ALL-WAVE RADIO

JUNE • 1937

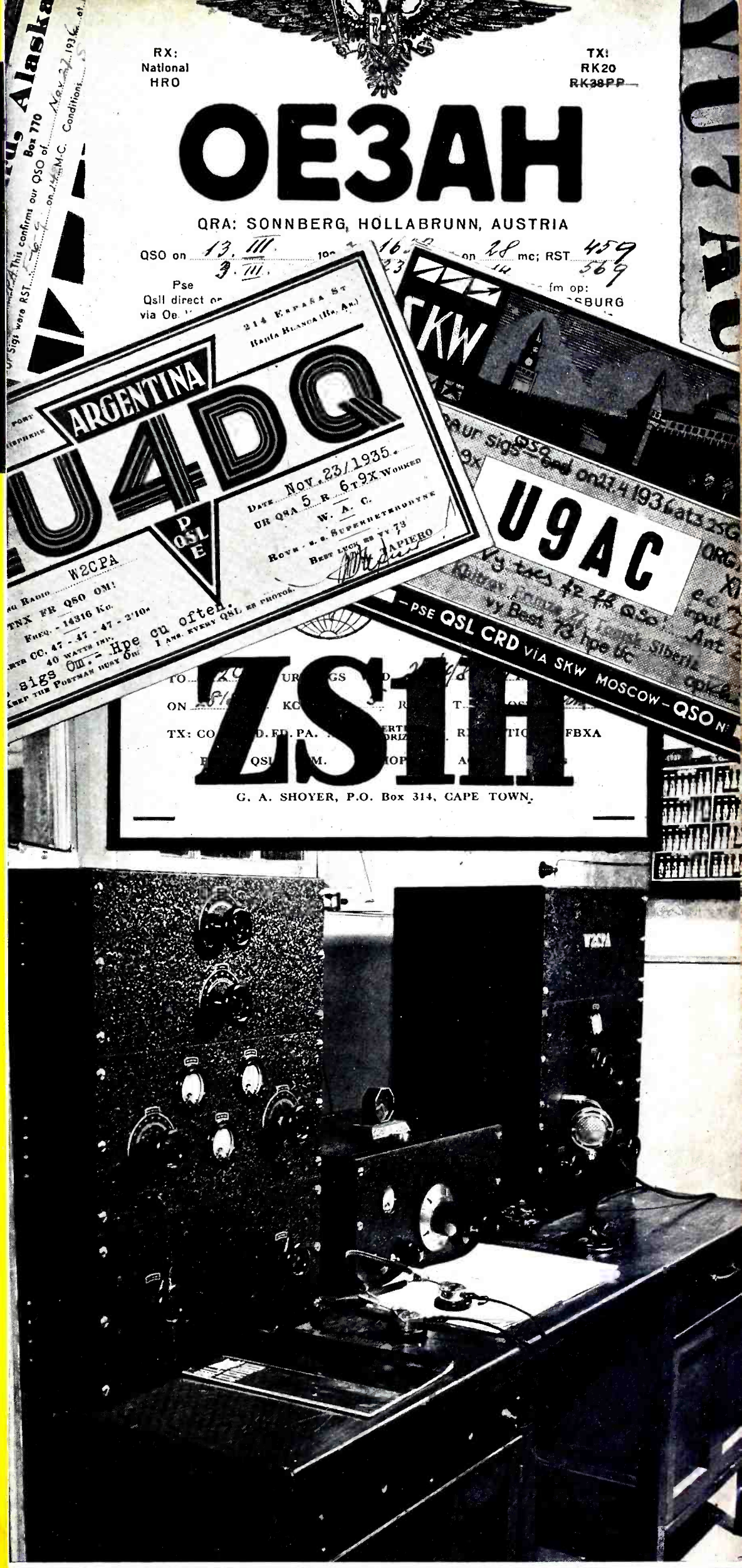
FREQUENCY CHECK LIST

CALL UR SIGNAL SHOTS
with a receiver-oscilloscope

QRP FONE TRANSMITTER
built for emergency work

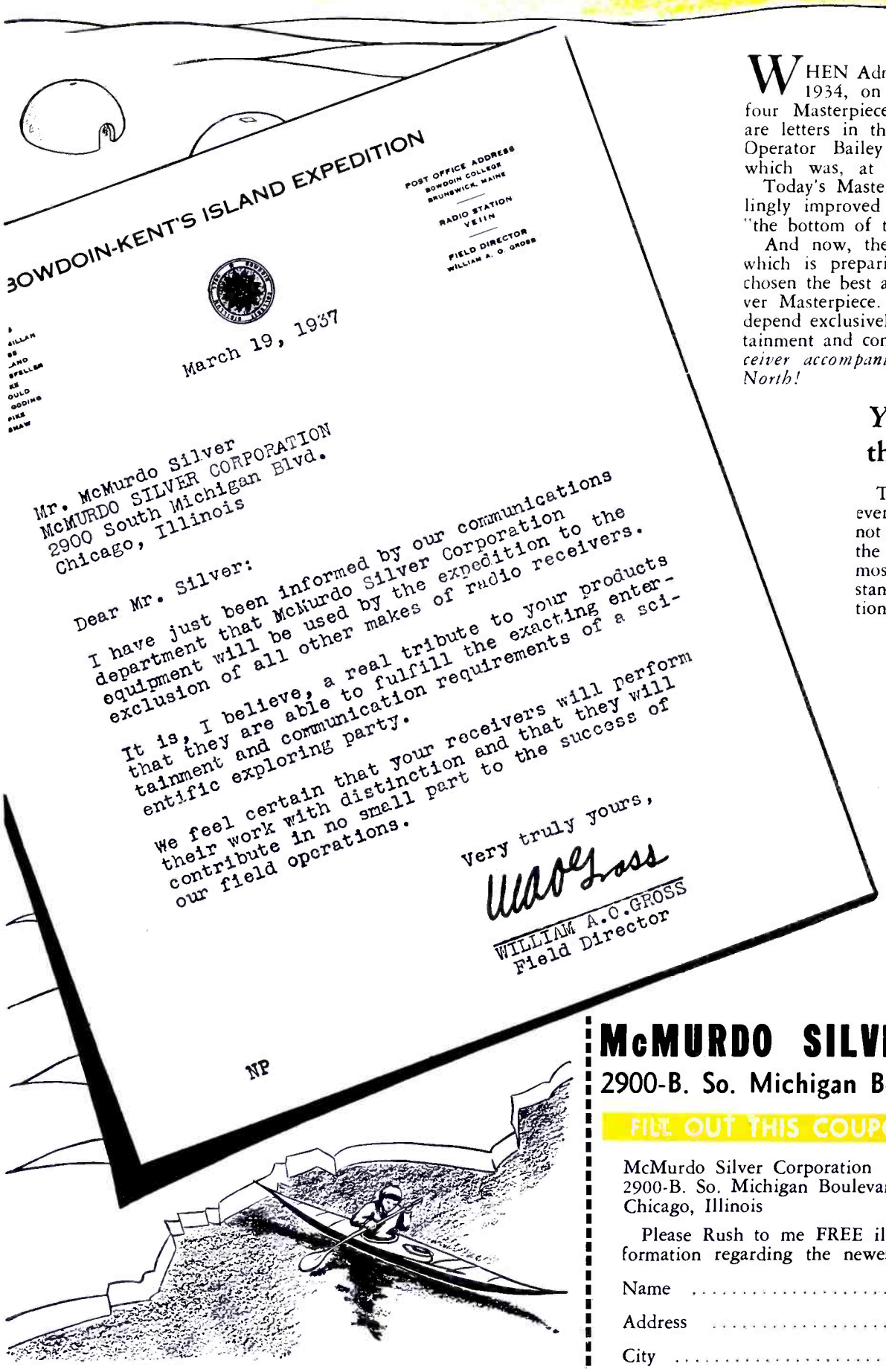
NEW WWV SCHEDULES
of standard frequency signals

25c U.S. and CANADA



THE JOURNAL of WORLD RADIO

Another Polar Expedition Chooses McMURDO SILVER MASTERPIECE RECEIVER!



WHEN Admiral Byrd went to Little America, in 1934, on his second South Pole Expedition, four Masterpiece Receivers went with him. There are letters in the McMurdo Silver files from Chief Operator Bailey lavishly praising the Masterpiece which was, at that time the world's best radio.

Today's Masterpiece is still the best, though startlingly improved over the Masterpiece that went to "the bottom of the world."

And now, the Bowdoin-Kent's Island Expedition which is preparing to sail for the Arctic has also chosen the best and most reliable—the McMurdo Silver Masterpiece. This scientific exploring party will depend exclusively on the Masterpiece for total entertainment and communication reception. *No other receiver accompanies this expedition into the frozen North!*

You, Too, Should Have the Best in the World!

The MASTERPIECE can be owned by everyone who wants the very best. It is not priced so high that it is only within the reach of the millionaires. YOU, almost regardless of your financial circumstances, if you demand fine radio reception, can own the MASTERPIECE.

Remember!

You can Buy the World's Best Radio On Small Monthly Payments.

Write for Illustrated Literature

The McMurdo Silver laboratories have just fathered spectacular new developments in the radio art. Features never dreamed of before—and not found in any other radio receiver! Just fill out the coupon NOW and we will explain clearly the reasons why the Masterpiece is the world's best radio. TRULY CUSTOM-BUILT FOR YOUR INDIVIDUAL NEEDS.

McMURDO SILVER CORPORATION

2900-B. So. Michigan Boulevard, Chicago, Illinois

FILL OUT THIS COUPON AND MAIL TODAY!

McMurdo Silver Corporation
2900-B. So. Michigan Boulevard
Chicago, Illinois

Please Rush to me FREE illustrated literature, complete information regarding the newest, improved Masterpiece radio.

Name .....

Address .....

City ..... State .....

"THE WORLD'S FINEST CUSTOM-BUILT RADIO"

No Pep? All In?

IT MUST BE

THE HEAT!

Brother, Conserve Your Energy!

Let the **Mailman** do your extra walking! Why hoof it to the corner or to the village for your copy of A.W.R. when it's so easy to have it delivered right to the door. You'll find this easier not only on the blood pressure but also on the **pocket book.** Besides you get each copy before the newsstands and there's no risk of being **"Just Too Late."**

Moving out of town **for the summer? No problem at all! Mountains — lakes — ranches — sea-shore, wherever you choose to go,** ALL-WAVE RADIO **will follow right to your door!**

You can't afford to miss the timely "portable" constructions and other "Summer Specials" to come. The editorial staff may have its sleeves rolled up but there's still plenty up 'em!

