptable to all types of cathode-ray oscillographs in circuit alignment applications and which eliminates the need for a separate frequency modulator.

Ever since its introduction, the cathode-ray oscillograph has become an indispensable adjunct to progressive servicing methods. This modern X-ray of radio has become recognized as the simplest and most advanced means of accomplishing many of

the service engineer's most important tasks. The introduction of the new oscillograph, with a one-inch screen that meets every requirement and more of the serviceman's work, places this valuable instrument within the reach of additional thousands of service engineers at almost half the cost of the larger, more elaborate oscillographs. Its development was only recently made possible by using the new RCA 913 simplified cathode-ray tube, and further simplification of the associated apparatus. With it, circuits may be accurately aligned, visually; all forms of distortion and hum checked, and modulation measured. Among its outstanding features are high sensitivity, providing a full visual image while using only 1.75 volts (RMS); vertical and horizontal amplifiers, with individual controls, in a flat range of from 30 to 10,000 cycles; linear timing axis in the same range; small spot diameter for sharp focusing and individual centering controls. It utilizes five tubes, and has an input power consumption of 50 watts cold and 30 watts hot.

The new RCA electronic sweep test oscillator incorporates a number of outstanding advantages over previous apparatus of this type. Entirely a-c operated, it is ideal for every application in which a wide frequency range test oscillator is needed. It may be used with all types of cathode-ray oscillographs in alignment applications, eliminating the need for a separate frequency modulator. The new oscillator is particularly valuable in servicing receivers of the high-fidelity type having flat-top i-f

stages, which cannot be properly adjusted with an ordinary output meter. High output, negligible leakage, variable with frequency modulation, and a sweep rate of 120 times per second which eliminates flicker are some of its many features. An easy-to-read 4-inch dial, rotating 340 degrees, spreads the six fundamental frequency ranges over a total scale length of 45 inches. Other specifications are five tubes; frequency range of from 90 to 32,000 kilocycles; output control has three-step attenuator plus continuously variable control; dimensions 13¾" in length, 9¼" high, 7½" deep, and weighs 17 pounds.

Both pieces of test equipment are almost identical in size and external appearance. The cases are attractively finished in gray wrinkle lacquer with nickel trimming, reversed etched, nickel-silver panel and large, soft rubber feet. ALL-WAVE RADIO.

◆

New Clough-Brengle Oscillator

THE NEW MODEL OC-A R-F Signal Generator just announced by the Clough-Brengle Company of 2815 West 19th Street, Chicago, Illinois, offers an advance in test equipment appearance that is just as marked as should be the performance resulting from the many new technical improvements embodied.

Believing that modern test equipment can be of real assistance in building customer confidence, Clough-Brengle design engineers have given this, as well as all their other 1937 models, an eye appeal that commands instant attention. On the Model OC-A, the jet black crystalac case contrasts with a

broad etched panel plate finished in C-B emerald green with silver trim. The new carrying handles are identical to those used on the finest laboratory instruments and are capable of service on instruments weighing over 100 lbs.

Technically, the Model OC-A offers advances that are of unusual interest, such as: Each band hand-calibrated to a guaranteed frequency accuracy of ½ of 1%; dial length of twenty-five inches per band; new dual stepless attenuators for both r-f and a-f output voltages; plug-in shielded output lead; single output switch for instant selection of unmodulated r.f., modulation r.f., and pure sine-wave 400-cycle audio—all available at the same output jack.

Three instruments all having these same general specifications are available—the Model OC-A for straight a-c operation, the Model OC-B for a-c - d-c universal operation, and the Model OD-A for operation from self-contained batteries.

BOOK REVIEW

THE RADIO AMATEUR'S HANDBOOK, Fourteenth, (1937) Edition, by the A.R.R.L. Headquarters Staff. 544 pages (including a 112-page catalog section), with approximately 564 illustrations; 74 charts and tables and 86 formulas. 6½ by 9½ inches, double-column format. Published by The American Radio Relay League, West Hartford, Conn., U.S.A. Price, paper binding, $1.00 postpaid in U.S.A. proper; elsewhere, $1.25; buckram binding, $2.50 in all countries.

The new 1937 edition of The Radio Amateur's Handbook surpasses any of the previous editions both in size and quality of practical content. The new edition has a total of 21 chapters with an appendix of miscellaneous practical information, followed by an exceptionally comprehensive topical index which facilitates quick reference.

Many important technical developments during the past year and sweeping changes in operating technique and methods have called for enlargement of the book and rewriting of almost all chapters. Some idea of the extent of the revision may be had from the fact that two hundred new illustrations are included.

Special attention has been given to the new developments in noise silencers for short-wave receivers and to the new technical trends in circuit design. A wealth of new material is added to the wide field of transmitter planning, construction and adjustment. The capabilities of the new tubes are exploited to the full in the radiotelegraph and 'phone transmitter designs presented. Extended space is also given to the ever-important subject of antennas, directional systems and the new ideas in coupling methods being treated in particular detail. The ultra-high frequencies come in for a big share of the space also, new and advanced equipment being detailed to illustrate the latest trends in this rapidly-growing field.

As in previous editions, full attention has been given to charts and tables of information for the radio enthusiast; the vacuum tube tables, for example, occupying seventeen pages and being, without doubt, the most complete and detailed tabulation of tube data ever published.

The basic purpose of The Radio Amateur's Handbook is to present a complete treatment of every phase of modern amateur radio communication from elementary theory through advanced practical application, with emphasis always on ideas and methods that have shown their worth in the field. This new edition fulfills this purpose even more effectively than any of its predecessors.

✦

JONES RADIO HANDBOOK, 1937 Edition. (Formerly called The "Radio Handbook"). $1.50 per copy. 468 Pages. Published by Pacific Radio Publishing Co., Inc., Pacific Building, San Francisco, Calif.