So just pick up your pen—Fill out the coupon below and—Relax until the Fall.

All Wave Radio's "Hot Weather Relief" Special

16 East 43 St.
New York, N. Y.

O.K. Gentlemen, Enclosed Please find $1.00 in

☐ check ☐ money order ☐ cash, for which send me

5 issues for $1.00

Start with ..... (Issue)

Regular Mailing Address

Name .....

Address .....

City..... State.....

Special Summer Mailing Instructions

Name .....

Care of .....

Address .....

City..... State.....

ALL-WAVE RADIO

Reg. U. S. Pat. Off.

VOLUME 3 • NUMBER 6

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.

SUBSCRIPTIONS

YEARLY SUBSCRIPTION rate: $2.50 in the United States and Canada; $3.00 in foreign countries. Single copy price, 25 cents. Notice of change of address required two weeks prior to publication date, or the 15th day of the month. Notifications received after this date will become effective with second issue.

ADVERTISING OFFICES

EASTERN ADVERTISING Manager, Sanford L. Cahn, All-Wave Radio, 16 East 43rd St., New York, N. Y.
DETROIT OFFICE: Roy Buell, General Motors Building, Detroit, Mich.

CONTRIBUTIONS

MANUSCRIPTS ARE submitted at the author's risk and cannot be returned unless accompanied by postage. Notification of the acceptance or rejection of a manuscript is given within two weeks after receipt.

Edited by M. L. Muhleman

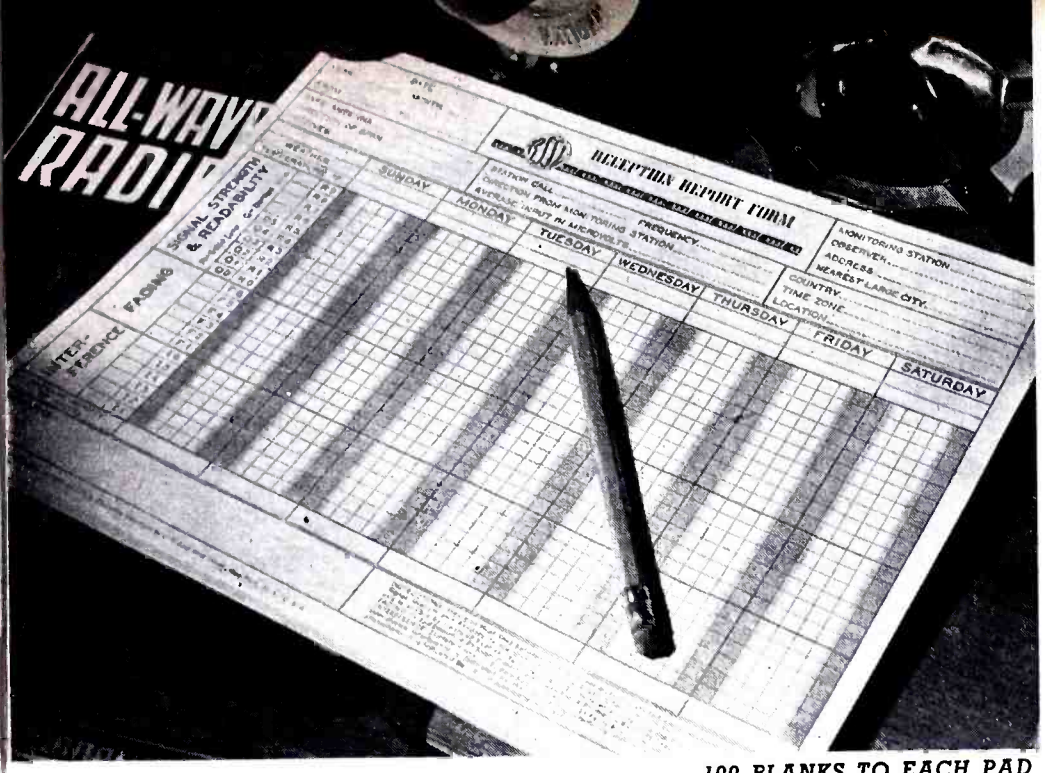
CONTENTS - JUNE - 1937

COVER

The complete AWR "Commercial" c.w. and fone transmitter set up at station W2CPA for test—and a few of Bohlen's QSL cards. The Audio Unit of the AWR "Commercial" is described in this issue.

FEATURES

DEPARTMENTS



100 BLANKS TO EACH PAD

FOR THE rssl MEMBER

• REPORT FORM BLANKS •

New in principle, these Report Form blanks have been specially designed for the recording of information essential in carrying on the work of the R.S.S.L. Printed in green ink on white bond paper, 8½x11, records can be made in either pencil or ink —each sheet covering a full week's report.

$1.00 Per Pad • Postpaid

ARE YOU ELIGIBLE FOR MEMBERSHIP IN THE RADIO SIGNAL SURVEY LEAGUE?

There is only one requisite for Membership, namely: That you be sincere in your desire and efforts to assist the league in fulfilling its public service of "improving domestic and international radio transmission and reception conditions." Here is an opportunity to help make radio history and at the same time do a real public service.

JOIN THE R.S.S.L. TODAY! NO FEE! A POST CARD WILL FETCH YOUR APPLICATION BLANK.

• QSL CARDS •

No QSL Cards have, as yet, been prepared. In order that members may retain the individuality of their QSL Cards and at the same time indicate their association with the R.S.S.L., a Matrix ("Mat") has been prepared from which a metal cast can be readily made of the R.S.S.L. emblem at low cost. "Mats" can be had for either "Negative" (above) or "Positive" (right) type emblem. They are practically indestructible and are familiar to almost all printers. Be sure to specify "negative" or "positive." Above illustrations are actual size!

"MATS" 25c Each Postpaid

METALETTE R.S.S.L. SEALS

Are gummed on one side. Blue embossed on Silver. Same size as above illustration. They have the handsome appearance of real metal. Can be used on stationery, letterheads, QSL cards, etc.

25 Seals 15c • Postpaid

IMPORTANT: Above supplies may be purchased by **R.S.S.L.** members **ONLY!** Be sure to give your Monitoring Station number with order. No orders sent C.O.D. Be sure to enclose check, stamps or M.O. with order and send to:

RADIO SIGNAL SURVEY LEAGUE
16 East 43 Street, New York, N. Y.

MEMBER STATIONERY

Every member will be proud to use this handsome R.S.S.L. Members' Stationery for his radio correspondence. Printed in blue ink on 8½ x 11 white bond paper, it bears the Radio Signal Survey League's official emblem.

Note: Those who prefer to design their own stationery or who would like to add the R.S.S.L. emblem to stationery they already have can secure "Mats" (Matrices) of the above two illustrations (actual size). For details see section headed "QSL CARDS."

100 Sheets 50c • 250 Sheets $1.00

WWV TRANSMISSIONS

Standard Frequency and Other Services Broadcast By The National Bureau of Standards

BEGINNING June 1, 1937, the National Bureau of Standards will make some changes and extensions in the services broadcast by its radio station WWV, at Beltsville, Md., near Washington, D. C. The services will include: (1) standard radio frequencies, (2) standard audio frequency, (3) standard time intervals in the form of pulses accurately spaced one second apart, (4) the standard of musical pitch, 440 cycles per second, and (5) bulletins of information on the ionosphere and radio transmission conditions.

1. Standard Radio Frequencies

This service makes generally available the national standards of frequency which is of value in scientific or other measurements requiring an accurate frequency, and is useful to radio transmitting stations for adjusting their transmitters to exact frequency, and to the public generally for calibrating frequency standards. This service will be given every Tuesday and Friday, (except nationally legal holidays), as heretofore, but the times, character, and frequencies of the emissions will be somewhat changed. The emissions each Tuesday and Friday will be continuous unmodulated, unkeyed waves (c.w.) except for a short pulse each second as described under 3 below.

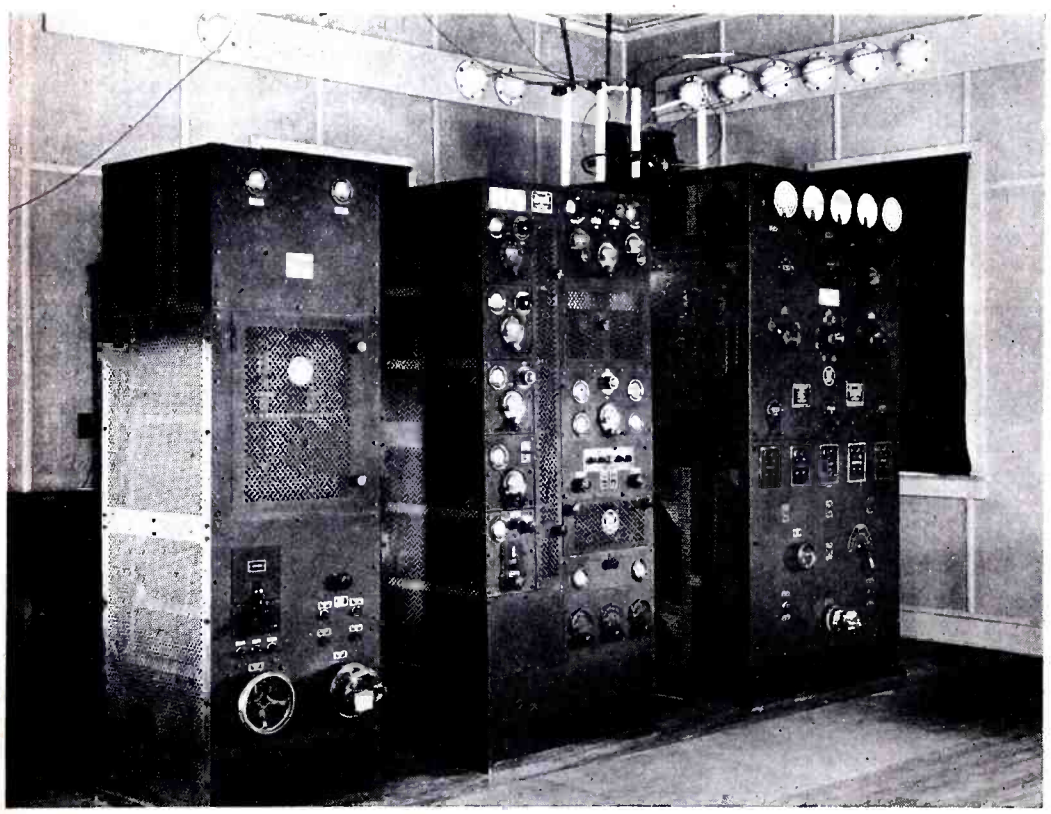
The service will be given successively on three radio carrier frequencies, as follows:

10:00 to 11:30 A.M., EST.— 5,000 kc.
Noon to 1:30 P.M., EST.—10,000 kc.
2:00 to 3:30 P.M., EST.—20,000 kc.

The power of the transmitter used is approximately 20 kilowatts. The emissions on 5,000 kc. are particularly useful at distances within a few hundred miles from Washington, those on 10,000 kc. are useful for most of the rest of the United States, and those on 20,000 kc. are useful in the western part of the United States and in other parts of the world.

From any single frequency, using harmonic methods, any frequency may be checked.

During the first four and the last four minutes of the 90-minute emission on each carrier frequency, announcements will be given; they will be made by telegraphic keying and by voice, and will include the station call letters (WWV) and a statement of the frequency and the accuracy. The accuracy of the frequencies is at all times better than a part in five million.



Three of the units of the 30-kw transmitter at WWV, National Bureau of Standards, Washington, D. C.

2. Standard Audio Frequency

On each Wednesday (except nationally legal holidays), a frequency of 1000 cycles per second will be transmitted as a modulation on the same radio carrier frequencies and at the same times of day as previously listed. The radiated power will be approximately 20 kilowatts, with 30% modulation.

Except during announcements, the emissions will consist of the uninterrupted 1000-cycle frequency superposed on the carrier frequency. During the first four and the last four minutes of the 90-minute emission on each carrier frequency, announcements will be given, they will be made by telegraphic keying and by voice, and will include the station call letters (WWV) and a statement of the radio carrier frequency and the audio modulation frequency and the accuracy.

The accuracy of the frequencies (both carrier and modulation) as sent out from the transmitting station is at all times better than a part in five million. Transmission effects in the medium (Doppler effect, etc.) may result in slight fluctuations in the frequency as received at a particular place. As far as the carrier radio frequencies are concerned, such fluctuations practically never exceed a part in five million; furthermore, the presence of the audio modulation frequency does not reduce the accuracy of the carrier radio frequency. Under occasional extreme conditions, momentary fluctuations as great as one cycle per second may occur in the audio modulation frequency as received. It is generally possible, however, to use the audio frequency with an accuracy better than a part in a million by employing that one of the three carrier frequencies which has the least fading. It is helpful to use automatic volume control and audio-frequency filters to reduce the effects of fluctuations in amplitude or phase of the received audio frequency.

Any desired frequency may be measured in terms of any one of the standard frequencies, either audio or radio. This may be done by the aid of harmonics and beats, or, in the case of the 1000-cycle standard, also by the operation of a simple motor-generator.

The standard 1000 cycles per second is especially useful in the accurate measurement of audio frequencies and time intervals, calibration of tuning-forks, etc.

3. Standard Time Intervals

The c.w. standard frequency emissions each Tuesday and Friday, described under 1 above, will be modulated (30%) by a short pulse once each second (except during announcements). The pulse lasts about 0.005 second and consists of a 1000-cycle modulation on the carrier frequency; this type of pulse was chosen to facilitate its reception by ordinary radio receivers. The length of the intervals thus marked between each second and the next is accurate within 0.000 01 second, as sent out from the transmitter. Measurements to this accuracy have not been made of these signals as received, but measurements made at one receiving location showed no error within the limits of precision of the measurement, which was about 0.000 03 second. Vagaries occurring in the transmission medium may cause fluctuations materially greater than this at particular places or times where there is excessive fading.

These standard seconds signals constitute a standard frequency of one cycle per second and are derived from the Bureau's primary standard of frequency which is in turn based upon the standard time service maintained by the U. S. Naval Observatory. They are of special value in physical measurements, in geodetic, seismological, and similar work, in rapid checking of pendulums and chronometer rates, and wherever short time intervals of great accuracy are needed. They are not capable of giving absolute time, as needed in navigation, for example, for which astronomical observations or the Navy's time signals are required.

4. Standard of Musical Pitch

The American standard of musical pitch, 440 cycles per second for A above middle C, will be broadcast as a modulation frequency every night except Saturday and Sunday (and except nationally legal holidays). It will be a 440-cycle modulation on a radio carrier frequency of 5000 kc. The service will be given daily from 4:00 P.M. to 2:00 A.M., EST. The station call letters (WWV) will be given every ten minutes on the even ten minutes by telegraphic keying, so that musicians using the service may be sure they are listening to the right station. The letters WWV are dots and dashes as follows: .-- .-- ...- (de dah dah—de dah dah—de de de dah.) The radiated power will be one kilowatt, with 100% modulation. The accuracy of the 440-cycle standard pitch is approximately the same as that of the 1000-cycle tone as described under 2 above, i.e., far beyond any musical requirements.

5. Ionosphere Bulletins

Data on the ionosphere and a summary of high-frequency radio transmission conditions will be broadcast each Wednesday afternoon, the same day on which the 1000-cycle modulated emissions are given. The bulletin will be given by voice on each of three radio carrier frequencies, as follows:

1:30 to 1.33 P.M., EST.—10,000 kc.
1:40 to 1:43 P.M., EST.— 5,000 kc.
1:50 to 1:53 P.M., EST.—20,000 kc.

The broadcast includes statements of the normal-incidence critical frequencies and virtual heights of the ionosphere layers, and estimated skip distances for a number of frequencies, all based on observations at Washington the day of the broadcast. Both day and night values are given. The information is an aid in choosing optimum frequencies for long-distance communication.

Further information is given in the Bureau's Letter Circular, "The Weekly Radio Broadcasts of the National Bureau of Standards on the Ionosphere and Radio Transmission Conditions."

General

Information on how to receive and utilize these various services is given in phamphlets obtainable on request addressed to the National Bureau of Standards, Washington, D. C.

The Bureau welcomes reports of use and comments upon the services. It is desired that users report to the Bureau their experience in using them, including: description of method of use; statement of relative fading, intensity, interference, etc., on the three carrier frequencies; and suggestions for improvement of any details. Correspondence should be addressed to National Bureau of Standards, Washington, D. C.

C. W. STATION FREQUENCY CHECK LIST

K.C.	Call	Emission	Location
19680	DFJ	M	Nauen, Germany
19620	IRL	C	Roma, Italy
19400	FRO	C	Sainte Assise, France
19210	DFA	C	Nauen, Germany
19110	PCS	M	Kootwik, Netherlands
19080	GLW	M	Essex, England
18790	GMF	M	Grimsby, England
18780	TMB2	C	Pontoise, France
18770	ORO	M	West Flanders, Belgium
18710	WCP	C	?, U. S. A.
18480	HBH	M	Geneva, Switzerland
18290	KWQ	M	Palo Alto, Calif.
18270	YVR	C	Maracay, Venezuela
18210	EAH	M	Valleces, Spain
17990	JUX	C	Tokyo, Japan
17860	OEU	C	Deutsch Altenburg, Austria
17850	OEV	C	Deutsch Altenburg, Austria
17720	HAP	M	Budapest, Hungary
17610	IBC	M	Roma, South Paolo, Italy
17110	KNG	M	Palo Alto, Calif.
16900	WCC	M	Chatham, Mass.
16800	WSL	C	Sayville, L. I., N. Y.
16790	KFS	M	Palo Alto, Calif.
16390	WKT	C	Sayville, L. I., N. Y.
16300	WDT	M	Sayville, L. I., N. Y.
16300	WKS	M	Sayville, L. I., N. Y.
16200	NPO	C	Cavite, Philippine Islands
16110	WAR	C	Washington, D. C.
16005	HHA	C	Port-au-Prince, Haiti
16000	WAZ	M	New Brunswick, N. J.
15910	WCW	M	Hicksville, L. I., N. Y.
15910	WRK	M	Hicksville, L. I., N. Y.
15820	WRK	M	Hicksville, L. I., N. Y.
15720	JNF	M	Nagoya, Japan
15700	WAI	C	Rocky Point, N. Y.
15690	KJH	M	Daly City, Calif.
15510	KEM	M	Bolinas, Calif.
15490	KKR	M	Bolinas, Calif.
15480	WQZ	C	San Juan, Porto Rico
15450	KWE	M	Bolinas, Calif.
15080	WQG	M	Rocky Point, N. Y.
15040	GMX	M	Essex, England
15010	PQW7	M	Pera, Brazil
15011	REO	M	Aralsk, U.S.S.R.
14900	KGL	M	Musselrock, Calif.

THE accompanying list of Commercial Radio Telegraph Stations is necessarily brief. There are literally thousands of such stations, but many of them are not used in constant service. Those listed are active and usually remain on the air with their V-wheels between traffic-handling periods.

The principal purpose of this list is to provide spot frequencies for those able to read code so that they can check the calibration of their receivers. The frequency of each station listed has been air-checked in our laboratory with highly accurate equipment.

The letter M following the station call indicates that the emission is modulated c.w. and can therefore be received on the average receiver. The letter C indicates that the emission is pure c.w. and can be received only by means of a beat-frequency oscillator.

14890	JAM	C	Tokyo, Japan
14820	WQW	M	Rocky Point, N. Y.
14800	KQI	M	Kailua, Hawaii
14690	KPF	M	Daly City, Calif.
14500	XDA	C	Chapuctepec, Mexico
14499	PLK	M	Malabar, Java
13910	JNB	M	Nagoya, Japan
13890	WPK	C	Hicksville, L. I., N. Y.
13810	KKW	M	Bolinas, Calif.
13800	FSE	M	Sainte Assise, France
13651	SPW	C	Stanislawow, Poland
13650	JND	C	Nagoya, Japan
13640	HJO	C	Bogota, Colombia
13490	WKD	M	Rocky Point, N. Y.
13360	CUD2	M	Lisbon, Portugal
13300	FXB	M	Beyrouth, Lebanon, Asia
13252	RKC	C	Moscow, U.S.S.R.
13250	DGO	M	Nauen, Germany
13200	DGG	C	Nauen, Germany
13199	WKU	C	Rocky Point, N. Y.
13050	WMEC	M	St. John, Ind.
13040	WJH	M	Sayville, L. I., N. Y.
13000	EPA	M	Iran, Asia
12940	OXR	M	Zealand, Denmark
12940	OXE	M	Julianehaab, Greenland
12900	FZF	C	Martinique, West Indies
12890	HHH	M	Port-au-Prince, Haiti
12850	CNR	C	Rabat, Morocco
12780	KPH	M	Bolinas, Calif.
12750	KPH	M	Bolinas, Calif.
12630	NAA	C	Arlington, Va.
12630	NSS	C	Washington, D. C.
12590	KFS	C	Palo Alto, Calif.
12540	WBF	C	Hingham, Mass.
12190	FQO	M	Sainte Assise, France
12180	FQO	C	Sainte Assise, France
12040	IRX	C	Torrenova, Italy
12020	IBD	C	Roma, S. Paolo, Italy
12000	JAP	M	Tokyo, Japan
11940	PPH	C	Rio de Janeiro, Brazil
11910	SUW	M	Cairo, Egypt
11710	RKA	C	Moscow, U.S.S.R.
11690	VIZ	C	Fiskville, Australia
11680	FYR	M	Lyon, France
11490	FZK	C	Dakar, Senegal, W. Afr.