The 1937 edition of the Jones Radio Handbook is a comprehensive treatise of the design, construction and operation of short-wave amateur and commercial receivers and transmitters of every description from the simple one-tube sets for beginners to the largest de-luxe superheterodynes and telegraph-telephone transmitters for advanced amateurs. It contains 19 Chapters, including simplified theory on Cathode Ray Television and Radio Therapy (Diathermy).

Outstanding Chapters cover new types of Jones Multi-Band Oscillators from which fundamental and harmonic operation can be secured from a single crystal and one tuned circuit. There are other Exciters which operate on 6 bands, from 160 to 5 meters.

The Antenna Chapter is twice as large as in the previous edition. It covers the new types of directional arrays, tilt antennas, special 10-meter antennas and data on loading short antennas for small sea-going craft. Commercial and amateur antenna types are thoroughly covered. There are some good Antenna Feeder and Radiator Calculating Charts, particularly for Directive Antennas.

The Receiver Chapter describes seven new Jones Receivers, with and without noise limiters. The Chapters on Radiotelephony, C.W., Ultra-High-Frequency Communication, Test Instruments and Practical Radio Theory are new.

Vacuum tubes of both transmitter and Receiver types are analyzed by means of detailed Characteristics Tables and more than 100 block diagrams, from which the reader can learn what tube complement is needed for designing any type of c.w. or phone transmitter with power outputs from 10 watts to a kilowatt. These new tube tables and charts cover more technical data than is found in the Tube Manufacturers' Bulletins, in that numerous calculations were made in the author's laboratory.

The publishers also announce a SUPPLEMENT to the JONES RADIO HANDBOOK, which will be issued within several months, and which will supplement the data in the main Handbook. The purchaser of the Handbook likewise is entitled to a SUPPLEMENT with his purchase of the book.

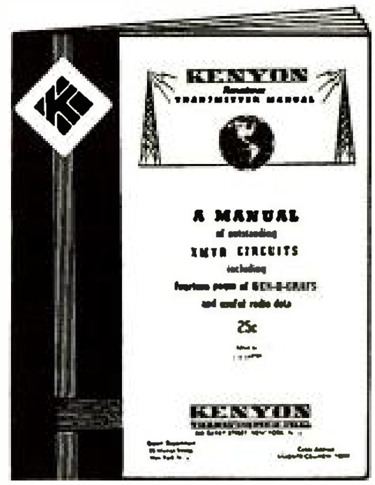
✦

KENYON AMATEUR TRANSMITTER MANUAL, edited by J. B. Carter. Published by the Kenyon Transformer Co., Inc., 844 Barry St., New York, N. Y. Red and black paper cover, 8½ by 11 inches, 64 pages profusely illustrated with charts and diagrams. Price 25 cents.

The "Kenyon Amateur Transmitting Manual" is composed principally of design details for the construction of c.w. and phone transmitters for the various amateur bands, ranging in power from 20 watts to one kilowatt. The circuit diagram and parts values for the radio-frequency section, modulator unit and power supply are given in each case, together with remarks regarding the characteristics and application of the equipment. There is also included the data on a 100-watt high-frequency phone transmitter, a 5-meter transmitter and receiver of simple construction, and a two-tube 5-meter transceiver.

The opening article in the Manual deals with the r-f operation of screen-grid tubes used for transmitting purposes. This is followed with data on improving modulation in transmitters. The next 22 pages cover transmitter design as previously outlined.

There are 13 pages of useful radio data, such as formulas, abbreviations of radio terms and vacuum tube notations, conversion tables, inductance calculations, coil specifications, antenna calculations, etc. There are also a number of pages given over to a listing of the states and counties in each amateur call area, international amateur prefixes, signal strength report systems, amateur abbreviations, and the FCC rules for amateur operators and stations.



There are 14 full-page "Ken-O-Graphs" in the rear of the book which permit the easy calculation or conversion of various units or terms. These are followed by data on simplified power-supply units for high and low voltages, most of which employ but a single power transformer.

An excellent reference book for the licensed or prospective ham.

✦

New Hammarlund "37" Catalog

RICH IN COLOR, profuse in illustration, and replete with specifications, the new 15-page Hammarlund "37" Catalog, prepared by Lewis Winner, is a valuable piece of literature. It includes complete data on the entire line of Hammarlund radio parts and equipment.

Among the items listed are the new Super-Pro Receivers, the "MC" Midget Condensers, the "MTC" Transmitting Condensers, the "HFD" Split-Stator Micro Condensers and the "ICT" line of Iron Core I.F. Transformers. Mechanical and electrical specifications are given.

The Catalog is now ready for distribution. A free copy may be had on request to the Hammarlund Manufacturing Co., Inc., 424-438 West 33rd St., New York, N. Y. ALL-WAVE RADIO.

RCA ALL THE WAY

RCA Radio News

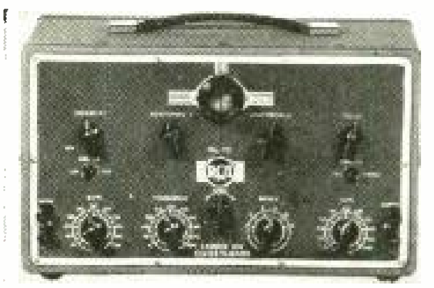
RCA Manufacturing Company, Inc. • Camden, New Jersey
A Service of the Radio Corporation of America

EVERYTHING IN RADIO—MICROPHONE TO LOUDSPEAKER

To the consumer, RCA means high quality performance at low cost . . . To the radio man, RCA means easier selling, higher profits

RCA VALUES FOR MARCH!

New RCA Test Equipment... at prices never before so low!



RCA Cathode Ray Oscillograph

Stock No. 151 **Net Price $47.50**

FEATURES

1 COMPLETE oscillograph using new RCA-913 Cathode Ray Tube.

2 High sensitivity—1.75 volts R.M.S. for full-scale deflection.

3 Both vertical and horizontal amplifiers–individual gain controls—Flat 30-10,000 cycles.

4 Linear Timing Axis—30-10,000 cycles.

5 Light shield and calibration screen.

RCA Electronic Sweep Test Oscillator

Stock No. 150 **Net price $64.50**

FEATURES

1 No moving parts. Variable electronic sweep—1 to 40 kcs.—at any r-f or i-f frequency—sweep rate, 120 times per second, eliminates screen flicker.

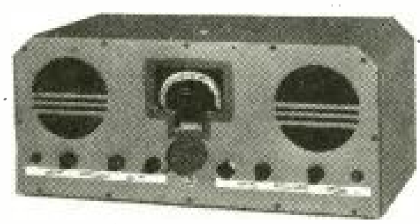
2 Wide frequency range 90 kcs. to 32,000 kcs.—fundamental frequencies—400 cycle modulation—JACK FOR EXTERNAL MODULATION.

3 Large direct-reading dial—4 inches diameter—indirect illumination—projected zero indicator lines eliminates parallax—two vernier ratios, 2:1 and 5:1.

4 AC operated—no batteries or motor.

ACR-155
A New, Moderately-Priced, General Purpose Communication Receiver

Amateur's Net $74.50 f.o.b. factory



The ACR-155 is a moderately-priced communication receiver capable of superior performance under modern operating conditions. It provides a number of features not usually found in receivers of its price class.

1 Continuous frequency coverage from 520 to 22,000 kcs.

2 Nine Metal RCA Radiotrons for improved high-frequency performance.

3 Improved, large tuning knob with crank handle for smooth, easy tuning. 100 to 1 band-spread tuning drive.

4 Improved, adjustable, air-dielectric trimming capacitors. Magnetite core i-f transformers.

5 Calibration-spread dial for accurate logging.

6 Electrically stabilized oscillators.

In addition to the performance and convenience features shown above, this receiver also provides antenna rejection filter to reduce interference . . . A.V. C. at will . . . Six-inch, dustproof electrodynamic speaker for high-quality reproduction...Preselection for better signal to noise ratio, lower image response.

Small, Low-Cost Record Player Converts Radio into Phonograph-Radio!

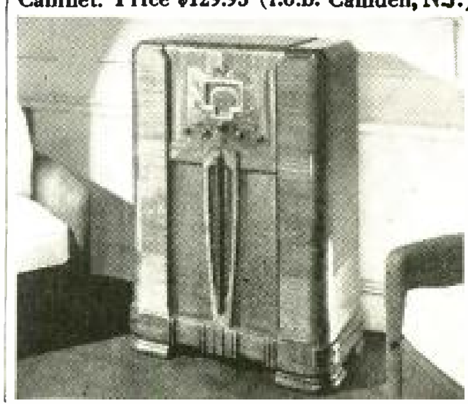
The smart looking RCA Victor Record Player, R-93, shown at right, is ideal for the radio owner who also desires recorded music. Attaches quickly and easily to any electrically operated radio, and converts the set into a phonograph-radio!

It's small in size, can be placed in any small space—costs less than $20—available in a walnut finish, or, at slightly higher prices, in red, black, ivory.

In the field of radio, RCA Victor offers you more for your money in 1937 than ever before! Model 9K-3, shown below, is typical of the entire new line. It's easy to look at . . .easy to buy . . . and a real pleasure to hear!

These radios offer you, in addition to the many great features led by Magic Voice, Magic Brain, Magic Eye and Metal Tubes—the magic of radio that's RCA ALL THE WAY. Designed by men equally familiar with broadcasting and reception (for RCA designs most of the broadcasting equipment used by radio stations), they are the finest radios you can buy. Hear them today! There's a model and a price to please you. Easy payments through C. I. T. Corp.

RCA Victor Console Model 9K-3...with Magic Voice, Magic Brain, Magic Eye and Metal Tubes. Tuning range from 530 to 22,000 kcs. Beam Power Amplification. Selector Dial. 9 tubes. Automatic Volume Control. Automatic Tone Compensation. 12 watts output. Superb Cabinet. Price $129.95 (f.o.b. Camden, N.J.)



ACR-155 RECEIVER

(Continued from page 148)

in Fig. 4. The sensitivity (m.v. input for 1 watt output) is approximately 9 microvolts at 550 kc and 6 microvolts at 1500 kc. It is 30 and 15 m.v. at 2000 and 6000 kc respectively, and 35 and 13 m.v. at 6300 and 20,000 kc respectively. The image ratio is 60,000 at 550 kc and 1500 at 1500 kc. It is 3000 and 150 at 2000 and 6000 kc respectively, and 250 and 20 at 6300 and 20,000 kc respectively.

The receiver has a favorable signal-to-noise ratio and is free from dead spots. Its overall performance is highly satisfactory and well in line with the price of the set.

GLOBE GIRDLING

(Continued from page 133)

eight shown in station list. No definite time schedules have been announced and the same time on the air—4 A.M. to 9 P.M.—is shown for all frequencies. It is understood that schedules for each frequency will soon be given out. We are also informed that when this is done separate call letters for each frequency will be assigned.

FO8AA, 7100 kc, Papette, Tahiti, is being heard by a number of listeners and verifications are being received. Station is operated by "Radio Club Oceanien" and has 200 watts power. Verifications are signed by Alfred T. Poria, President of the above mentioned club. Some say they are also broadcasting the same program on 10110 kc.

LCJ1, 9530 kc, Jeloy, Norway, has been reported heard lately by several listeners between 3 and 4 A.M. No reports have as yet been received on any of the new stations which are being installed in Norway, the call letters for the various transmitters being listed in this section in our January issue.