(Continued on page 330)

The AWR "COMMERCIAL"

AUDIO SECTION IN THREE-DECK CABINET TO MATCH THE R.F. UNIT

BY CHESTER WATZEL • W2AIF

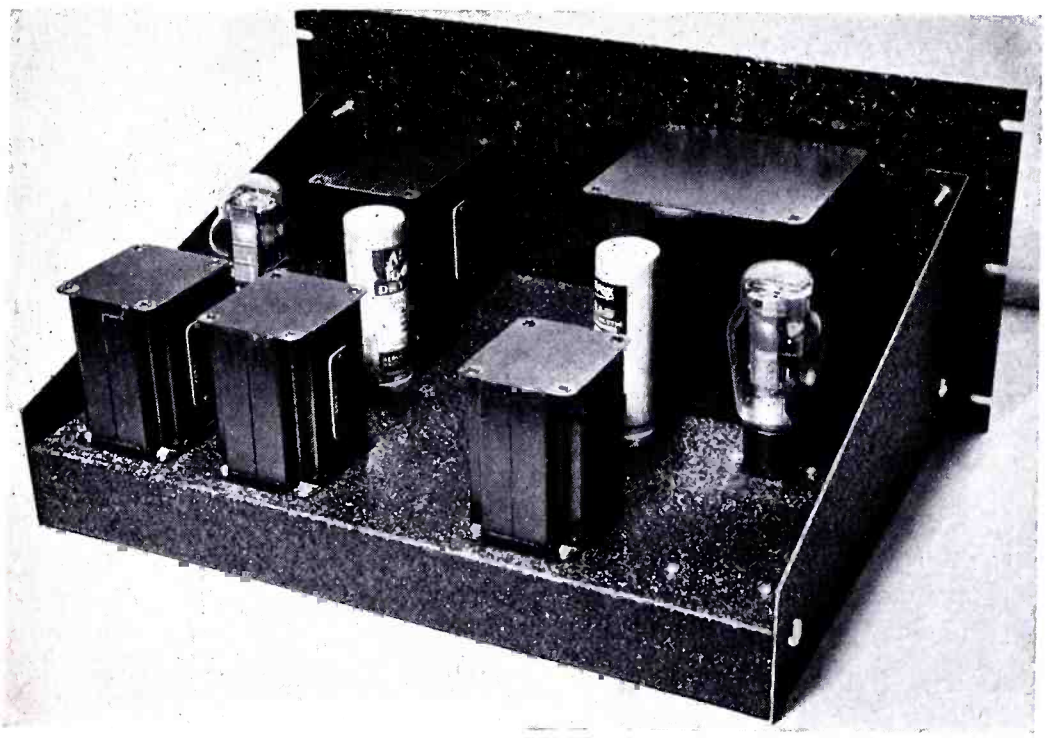
AND WILLARD BOHLEN • W2CPA

THE design of the Audio Section of the AWR "Commercial" revolves electrically, about a pair of Taylor 756 modulator tubes, and mechanically, about a three-deck cabinet identical to that used for the R.F. Section described last month. The electrical design will be taken up first.

The 756's take a maximum plate voltage of 850, grid voltage of 30, and 7.5 volts on the filaments. It requires approximately 5 watts driving power. We need, therefore, an 850-volt plate supply, 30-volt bias supply and a speech amplifier, with associated power supply, capable of an undistorted audio output of a little over 5 watts. While the various power supplies follow a standard design pattern, except for size of components, the speech amplifier is somewhat unusual in layout and requires a bit of detailed explanation.

The Speech Amplifier

Some time ago we described in ALL-WAVE RADIO an amplifier which was completely push-pull, from crystal microphone to output tubes. The complete absence of hum and lessened tendency toward feedback experienced in this amplifier made a complete push-pull design quite desirable in the AWR "Commercial" audio system if it could be incorporated without undue increase in components. The particular layout used provides more than sufficient gain from a crystal microphone with only three stages of speech. This reduces the total audio line-up, from microphone input to modulator output, to but four stages.



Rear view of the low-voltage supply unit which provides positive 350 volts for the intermediate amplifier tubes and negative 30 volts for biasing the 756 tubes.

Before going any further it might be well to mention that *all* crystal microphones are "push-pull." The only difference between a single-ended crystal microphone and a "push-pull" one is that in the former one connection of the crystal unit is grounded, while in the latter both sides of the crystal unit are led out through a shielded cable, the shield becoming the "ground" connection. Any crystal microphone can be "converted" to "push-pull" by merely substituting a two-wire shielded cable for the previous single-wire cable.

The first audio stage uses 6F5's. These tubes are high-gain triodes, designed especially for resistance coupling. The grid connection comes to a cap at the top of the tube, which keeps the sensitive grid leads away from the a.c. field of the heater leads. This first stage is resistance coupled to a 6N7, which acts as a medium-gain push-pull tube. The dual gain control is placed in the grid circuit of this stage.

The 6N7 stage is transformer-coupled

to a pair of 6F6 pentode drivers. The high gain of this stage makes it possible to attain sufficient overall gain in the fewest number of stages. The transformers used provide a close impedance match between all stages. As no transformers are used in the low-level circuits no trouble is experienced from unwanted pickup or coupling.

Voltage Supplies

Two voltages are used on the speech amplifier section. 350 volts is applied to the 6F6 plates. The drop through the cathode resistor makes the effective plate voltage about 325. This voltage is taken off after the first filter choke. A 5,000-ohm resistor and 800-ohm second choke drop the voltage applied to the 6F6 screens and plates of the first two stages to 250 volts. An extra 8-mfd. filter condenser section is connected between the second choke and the resistor so as to provide a three-section filter for the two low-level stages.

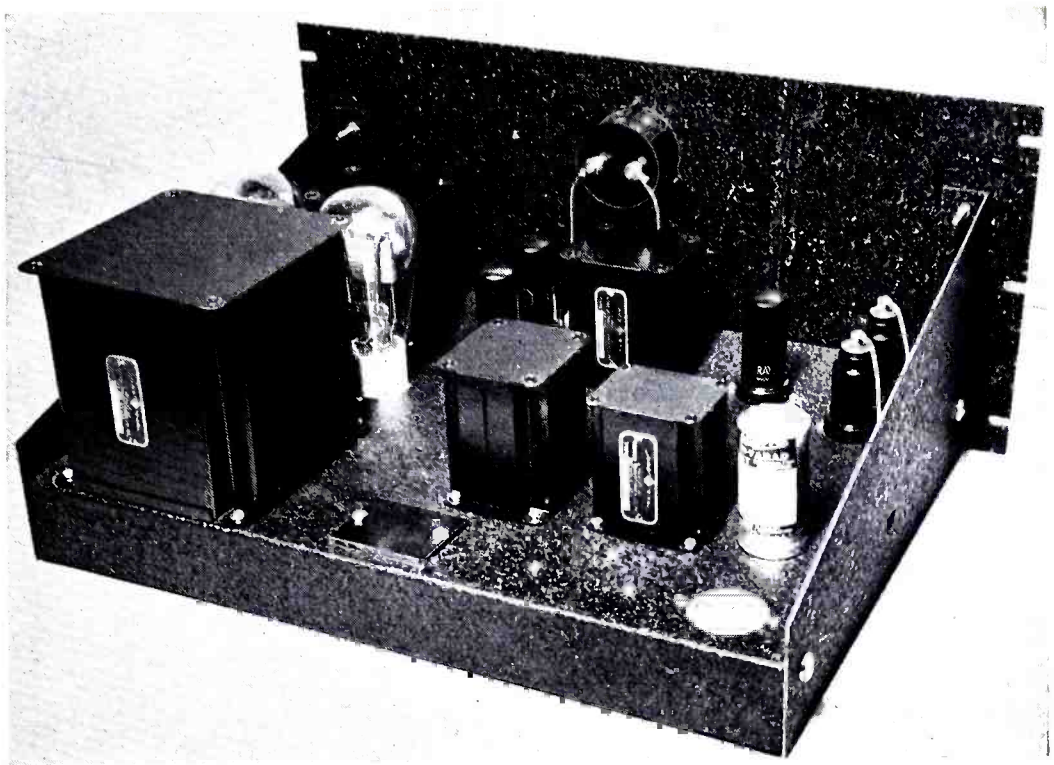
The 800-volt supply for the 756 plates uses a choke input two-section filter. The input choke is of the swinging type for best regulation. The 866 type rectifier tubes and 1500-volt working filter condensers assure uninterrupted operation of this supply.

The 350-volt supply for the speech amplifier uses a 5Z3 rectifier tube and also employs a choke input filter. The filter for this supply is, in the diagram, split between two sections. The input choke and first filter condensers are shown in the upper section, while the rest of the filter is shown in the center section of the diagram.

Up until recently it has been almost impossible to find a low-voltage, high-current power transformer suitable for use in a C-bias supply on a Class B audio stage. The T-220 transformer specified in this job takes care of the problem nicely. It is rated at 125 volts each side of center, at 200 ma. In the AWR "Commercial" it is used with a choke input filter to furnish 80 volts with a 1500-ohm bleeder resistor. The basic idea in a C-bias supply is to dissipate a relatively high current through a low-resistance bleeder. This will hold the applied C-bias voltage to a steady value during modulation. As 80 volts is too high for the 756 grids, but 30 volts being required, the grids are tapped down on the bleeder at the 30-volt point. A 25 mfd. condenser provides ample bypassing at this point.

Switching System

The a.c. control of this entire audio unit ties in to the a.c. circuits of the r.f. unit through an interconnecting 5-wire cable. In this way the filament switch of the r.f. unit controls the filament circuits of the a.f. unit, while the plate switch and remote control of the r.f. unit controls the plate circuits of the a.f. unit. Separate plate and filament switches on the a.f. unit permit it to be turned off when c.w. operation is desired.



Rear view of the modulator chassis which includes the speech amplifier as well as the push-pull 756's. This is the center unit in the cabinet, as may be seen below.