EA9AH, 7030 kc, Tetuan, Spanish Morocco, Africa, also broadcasts news items in connection with the Civil War in Spain, on the "LF" side of American c.w. band at 4 P.M. in English and in Spanish at 5 P.M. daily and is heard at other times calling amateurs on the 20-meter band. Address of EA9AH is Radiodefusora EA9AH El Coronel Jefe de Estado Mayor, de las Fuerzas Militares de Marruecos, Tetuan, Spanish Morocco, Africa.

Brazil—A revision of the frequencies of radiophone stations are stated in this issue and reflected in station list and "new stations" in this article.

PRF5 still remains the only short-wave broadcasting station.

Australia—R. Simpson, Concord West, N.S.W., advises that it has been officially announced that Australia is to have six new short-wave stations, to be operated by the Post Office Department of the Government. They will be additional to VK6ME. The power of the present government-operated station VK3LR is to be increased.

England—Mr. J. B. Clark, Director, Empire Service, British Broadcasting Corporation, states that it is expected to have the new short-wave transmitters in operation in the early spring.

Colombia—While there are some little differences in frequencies between the last list of frequencies received from Colombia and the station lists, our listing is correct as prepared from information received direct from the individual stations.

Complaints are still being received that the following stations are slow in forwarding verifications covering reception reports filed: HJ1ABB, HJ4ABD, HJ4ABB—Colombia; HCETC—Ecuador; HRN—Honduras; CB960—Chile; HI2D, HI4V, HI5N, HI7P, HI9B—Dominican Republic. It is requested that those receiving late veri cards from any of these stations, drop a card to this department as promptly as possible after receipt. It is not our desire to list any station which is supplying verifications promptly.

The "Harmonic Verification Club" now has a fourth member; Mr. LeRoy Waite, Ballston Spa, New York, who received a letter verification from I1KZ, Trento, Italy, verifying Mr. Waite's reception of their 40-meter transmission on 20 meters. By the way, this was also Mr. Waite's first and only Italian amateur heard.

Amateur Phone Stations

The following is a list of 20-meter amateur phone stations as shown in late reports which have not been listed in previous reportings in this section:

Country	*Frequency*	*Calls* / *Time*
Australia	LF	VK2MV — VK3HM — VK3GO; 2-3:45 A.M.
Argentina	LF	LU5AN — LU7AG — LU7ET — LU1HI — LU1UA;—
	HF	LU5AN; 7:40-11 P.M.
Antiqua	LF	VP2DS — VP2DA; 7-8:15 A.M.
Brazil	LF	PY8RB — PY2AK — PY1MK — PY8AG; 7-8 P.M.
	HF	PY8AD; 7:30 P.M.
Barbadoes	LF	VP6TR; 8:30 P.M.
Chile	HF	CE4AI; 10:25 P.M.
Colombia	LF	HK3JA; 8:15 P.M.
	HF	HK1GK; 11 P.M.
England	LF	G5BP — G5PP — G2ZY —G2HK — G6JQ; 7:15-10:45 A.M.
	HF	G5HT; 2:40 P.M.
Holland	LF	PAOWV; 8:20 A.M.
Maui (Hawaii)	AM.	K6NTV; 11:15 P.M.
Ireland	LF	GI6XS; 8:35 A.M.
Morocco	LF	EA9AH; 5 P.M. (14030 kc.)
Newfoundland	LF	VO2Z; 2:10 P.M.
Portugal	LF	CT1AY; 6 P.M.
Scotland	HF	G2UU; 8:15 A.M.
South Africa	LF	ZS6AJ—ZU6P; 11-11:30 P.M.
Virgin Islands	AM.	K4ENY; 10 P.M.
Venezuela	LF	YV3AD; 9:45 P.M.

We are grateful to the following for this information and thank them for the painstaking manner in which it was prepared: Allen Anderson, Lawrence, Kansas; Joseph Brown, Jr., Houston, Texas; Howard Wilson, Jr., Ithaca, N. Y.; R. E. G. Langton, Hammond, B. C., Canada; R. L. Weber, West Mc-Henry, Ill.; Galen Balfe, Lowell, Mass.; M. M. Elliott, Minneapolis, Minn.; Wm. Bell, Monroe, La.; J. O. Faris, Danville, Ill.; James Fitzwilliam, Wichita, Kas.; Homer Bohlender, Brookville, Ohio; Leroy Waite, Ballston Spa, N. Y., and Harry E. Kentzel, Averill Park, N. Y.

Acknowledgment

It is with pleasure we acknowledge reports and letters from: Allen Anderson, Lawrence, Kansas; W. H. Ansell, Regina, Saskatchewan, Canada; Joseph Brown, Jr., Houston, Texas; A. C. Booth, Pelham, New York; William Bell, Monroe, La.; Dick Bruce, Greenfield, Mass.; Jim Brooks, Lansing, Michigan; William S. Brannan, Washington, D. C.; Homer Bohlender, Brookville, Ohio; R. Lester Collins, South Hanson, Mass.; Paul Dahl, Minneapolis, Minn.; L. F. Dreifus, Lock Raven, Md.; Orville J. Evenson, Minneapolis, Minn.; George Elener, Pelham, New York; Morgan Foshay, Montclair, N. J.; J. O. Faris, Danville, Ill.; James Fitzwilliam, Wichita, Kans.; Dr. Henry H. Grant, Portland, Maine; Paul R. Henniger, San Francisco, Calif; Hyde J. Herbert, Elmwood, Conn.; Harry Honda, Los Angeles, Calif.; Miss E. A. Hedden, White Plains, N. Y.; David H. Henderson, Wheeling, W. Va.; W. F. Herzog, Center Moriches, N. Y.; Fred Karpen, Johnstown, Pa.; Charles L. Lord, Cranston, R. I.; Morton D. Meehan, Elizabeth, N. J.; Benjamin Markowitz, Brooklyn, New York; Orley McLaughlin, Carrollton, Ohio; Howard A. Olson, Chicago, Ill.; Fred A. Pilgrim, Oakland, Calif.; Stuart Senniger, St. Louis, Mo.; Dick Thorpe, Omaha, Neb.; W. S. Wade, Jr.; Palo Alto, Calif.; Karl C. Whitehouse, Bound Brook, N. J.; J. R. Wallis, Lamberhurst, England; Walter J. Wolveris, Foxboro, Mass.; and to extend to them and to many others the thanks of ALL-WAVE RADIO and the writer of this section for their kindly assistance and words of encouragement.

All questions pertaining to reception, unknown stations, or station matters in general will be answered promptly.

All listeners and readers can assist materially in comparing new veri cards received with the information shown in the station lists and address section and by advising this department of any changes in time schedules, frequencies, addresses, etc., when differences are noted.

Address your letters to me at 85 St. Andrews Place, Yonkers, New York, enclosing self-addressed stamped envelope, should you desire a reply.

NIGHT-OWL HOOTS

(Continued from page 135)

to write to the management requesting the return of the program. If enough requests are received the program may be revived." This from Joe Lippincott who did the DX announcing on the program.

From our friend down in the little Cuban city known as the Pearl of the South, Cienfuegos, Cuba—"I have made a schedule of dedications for future DX programs and the one corresponding to March 4 from 2 to 3 A.M. has been selected for ALL-WAVE RADIO and its Contest." Our friend is, as you know, Senor Enrique Hidalgo who holds fourth place in the contest and is rapidly gaining ground after a late entrance. . . . "Let me say that AWR has 'sold' me on BCB DXing. The short waves have been practically abandoned since the lure of BC DXing has gripped me. So far I've had veries from WIL, KSL, and KOA." Thus speaks Night Owl Lewis Beibigheiser of Morristown, N. J. Night Owl Beibigheiser also agrees with us on the all nighters and offers as a solution that a station which cannot get real talent for its programs be forced to stop broadcasting. He states that Morristown has a local WPA band which does nothing but rehearse, and feels sure that many other communities have the same situation. "Why not WPA musicians instead of phonograph records," is our friend's suggestion. . . . And just as we're about to finish this paragraph a flash comes with some reports from "Steve" Brode. "XELO is now operating on 580 kc."

Kilocycling Around

Czechoslovakia plans to erect a new 100-kw station near Melnik in the province of Bohemia during 1937. In addition two other stations with the same potency will be erected somewhere in the provinces of Moravia-Silesia and Subcarpathian-Russia. Tests are now being made to find suitable locations. . . . In San Francisco in 1939 there will be held a World DX Convention in conjunction with the Golden Gate Exposition. From George C. Sholin, in charge of convention activities, we have the news that a delegate from Malta will be present at the affair and that two Japanese members of the IDA plan to make the trip. The New Zealand DX Club has taken great interest in the convention and quite a number of representatives from that country are likely to attend. So if you haven't yet planned your 1939 vacation, don't pass up the Golden Gate Convention.

The Chief is in receipt of a very friendly verification from A. D. Cervantes, English announcer at CMCW and he informs that CMCW has installed all new equipment and that they will conduct special programs for DXers every Sunday from 1 to 3 A.M. Senor Cervantes says, "We are going to break all records in sending verifications this season, we only claim that all reports include ten cents or one coupon of international mail." . . . While in Cuba, we'd like to find out whether CMKW is operating on 1330 or 1350 kc. Reports on this station have been very conflicting and we would like to straighten things. We are listing it as 1350 as the Department of Commerce shows that as their correct frequency.

TIPG was logged for the first time by the Chief Night Owl when they stayed on the air until the early morning hours broadcasting from El Teatro Nacional where the event was a contest of beauty between many of Latin America's most attractive young ladies. Evidently the competition was very strong for the outbursts of the crowd were terrific, and it was nearly three in the morning before Senorita Venezuela was finally picked as the winner and crowned Senorita Atlantida. And all this with television still around the corner! . . . According to Lester Harlow, Transmitter Engineer, station KUOA in Siloam Springs, Arkansas is now operating with new studios and transmitter with 2500 watts power on 1260 kc from 6 A.M. to sunset (CST). All reports are verified if return postage is enclosed.

From the Universal Radio Club of San Francisco we have received a stack of bulletins issued during the past season and find them to be of very high quality. This club is the only DX club in the country west of the Mississippi and it is the only club which has a DX calendar in Pacific Standard Time. For information regarding the URC we suggest writing to President Charles Norton at 2018 Green St., San Francisco, Calif. . . . From another Universal Club, the UDXC of Oradell, N. J. we learn of the following: KZEG in Manila, P. I., though reported on 890 is still on 780 kc. KZIB of the same city is the station on 890, having moved from 900 kc. . . . "WHKC, 640 kc, Columbus, Ohio on every morning at 6:30."—This from the weekly bulletin of the NNRC.

Cheers and Cheers

Three rousing cheers this month for Dr. John R. Brinkley who shut down his powerful XEAW for one hour that DXers might hear a special program for the NNRC from PRF3 in Brazil on the same channel.

Another three cheers to WSAI for putting on the best DX program that we have ever had the pleasure of hearing. An arrangement permitted the announcer and control engineer to break in with comments at any time and their good-natured horseplay with very enlightening descriptions of the inside workings of a DX program made it very enjoyable entertainment. Music was of the phonograph record nature and they were remarkably well selected for a DX program. Call announcements were frequent and weather conditions in Cincinnati were given for the benefit of DXers. A bright spot of the program included the playing of records made by the boys at WSAI in the recording studio. Three cheers for a four-star DX program. May there be many more of them.

QUERIES

(Continued from page 143)

stretched around the room in the most convenient manner. There is no antenna proper—rather a length of lead-in, which is almost invariably located in a noise area. A noise-reduction type of antenna cannot be employed with many of these receivers without making alterations in the aerial input circuit. Third: The majority of these receivers are designed to operate without a ground. A ground has several noise-reducing effects. It functions as a "drain", permitting a certain amount of noise (or, more correctly, noise-producing impulses) to leak away from the receiver. Also, a ground often increases signal pick-up, and the combined effect is one of an improved signal-to-noise-ratio.