An extra a.c. outlet is provided on the back of the lower chassis so that the a.f. unit may be independently used for p.a. work or with some other r.f. section. When used in this manner a five-prong plug with a jumper between the opposite small prongs should be plugged in to the socket marked "to r.f. unit" so as to connect in the plate transformer. A remote-control plate switch may be connected to these two prongs in place of a jumper if desired.

This interconnecting cable between the a.f. and r.f. racks carries two additional wires besides the three a.c. control wires. These two additional wires carry the C-bias voltage from the a.f. to the r.f. rack in case it should prove desirable to used fixed bias on the T-55. This connection was shown in last month's diagram with a dotted line. In the original transmitter this dotted line connection was not made, the bias on the T-55 being derived wholly from the grid leak. This provision was made, however, in case fixed bias should at any time be wanted on the amplifier stage. The "plus" C voltage wire in this five-wire cable is also, of course, a common ground interconnection.

Mechanical Layout

The audio circuits and accompanying power supplies are divided, mechanically, between three chasses. The diagram is divided into three corresponding sections and shows clearly just what components are mounted on each chassis. The lower chassis is devoted solely to the 800-volt supply, filament and plate switches and external connections. The entire four audio stages, including the 756 modulators, are contained on the middle chassis. In addition the second filter choke of the 350-volt supply and the 7.5-volt filament transformer for the 756's are on this chassis. The upper chassis has only the C-bias supply and 350-volt supply, minus part of its filter, which is on the middle chassis, as stated before.

The chasses, being 13 inches in depth,

Rear view, with back door open, of the complete Audio Unit which matches up with the R.F. Unit described last month.

Rear view of the high-voltage power-supply chassis which employs two 866 half-wave rectifiers in full-wave connection.

all extend to the back door of the cabinet. This makes it impossible to place any connections on the back edges of the upper two chassis, as is customarily done. This difficulty is gotten around quite nicely by the dodge shown in the photos, for interconnections. The sockets terminating the lower ends of the cables are mounted toward the back of the chassis, while those terminating the upper ends are mounted under the chassis on small studs and face downward. Actually, this arrangement provides shorter and neater appearing cables than the usual method of plugging these cables in the back edges of the chassis.

The output connections of the modulation transformer T14 go to two No. C1-31 standoff insulators mounted under the chassis. From these two insulators flexible leads run to feedthrough insulators mounted on the lower chassis, as shown in the photos.

No identification of the various components shown in the photos should be necessary, a brief study of the diagram making them self-identifying. The audio section on the center chassis follows an almost ideal electrical and mechanical layout. The input starts from the microphone jack in the right front corner (rear view), runs symetrically along the front of the chassis over to the driver transformer T12, and then turns the corner of the chassis back through the 756's and the modulation output transformer.

A word of caution in mounting this modulation transformer: The photos show it as being mounted all the way to the back edge of the chassis. The door latch, unfortunately, hits the back of this transformer so that the door will not shut tightly. The transformer should be mounted about a half inch from the back edge to permit latching the door.

LIST OF PARTS FOR A.F. UNIT

AEROVOX
- 2—dual 8-8 mfd., 450-volt electrolytics (C26, C28, C29)
- 1—single 8 mfd., 450-volt electrolytic (C30)
- 1—25 mfd., 50-volt electrolytic (C27)
- 2—0.1 mfd., 400-volt paper (C24, C25)
- 2—2 mfd., 1500-volt filter (C22, C23)

BIRNBACH
- 7—type 4125 feedthru insulators
- Rubber covered wire for cables, push-back wire, No. 12 tinned bus

COTO-COIL CO.
- 3—type CI-46 control wheels
- 4—type CI-47 indicator plates (Nos. 18, 19, 21 and 15)
- 2—type CI-31 standoff insulators

HAMMARLUND
- 4—type S4 4-prong isolantite sockets
- 2—type S7 7-prong isolantite sockets (large)
- 2—type S5 5-prong isolantite sockets

KENYON
- 1—type T-353 7½-volt, 4a filament trans. (T13)
- 1—type T-460 modulation output trans. (T14)
- 1—type T-258 Class B input trans. (T 12)
- 1—type T-256 pp interstage audio trans. (T11)
- 1—type T-156 800-ohm, 25 ma. filter choke (T10)
- 1—type T-656 925-0-925 a.c. volt, 300 ma. power trans. (T6)
- 1—type T-507 250 ma. swinging choke (T8)
- 1—type T-164 250 ma. smoothing choke (T9)
- 1—type T-360 2½-volt, 10a fil. trans. (T7)
- 1—type T-220 125-0-125-volt, 200 ma. trans. (T19)
- 2—type T-152 200 ma. filter chokes (T15, T16)
- 1—type T-214 420-0-420-volt, 150 ma. power trans. (T18)
- 1—type T-154 165 ma. filter choke (T17)

OHIOHM
- 2—5-meg., ½-watt resistors (R10, R11)
- 2—¼-meg., ½-watt resistors (R13, R14)
- 2—1,000-ohm, 1-watt resistors (R12, R21)
- 1—50,000-ohm, 1-watt resistor (R15)

OHMITE
- 1—25,000-ohm, 200-watt resistor (R22)
- 1—25,000-ohm, 50-watt resistor (R19)
- 1—1,500-ohm, 50-watt resistor (R20)
- 1—5,000-ohm, 10-watt resistor (R17)
- 1—500-ohm, 10-watt resistor (R18)

PAR-METAL
- 1—type SC-2613 three-deck cabinet
- 3—type 15212 13″ x 17″ x 2″ black crackle chasses
- 3—type SB-713 pair of mounting brackets (for above)
- 3—type 3679 8¾″ x 19″ black crackle aluminum panels

RAYTHEON
- 2—6F6 tubes
- 1—6N7 tube
- 2—6F5 tubes
- 2—5Z3 tubes

SHURE
- 1—type 70S "Communication Type" crystal microphone

TAYLOR
- 2—type 756 tubes
- 2—type 866 tubes

TRIPLETT
- 1—bakelite case 2-inch meter, 0-300 ma., d.c.

YAXLEY
- 1—type NN dual 500,000-ohm potentiometer (R16)
- 1—type 702B three-circuit microphone jack
- 1—type 76A three-circuit microphone plug, shielded
- 1—type 310A amber pilot light

MISCELLANEOUS
- 5—octal wafer sockets
- 1—5-prong wafer socket
- 2—4-prong wafer sockets
- 3—5-prong cable plugs
- 2—7-prong cable plugs
- 2—metal tube type grid clips
- 1—a.c. outlet
- 2—s.p.s.t. rotary toggle switches

Testing Procedure

The testing procedure with this audio unit was necessarily different than that customarily pursued. It has been the habit in the past to build the speech amplifier as a separate unit from the modulators. For testing these previous amplifiers a large dynamic speaker was hooked up in company with a high quality phono. pickup. Building the modulator on the same chassis makes this procedure impossible.

In this instance an 8,000-ohm heavy duty resistor was connected across the modulation transformer output. This provided a properly matched impedance load for the 756's. With the entire job warmed up the plate voltage switch was thrown on and the gain control advanced. Any hum or feedback present would thus show up as an increased reading on the meter scale. The meter should read only about 20 ma. or so with the gain control in the off position. On the first test it was found that the gain could be completely opened without moving the meter a single mil, showing an appearently complete absence of any hum or feedback.

With a single-ended crystal microphone plugged in, the gain was sufficient to run the meter off the 300 ma. end of the scale. With the proper push-pull connections from the microphone the gain was still sufficient to run the meter reading up to about 200 ma. with normal speech. With the gain control about half open the output is sufficiently high to completely modulate 175 watts input to the T-55.

The audio unit was next connected to the r.f. unit, which had been on the air from W2CPA for some time previously. Various air tests were made on both 10- and 20-meter phone. A Shure type 70S "Communication Type" crystal microphone was used. While the output of this microphone is somewhat lower than with other standard types of crystal microphones, it was found that sufficient gain could be secured with the gain control just a little past the middle setting for 100 per cent modulation. Approximately 175 watts input was used to the T-55 on both bands.

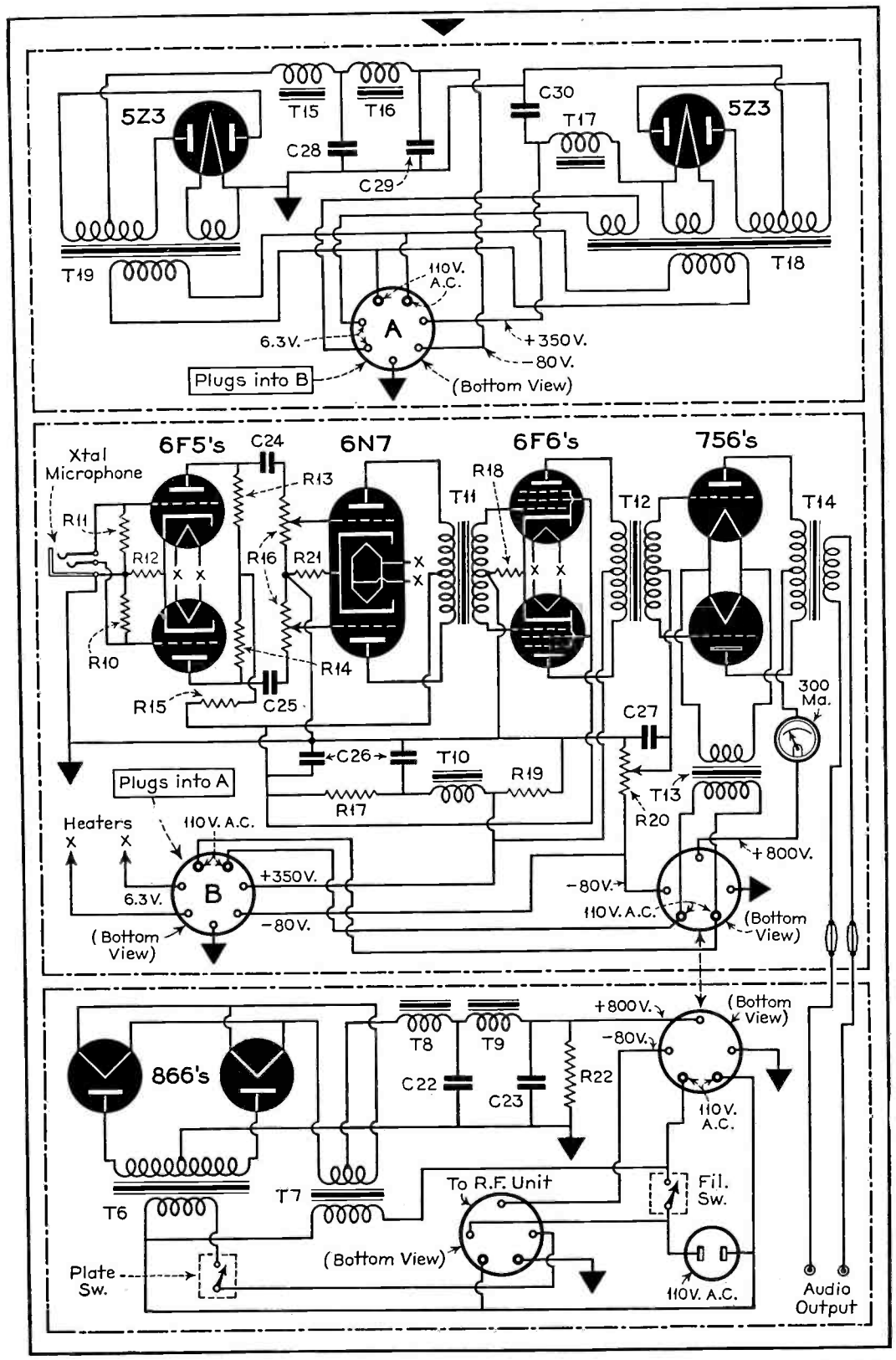
Silent Carrier

The transmissions were monitored from a receiving position several miles away. The quality was, as expected, quite excellent but the surprising feature of the signal was the complete absence of any carrier noise. Absolutely no hum could be detected. When tuning across the carrier while the operator was not talking no sound could be heard. The carrier was really "dead," a condition which obtains in very few amateur phone stations. The use of complete push-pull audio amplification as well as the adequate filtering throughout the transmitter undoubtedly was responsible for this desirable result.

A safety margin has been left throughout the design of this transmitter, so that continuous operation at full input on any band from 10 meters up could be realized. In this respect the design might be said to be really "commercial." The first cost of such a transmitter is a little higher than that of one without sufficient safety margin, but is more than adequately covered in the maintenance cost. One advantage of this enclosed cabinet design is that the transmitter may be moved at any time to a different location without going through semi-rebuilding operations.

"BARB" AND "ERNEST"

Mr. and Mrs. Rowland — "Barb" and "Ernest" to you—are on a month's combined vacation and business trip. Rather than make them bone when they should be resting, Mr. Granger is discontinuing his "letters" until their return, at which time they intend taking the examination for an amateur license. When they next appear, the letters will deal with the plans for the Rowland's station equipment.



Complete schematic diagram of the Audio Unit for the AWR "Commercial." The individual circuits are in the same order as the chasses are stacked in the three-deck cabinet.

SIMPLE QRP 160-METER PHONE TRANSMITTER

An Easily Constructed Emergency Rig

BY R. M. ELLIS • W9YSA • ex W5ETC

Fig. 1. The completed rig.

THE recent Ohio Valley Flood jarred the writer's mind from its barnacled moorings. Yes Sir—before that time we were content to worry a key on the 40-meter c.w. band, chewing the rag with whoever would answer and holding in mental disdain those who talked into a microphone instead of using the good old Continental Code.

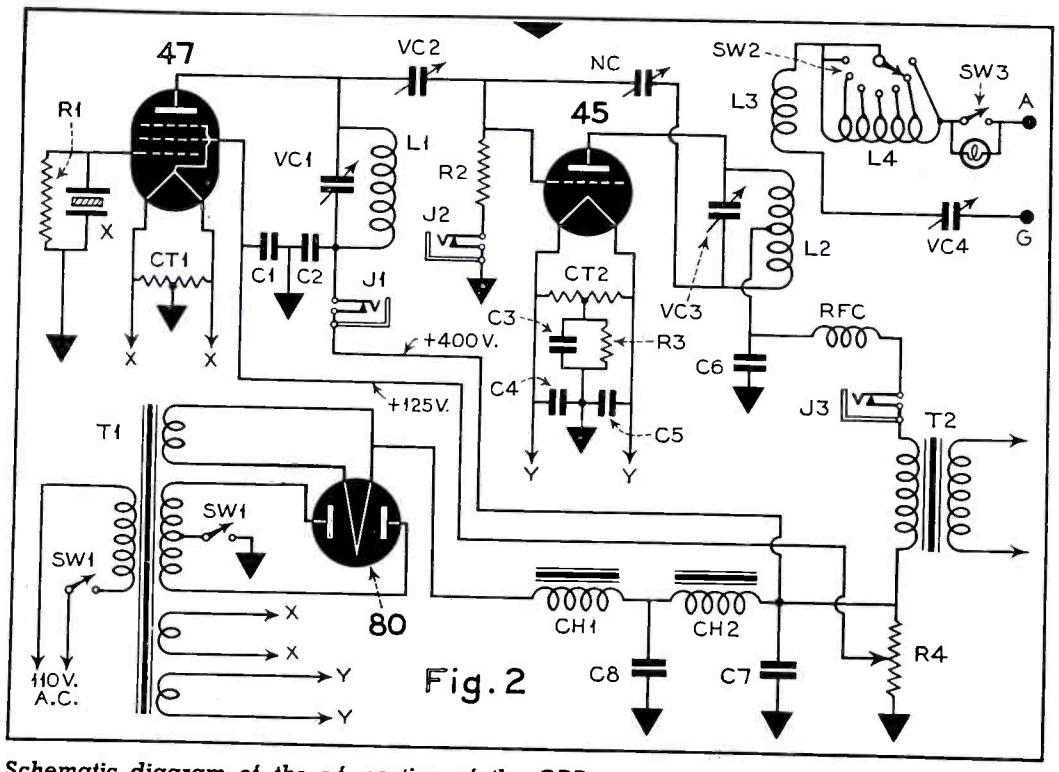
Our small experience in helping to handle flood traffic taught us three things—

The special value of the 160-meter phone band for moving short-haul traffic.

The dumbness of a c.w. man on a phone rig.

The fact that high power is not necessary to achieve satisfactory results. Some really marvelous work was accomplished in the flood area with QRP rigs having inputs as low as 3 watts.

After pondering over these conclusions for a while we knew that we would never be satisfied until we had a small semi-portable rig for 160-meter phone.



Schematic diagram of the r.f. section of the QRP transmitter with its individual power supply

Design Requirements

The transmitter shown in Fig. 1 was evolved as an answer to our requirements. Its design was based on the following considerations—

1. The cost must be reasonable. We did not want to spend a lot of money on what was to be distinctly a second rig for local work.

2. The rig should be usable with any kind of an antenna. At home we wanted to use it with a 65-foot off-center fed 40-meter antenna. Abroad we might want to use anything.

3. The input of 10 watts was decided upon as being adequate for local coverage. Experience has since verified that point. Even with our poor antenna we can lay down an R7 to R9 signal for a radius of 25 miles—and that is all we expected to do.

4. We must have good audio quality. Even if we were QRP we did not want to sound as if our mouth was full of mush.

The Circuit

Figs. 2 and 3 show the circuit employed. A 47 crystal oscillator is capacity-coupled to a 45 tube, operating with a combination of cathode and grid leak bias. Since 140-mmfd. midget con-

densers are used for the sake of compactness, it is essential that the 47 tank coil be proportioned so that it will tune to resonance with practically all of the capacity turned out, while the 45 final tank coil should be proportioned so that it will tune to resonance with the condenser plates almost completely in mesh.

The adjustable coupling condenser (VC2) is set for maximum grid current, as measured by inserting the meter plug in the jack (J2). The meter reading should be 7 to 9 milliamperes with no plate voltage on the 45, and from 3 to 5 milliamperes under normal operating conditions. The normal setting is with the condenser plates about two-thirds in mesh.

Some may object to the omission of a buffer stage. However, careful tests failed to show any trace of frequency modulation, providing the final was properly neutralized. However, a buffer stage would undoubtedly be desirable for working on the higher frequency bands.

The audio or modulator system is simplicity itself. For use with a high output microphone, a 56 tube is resistance coupled to a second 56 or 27, which in turn is coupled to a pair of 45 tubes operating in Class A or AB_1, using a common push-pull input transformer of good quality.

If a highly-damped double-button microphone is to be used, additional audio amplification may be secured by using a type 2A6 tube in the first audio stage, biased with a Bias Cell to eliminate audio degeneration and insure stable operation. The insert in Fig. 3 shows the constants to be employed when high audio gain is desirable.

The rather unique system used to couple the modulator to the final employs two dynamic speaker output transformers with the low impedance secondaries connected together. This method was used simply because we had the parts on hand, and works very well. If we had not possessed a pair of unused transformers we would have purchased a special coupling transformer and used the conventional hook-up.

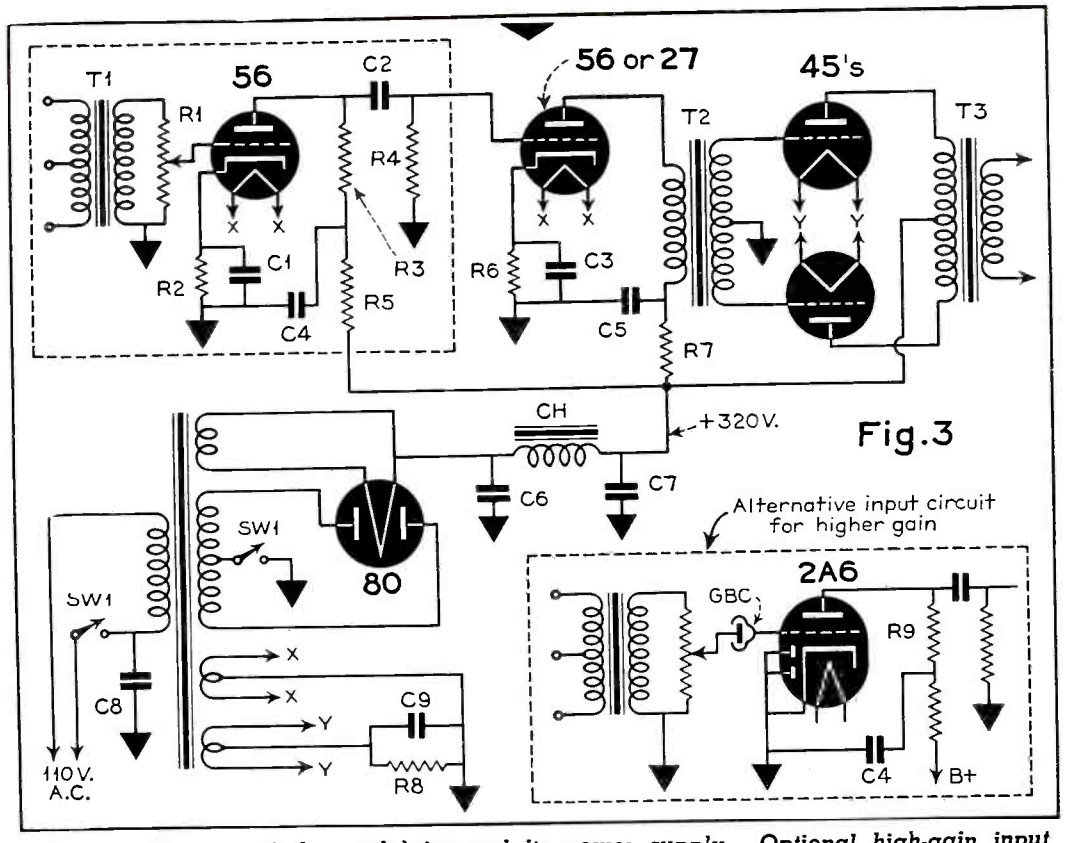


Fig.3

Schematic diagram of the modulator and its power supply. Optional high-gain input circuit is shown in right corner.