R. A. D. does not tell us what make and model receiver he has, therefore we are forced to treat his problem in a general way. A noise filter in the power lines—between the base receptacle and the receiver plug — might help matters considerably. Filters of this type were described at length in the Queries department of May, 1936. It is possible that R. A. D. can install one of these himself—certainly any serviceman can do it for him at a nominal cost. No special switch will be required, as suggested in the previous inquiry to which reference has been made, for condensers do not drain current in a d-c circuit.

A noise-reduction antenna can be installed in any receiver. However, with the majority of a-c, d-c combinations, this is a job for the radio serviceman, who should be called in, unless R. A. D. is an expert, or the set is accompanied with directions for use with such an aerial. It is probable that the antenna input circuit will have to be changed, but it is possible that some form of input transformer can be used. Definite recommendations can be made only for specific receivers.

The nature of the power supply circuit makes the use of a direct ground with the average a-c, d-c set dangerous or impossible. Remember, one side of your power circuit is always grounded, and if any piece of apparatus operated from it is also grounded, short-circuits and other complications are likely to result. Read over the directions accompanying your receiver to see if any mention is made of a ground. If it can be employed, connect it strictly in accordance with instructions.

An indirect ground can be used with any of these receivers, and is usually very beneficial from the point-of-view of an improved signal-to-noise ratio. You can connect this yourself—and *we suggest it as the first attempt to reduce noise*. Go to the nearest radio store and buy a 1-mfd *paper* condenser rated at a potential of 200 volts. You should pay between thirty and fifty cents for such a condenser. Connect one side of it to a good ground—radiator, water pipe, etc. (gas pipes are not so good), and the other side to the chassis of the receiver —to any convenient nut or bolt. (See Fig. 1.) Make these connections with the receiver disconnected from the power line (not merely turned off) to avoid possible shock as the condenser charges.

Of course, the best results in a d-c district will be obtained with a standard a-c set, operated from a converter (d.c. to a.c.) installed by an expert with proper filtering in both input and output circuits.

INDEX TO QUERIES

For your convenient reference. Listing all inquiries answered in AWR from January, 1936 to February, 1937 inclusive. Each inquiry has been answered in the form of a short article. The index is cross-referenced.

HAMFEST

(Continued from page 139)

fifteen-words-per-minute stage. Far from it. But the converse is pretty much a fact—i.e., the slow-speed glass-armed code man is much more interested in his speech-amplifier and modulator units, and he drifts to where he more properly belongs—in the fone bands.

◆

THE HAM IS coming in for a lot of criticism these days for etheric binges—from both fellow amateurs and the BCLs. The requirements for such a binge are adequate QSOs with a couple of bottles of gin and usually a few YLs on each, or all ends.

Personally, we can't get terribly excited over the matter—except when over-indulgence makes the amateur a bit more asinine than he often is *sans* alcoholic stimulus. Public drinking is a well-established custom throughout the world, and "Here's mud in your eye" via radio is even less public than with one's foot on the rail.

Public *intoxication* is an entirely different matter. If a person wants to get drunk, that's his own business—strictly his own, and so he should maintain it. There is only one way of getting drunk that is fair to all concerned. Also, it's the safest. Get into bed—a wide one, preferably—with a few bottles on one side, a pail and a pitcher of water on the other. Go to it, and clean up your own mess the next morning.

On the other hand, if you want a few drinks, there is nothing wrong in inviting friends in to join you. As a matter of fact, solo drinking is frowned upon in intelligent and polite circles. And if your friend happens to live a hundred or a thousand miles away, I'm hanged if I can see why he shouldn't be QSOed. Frankly, it's an ideal arrangement. He'll have to supply his own likker.

◆

SOMETIMES we wonder just why abbreviations were invented. Take for instance, "fr" as a contraction of "for." Obviously, it saves one letter—but nine hams out of ten insist on substituting a different third letter for the eliminated "o", and transmit the "abbreviation" as "fer." We'll admit that "e" is shorter than "o" in code—but it is definitely not so short as nothing at all. Similarly, "hv" is the classical abbreviation for "have," but your average ham insists on sending "hve."

There must be something psychological about it—some twist akin to the fone ham's insistence on saying "K" for "go ahead" and "R solid" (bad grammar . . . should be "am") for "everything okay," and "hi hi" in place of a good, reverberating belly laugh!!

◆

ON DECEMBER 30, 1936, a successful "All Continent Radiophone Round Table" was established via ham fone. The stations representing the six continents were: W4DLH of Goulds, Florida; VU2CQ of Bombay, India; SU1CH of Cairo, Egypt; HK1Z of Colombia, South America; G5ML of Kenilworth, England; and VK4LO of Brisbane, Australia. Transmissions took place in rotation, and each station on the air was received with good signal strength by the five on standby during the entire round robin QSO.

The "All Continent Round Table" was completed in the amazingly short time of *27 minutes*. On January 4th a second contact was established in *17 minutes*, and again on January 19th in *8 minutes and 10 seconds*—giving W4DLH his WAC in *10 minutes*. (Beat that, you California Kilowatters!)

Bill Burkhart—W4DLH himself—tells us that as far as he can determine, this "All Continent Round Table" is a world record on fone. He has also informed us that the six "Knights" of the "All Continent Round Table" get together for a 'round-the-world rag chew every Tuesday and Friday at 1230 G.M.T. or 7:30 A.M., E.S.T. Atmospheric conditions do not permit success at each attempt, but since December 30th a number of satisfactory contacts have been established.

◆

GOT A GRAPEVINE flash that Hank Lockwood, W2HFS, was WAC on 20 fone. Checked with the Ocean Hopper himself and learned that he contacted VU2CQ, Bombay, India, 8 A.M., E.S.T.

Sunday, January 24th. The QSO lasted for 20 minutes and was practically 100 per cent—which is nice work in any man's language.

This QSO completed the last link in his WAC chain which includes among others: W8OBX, LU8AB, G5NI, PK1QU, VK2AP and ZU6P. Salutem!

U.H.F. OSCILLATORS

(Continued from page 142)

tube efficiency starts falling off because of lack of grid bias. Second, when the grid taps are an appreciable distance up from the ground end of the rods, the grid-filament capacity of the tubes causes the circuit to oscillate at a frequency much lower than the natural resonant frequency of the rods, and these capacities become a large factor in determining the frequency of the oscillator. Third, reducing the distance of the grid taps from the ground end of the rods minimizes the loading effect of the tube capacity on the grid rods and improves the frequency stability, but in doing so, reduces the grid excitation and lowers the tube efficiency. So, any great increase in frequency stability obtained by this method will be accompanied by a proportionately large decrease in power output.

The obvious direction in which to look for a way to improve the frequency stability of ultra-high-frequency oscillators, then, is toward finding some way to remove the loading effect of the tube capacities on the grid circuit without affecting the tube efficiency. In the next issue of ALL-WAVE RADIO we will describe some experiments in which we reduced the loading of the grid rods until the frequency of the oscillator coincided exactly with the natural frequency of the grid rods, with a proportionate increase in frequency stability.

QRR—FLOOD!

(Continued from page 121)

Whether he worked as volunteer or in the government service at a dollar a day, his reward is in the job well done. To these and all others the thought expressed in Brigadier General L. S. Conelly's letter should be an inspiration to an even better job next time by being better prepared.

Naval Reserve Operators

The Naval Reserve operators at NEG were Lt. Elmer Schubert, W8ALW-W8NC, and his staff of W8DFR, W8FXR, W8HDJ, W8NQC, W8OOK, W8DAF, W8DSW, and W8HBM. At W8FIC were W8NMS, W8EDX, W8NDN, W8FHW, W8JFC, W8JIN, W8IAU, W8BUX, and W9FS. On the USS *Kentucky* were W8PBE, W8ODU, W8MCR. The USS *Scioto* carried W8EFX and W8OII. Aboard the USS *Theresa* was Ed. Smith of Oxford, Ohio, while the Engineers' station at Madison, Indiana, was manned by W8PAZ and W8AKW. At AB, of Columbus, were W8VE, W8FJN, W8JHE, W8FYS, W8LPN, W8IZK, W8ISK-WLHO, W8IJV, W8LEK and W8JBI.

The chief operator of W8YX was W8LNK, who was assisted by W8BRQ, W8ODL, W8JFZ, exW8CQM, W8PQE and W8JQZ. JQZ is Lan Wong, a Chinese student in electrical engineering at the University.

CHANNEL ECHOES

(Continued from page 140)

THE OCCASIONAL operatic programs over 2RO go far to compensate the propaganda broadcasts to which this station is addicted. Mussolini and Hitler are using up an appalling number of watts in an effort to justify themselves in the eyes of the world. The League of Nations station, HBL is rarely heard these days. So watt?

◆

IF YOU THINK the commercials on our domestic programs are bad, we suggest that you brush up on your Spanish and assimilate a few Cuban and South American programs. They make box-tops, labels, wrappers and facsimiles thereof sound like a symphony orchestra. Our Latin American neighbors introduce their commercials with appropriate sound effects—the wail of the winter wind for a cold preventative (said tempest being one hundred percent imported and faked—they simply don't have them down there), the chug-chug of a choo-choo for a railroad excursion, etc., etc. They advertise extensively midwives and undertakers—so far without benefit of sound effects.

◆

ENGLAND HAS A flair for novel programs. They really go us one better. When we try to think up something bizarre, about the best we can do is to plant a microphone in front of the lion's cage in the zoo, and turn up the gain control—or broadcast a national political convention (the effect is the same).

Daventry deserves the palm for a recent program entitled "Poems of Hate," which included about all the nasty things the world's rhyming geniuses have had to say about the world in general and each other in particular. However, they left out Lord Byron who, as we recall, was a past master in writing hateful things in iambic pentameter. Undoubtedly we shall have to wait until television—until asterisks can be broadcast.

◆

WE HAVE DEVOTED a considerable amount of time excoriating the worst programs on the air. Occasionally a bouquet is due, and we toss it (orchids no less) to Walter Damrosch (with whom we disagree on many points concerning the intellectual interpretation of music) for his Music Appreciation Hours, every Friday afternoon at two. The NBC chains carry these programs—as well as most of our short-wave stations, a gesture on the part of the latter toward rehabilitating ourselves in the ears of the world's listeners.

EMBRYO HAMS

(Continued from page 145)

so that there is sufficient power developed to operate the dynamic loudspeaker.

In order to receive the 3900-kc signal from the transmitter, it is necessary that the receiver be tuned to that frequency. This means that both the r.f. amplifier and the regenerative detector stage in the receiver must be tuned to 3900 kc. Both circuits are tuned by means of variable condensers. Since both stages are always tuned to the same frequency, the condensers are ganged together on the same shaft and controlled by a single tuning knob and dial. Then, if the circuits are properly aligned, the frequency to which the r.f. amplifier is tuned will always be the same as the frequency to which the detector stage is tuned. If the receiver is tuned to 3500-kc, then both stages or circuits will be tuned to that frequency.

So much for the simple transmitter and receiver circuits. I'll take up the superheterodyne receiver and the more complex transmitter arrangements in my next letter.

Gerald.

THE "FLEXIBLE 400"

(Continued from page 126)

the chassis unless it is mounted upside-down so that the "bottom" comes flush with the lower edge of the chassis. This has been accomplished, in our particular case, by means of a wooden spacer the size of the transformer itself, placed between the deck and the transformer mounting base. In addition to taking this weight off the chassis, mounting the transformer in this fashion provides a very substantial mechanical support.