COIL SPECIFICATIONS

L1 — 55 turns No. 27 single cotton enamel wire close wound on a 1½" diameter form.

L2 — 44 turns No. 18 double cotton covered wire, close wound on a 2½" diameter form. Tap at 22 turns.

L3 — 12 turns No. 18 double cotton covered wire, close wound on a 2" diameter form.

L4 — 50 turns No. 18 enamel wire, spaced the diameter of the wire, tapped at every 5 turns, wound on a 2¾" cardboard form.

All coils impregnated with Cerese Wax for moisture proofing. This wax is made by Socony-Vacuum Oil Co.

Switching Arrangement

Another feature of interest is the special switching arrangement used on the power transformers so that a stand-by position could be secured with filaments lighted and plate voltages turned off. Since we were using receiver type power transformers with both plate and filament windings, the only way that this could be accomplished was to disconnect the high-voltage center-tapped power transformer windings from their ground connections, and leaving the 110 volt a.c. input on.

The problem was solved by using a four-pole, three-position switch connected as shown in Fig. 4. The switch positions are as follows:

Position 1 is "Off."

Position 2 is "Stand-By"—the filaments are lighted.

Position 3 is "Transmitting."

In spite of the small size of this switch (1¼" in diameter) it breaks the 110-volt primary and high-voltage center taps without fuss or trouble.

Antenna Coupling

As we said, we desired to be able to use any available wire as a Marconi antenna which meant that a very flexible antenna coupling system was required. A further requirement was the number of controls and parts should be held to a minimum. After various loading and impedance matching devices were considered we decided on an "old timer." The variable pick-up coil and tapped loading inductance dates back to the spark days—but it is positive, simple, easy to adjust and efficient.

To tune the antenna circuit, swing the antenna coil so that it barely enters the tank coil form. Connect the antenna and ground; then set the tap switch (SW2) for maximum inductance. Open switch (SW3) to allow the antenna tuning lamp to light. Turn the antenna tuning condenser through its range. If the antenna does not take power as evidenced by the failure of the lamp to light at some particular setting of the

(Continued on page 331)

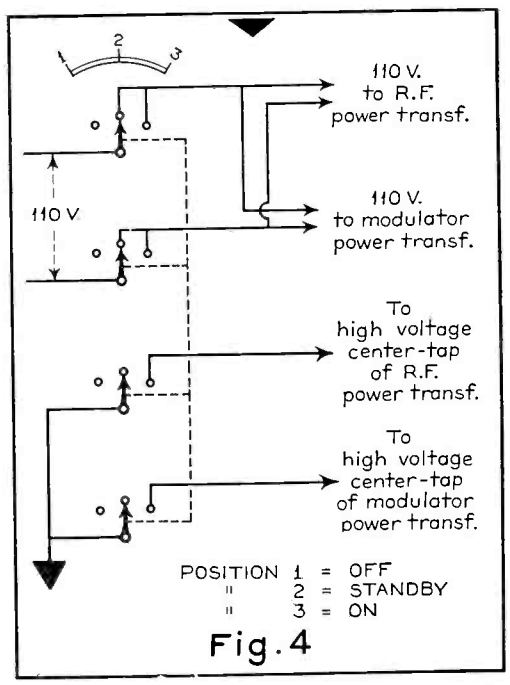


Fig.4

Connections of the multiple switching arrangement used on the power transformers to provide "off", "standby" and "transmitting" positions.

THE "FLEXIBLE 400" MODULATOR UNIT

BY ARTHUR H. LYNCH • W2DKJ

Rear view of the cabinet containing the speech amplifier at top and modulator chassis for the Flexible 400 transmitter

T[illegible]

articles [illegible] "Flexible 400" [illegible] have been tendered [illegible] and design [illegible] are to have a transmitter with [illegible] would lend itself [illegible] walls [illegible] circuit [illegible] disagreeable feed back or any [illegible] sonnet lines [illegible] from one [illegible] another.

In the art [illegible] Speech Amplifier portion [illegible] reference was made [illegible] a number [illegible] for using the Speech Amplifier and Modulator together were possible.

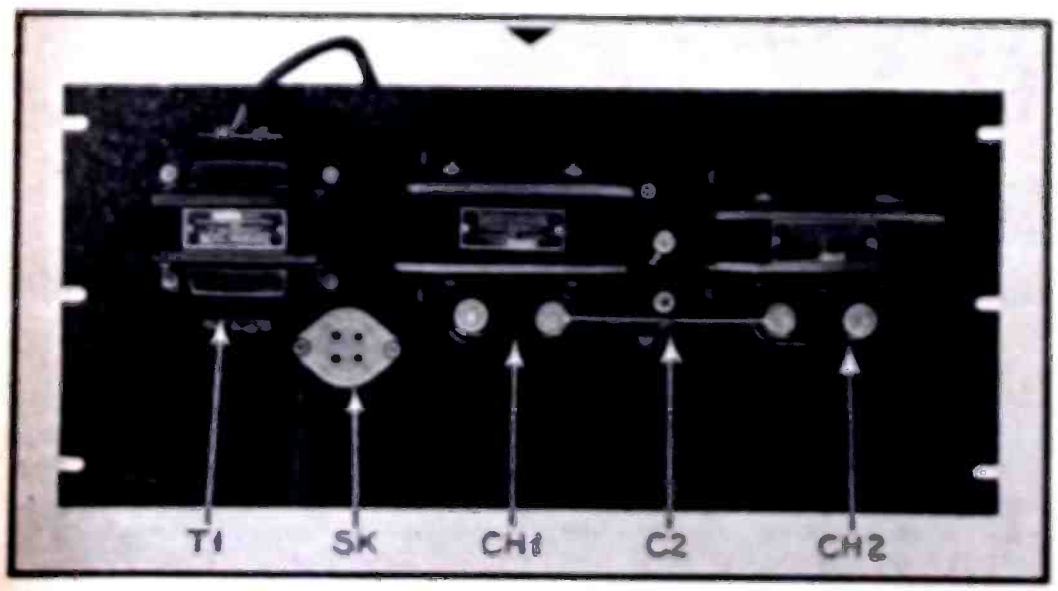
Unit Line Ups

It is to be the purpose of this article to indicate the manner in which the units were coupled together in our own particular case and suggest one or two

Rear of the center modulator panel carrying the input transformer and filter chokes. No chassis is used

T[illegible]

Flexible 400 transmitter. Many readers have shown an interest in this unit and this article is a summary of the results which have been obtained with it that is worth while. Mr. Lynch has agreed to prepare a short article of this nature for us. Among other things his location is not ideal as far as interference is concerned and his article will include a few observations on the performance of a National NC-100X receiver tweaked to include the noise limiting circuit described in the November 1936 issue of ALL WAVE RADIO — Editor



variations which may be desirable in other circumstances.

Reference to the rear view of the entire assembly lined up with the R.F. Power Supply supporting the R.F. Chassis and the Speech Amplifier and Modulator mounted in a single enclosed rack will indicate the manner in which the Modulator stage and its power supply can be separated from the Speech Amplifier and its power equipment. When this is done, Panel No. 1—described last month—would be set up in an individual cabinet and Panels Nos. 2 and 3 would be set up in a cabinet of exactly the same size as the one on the left which houses the R.F. Power Supply.

That arrangement would provide for a 500 ohm coupling link between the output of the Speech Amplifier and the input to the Modulator stage. The plates of the push-pull 6L6 tubes, used in the output of the Speech Amplifier would, in this case, be coupled through a transformer matching their plates to a 500-ohm line. In the case of our own transmitter this is a Thordarson T-8975 transformer and it may be seen in the center of the Speech Amplifier deck. Incidentally, the 6L6's used in this position are generally referred to as the Driver Stage for the Modulator.

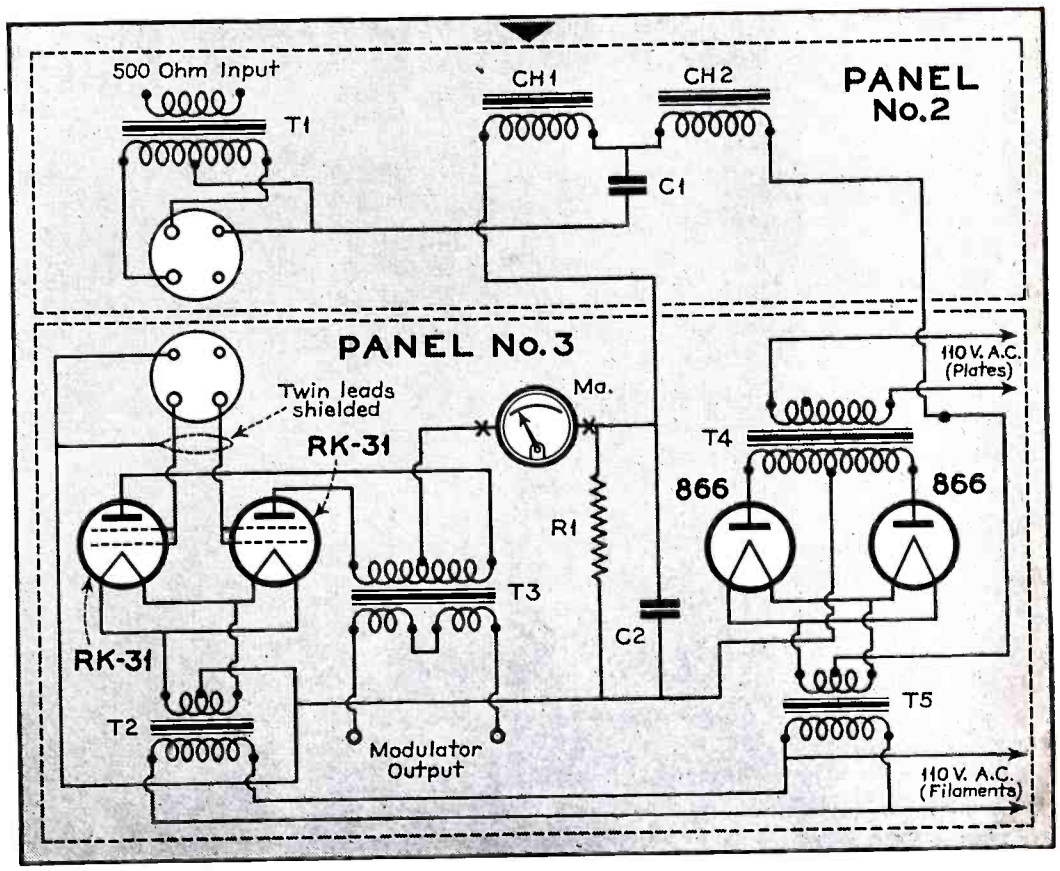
The input transformer to the Modulator stage, in our particular case, is designed to match the 500-ohm line to the grids of the RK-31's. The particular transformer that we have used has a 40-watt rating and, since the undistorted output of the 6L6's in Class A is approximately 15 watts, it will be noted that we

are dealing with equipment in a *most* conservative fashion. The particular transformer which we are using to bring this match about is the Thordarson T-6265.