The arrangement shown for mounting the inductance for the final tank circuit comprises a strip of 3/16 x 1 1/2 x 6" Victron and three stand-off insulators, with jacks.

General

We repeat that this is not the type of transmitter for the novice to attempt constructing and we feel sure that the data which has been outlined is sufficient to enable the relatively experienced amateur to duplicate our unit. It may be that he will want to incorporate certain revisions of his own and it is doubtful that any layout could be found which would be more flexible in this respect.

This unit has been on the air for a short time only but the results it has produced have been more than gratifying. It is used with a 450-ohm transmission line, approximately 25 feet long, connecting to a quarter-wave matching stub of the antenna system, which comprises two half-waves, in phase, in a horizontal plane, approximately 25 feet off the the ground.

Consistent contacts have been established with several stations in Europe, one in Hawaii and many throughout the western portion of the United States including several on the West Coast. The consensus of opinion among those who have listened to our signal is that it carries plenty of "authority" and the tone quality is reported as being very much above average.

(This is the first of a series of four separate and complete articles dealing with the features and construction of the units making up the complete "Flexible 400" Transmitter. The second article, on the power supply for the r.f. unit, will appear next month—Editor)

IT'S A SYSTEM!

(Continued from page 127)

start to tune at 7300 kc and stop at a reasonable distance. Why, it would take you many minutes to tune from 7300 kc to 7000 kc on the present-day band-spread receiver without skipping over signals, and when you get there, what hope would you have of raising the calling station?

Channel Hugging

Times certainly have changed. When the 40-meter band first opened up, one parked in any portion of it and stations were so few that one tuned the entire band easily. Even our youngest popular band is already divided into two segments with stations on 60 megacycles rarely working stations on 56 megacycles unless one started to tune from 56. This alone should be the signal for a general uprising for the adoption of this proposed schedule of CQ's. But, that isn't all!

Present-day manufacturers of ham transmitters preach the fact that they are all-band affairs, of course excluding the high frequencies. True, if you have enough crystals around the shack and you like to keep on rotating a multiplicity of dials, after a reasonable time you can switch from one band to another. It isn't quite as simple as changing from one band to another on your receiver. Anyone knows that a dyed-in-the-wool amateur is usually a lethargic soul and the chances are that once he has his rig perking nicely on one band, he thinks twice before skipping to another. Don't construe this to mean that all amateurs are that way. Many of them do flit from kilocycle to kilocycle as their moods dictate. But on the whole, it is the writer's belief that most operating amateurs limit themselves to the use of a certain portion of the one band and even to a certain frequency (depending upon drift). It is to these who constitute the majority that this idea is pointed!

Directional CQ

The traffic man with his hook full will usually resort to a directional CQ if his schedule does not go in that certain direction and specifically when he hasn't much time on his hands. When one hears "CQ-NYC," one can only infer that the calling station desires an answer from New York City, and if that isn't possible, at least from Secaucus, N. J. The general theme of this discourse also deals with a directional CQ, not to a definite point on the map but to a specific group of frequencies!

The mechanical part of the idea is a simple one. It makes no difference on which of the amateur frequencies you operate; the CQ selected from the appended table will designate that portion of the radio spectrum on which you will tune your receiver, at the conclusion of your CQ. For instance, you could call CQC from any portion of the 5-meter, 10-meter, 20-meter or 80-meter bands and listen for answers between 1900 and 2000 kilocycles, naturally starting to tune from the end nearest the edge of the band. If you operated on 1800 kilocycles, you could still call CQC which would imply that you would start to tune your receiver at 2000 kilocycles. It is as simple as all that!

The plan is practical since most present-day amateur stations, while their transmitting frequency might be limited, their receiving equipment is usually of the all-wave variety and all they need do is throw the band-change switch or juggle no more than two coils. Also, most present-day active amateurs, regardless of what frequency they use, do have a high-frequency receiver even though it might not use more than a detector.

Advantages of System

Think of the new vistas opened up for the edification of the amateur! Think of the scope! As you sit in your operating chair with your transmitter adjusted to a portion of the 80-meter band (for argument's sake), you are not limited to contacts near your own frequency or even in the same band! Verily, you have opened up before you the complete amateur spectrum! While this plan does not reduce the number of transmitters occupying any one band nor increase the frequency allotments for any band (ah, there), couldn't one get the impression that something has been increased in the way of space because he certainly has more to work with?

Perhaps it looks peculiar to allow calls for frequencies outside of amateur bands such as CQD, CQI, CQM, CQQ, CQT and CQW but there is a method to this person's madness. Amateurs oftimes contact stations outside of amateur bands, particularly in the cases of expeditions. As matters now stand, one must either have a schedule with or listen for CQ's from these expeditions. But an amateur, acquainting himself with expedition frequencies can call CQ, using the proper suffix letter—from any band on which he operates. Expedition operators could listen on all amateur bands for the one CQ which would include his transmitting frequency. Exciting, isn't it?

How About It?

All in all, isn't it a swell idea?—or one could just as well ask, "isn't it a lovely day?" because even if you like it, you, as an individual, can do nothing about adopting it except to urge its adoption. After publication of the writer's article in the New York *Telegram,* he took the liberty of forwarding it to ARRL headquarters. It was turned down.

Don't get the wrong idea about the last paragraph. The writer is a member of the league since the league, of all amateur organizations, is most powerful in aiding the amateur. The writer holds no brief as to whether the league is doing all in its power for its membership or not. The league is mentioned at this time only insofar as its consent and co-operation must be had if the plan outlined here is to become part and parcel of the Amateur's operating procedure.

Amateurs are requested to address the league on this subject. Join with the writer in giving ourselves something for nothing!

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