Separation of Units

In the event that the additional flexibility which is provided by separating the Speech Amplifier and Modulator into two distinct units is not desired, the transformers T-8975 and T-6265 will be replaced by a single Thordarson T-7510 transformer which is designed to couple the plates of the 6L6's to the grids of the RK-31's. This transformer is about the same size as those we have been considering and it may be mounted in place of T-8975, on the deck of the Speech Amplifier, and a pair of shielded leads run directly to the Modulator grids.

In our own case we found it desirable to use the method of assembly which the rear view of the completed Speech Amplifier and Modulator shows up so clearly. Mounting the transformer T-1 and the chokes CH1 and CH2 on the deck of the power supply for the Modulator was out of the question. Furthermore, the introduction of another sub-base would have been undesirable for two reasons. Firstly, the base would stick out toward the rear of the cabinet and would tend to retain the heat from the comparatively large tubes inside the cabinet, itself. The sub-base would have to be mounted on the front panel in such a manner as to permit attaching the various units and that, in itself would be no easy matter, because of the height of the large power and modulation transformers. The arrangement shown, however, reduces the accumulation of heat and this reduction is accelerated by the "chimney effect" provided by the louvres in the side walls of the cabinet. The

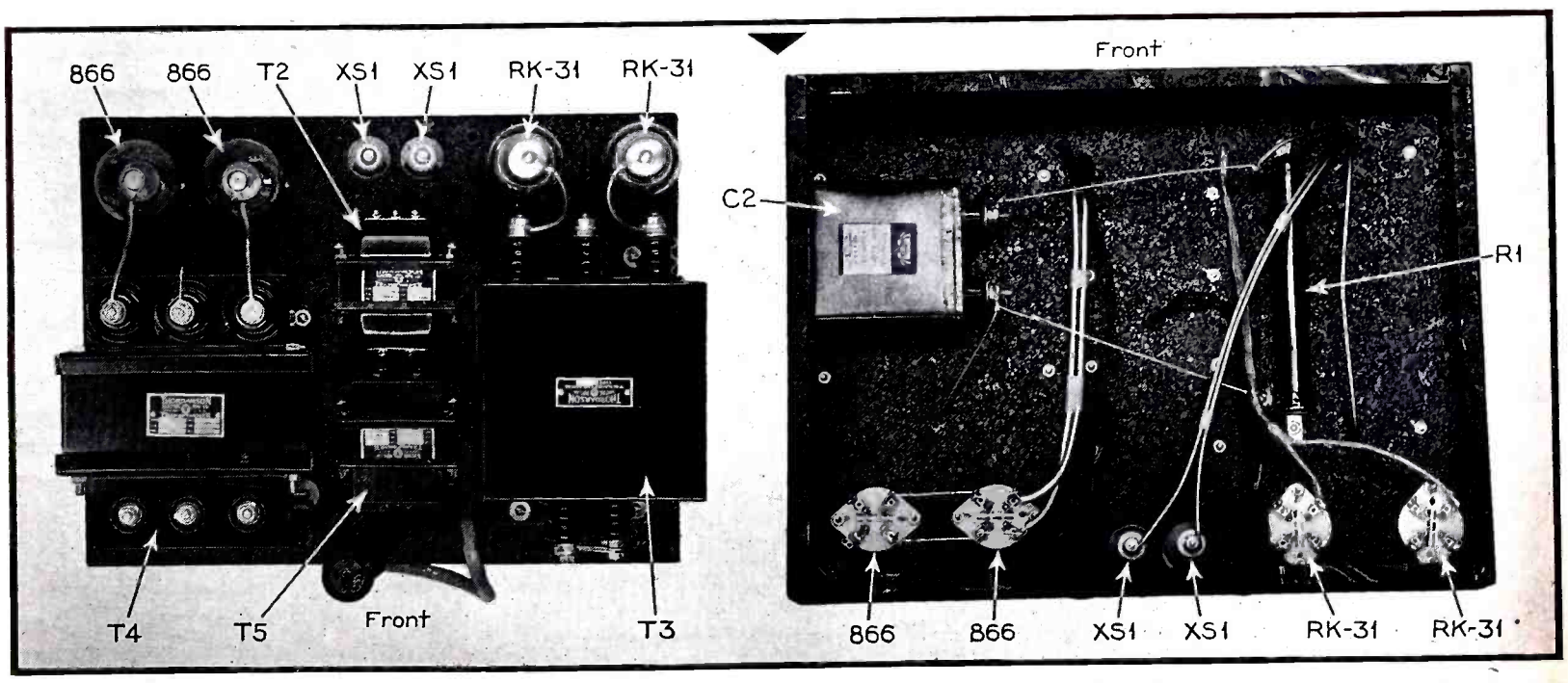


Schematic diagram of the "Flexible 400" modulator unit, consisting of two separate sections, as shown.

air around the tubes rises when it becomes warm. As it does so, cold air is drawn in through the lower louvres and the heated air is liberated through the apertures above. While continued operation of this unit has shown no tendency toward overheating, it might be desirable, under certain conditions, particularly when equipment of this nature is operated in the tropics, to provide some vent holes in the lid of the cabinet. This precaution would seem to be more important if the modulator and its power supply are mounted in a cabinet of the smaller size, such as is used for the R.F. Power Supply.

Lest we create a bugaboo about heat, a word concerning our own operation of the transmitter may be worth while. As the circuit diagram indicates, the filaments and plates of all of the tubes in the Speech Amplifier and the filaments of the tubes in all three units are on continuously. Operation of the entire assembly with the R.F. Power Supply on the floor, the Speech Amplifier and Modulator unit on top of that and the R.F. Chassis on top of the other two, has resulted in no overheating whatever. A piece of heavy linoleum has been placed between the top of the modulator unit and the bottom of the R.F. Chassis. This was done to protect the paint from scratches rather than for insulation from heat.

(Continued on page 335)



Top and bottom views of the modulator chassis. Note simplicity of wiring, and separation of condenser and resistor in under view.

PEDIGREE OF A FONE SIG

By J. F. GORDON • W7CNP

WITH the building of finer and more exact amateur 'phone transmitting equipment comes the increased desire to have a fellow amateur give just a little better signal check than the system now used. One has but to tune over any of the 'phone bands nowadays to hear such talk about "sig." as percentage modulation, carrier level, second harmonic distortion, ratio of QRM level to signal strength, and many other considerations that amateurs of a few short years ago thought of little consequence in the carrying on of two-way communication.

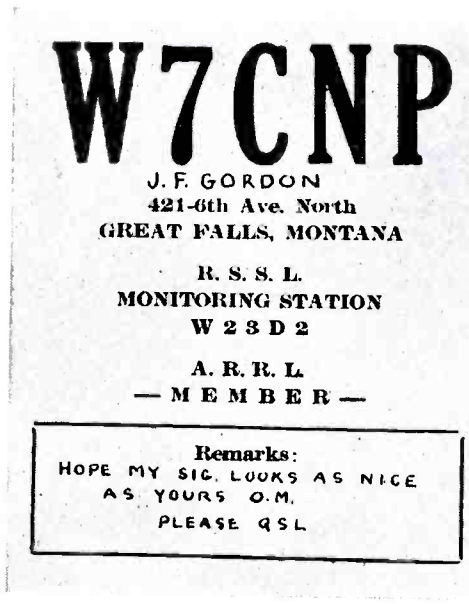
The following system, using a cathode-ray oscilloscope, gives a clear and unmistakable "pedigree" of any modulated or c.w. signal at the receiving position, providing ordinary care is taken in its adjustment.

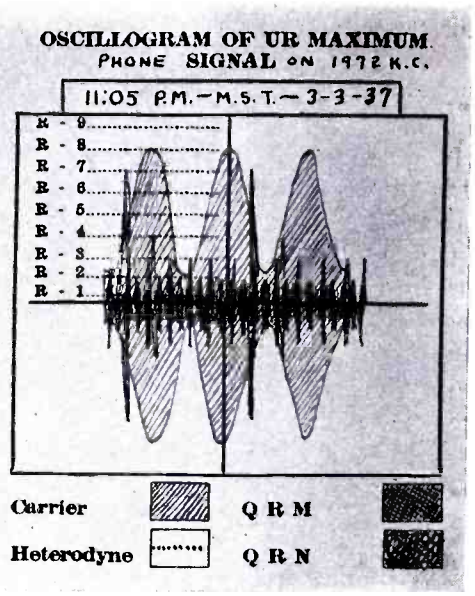
Additional Gain Necessary

In order to build up the radio-frequency voltage output of a superheterodyne receiver to 40 or 50 volts, which is the amount necessary for proper deflection of most of the oscilloscopes using three-inch tubes with electrostatic deflection, it is necessary to couple an additional i.f. amplifier to the receiver. This must be very loosely coupled so as to have no appreciable effect on the normal operation of the receiver. An amplifier with an untuned input was found to be satisfactory. A midget trimmer, offering variable capacitive coupling from the control grid of the second i.f. tube in a National FB7 was used in the system here outlined.

This allowed a balance to be brought about so that the coupling would not be so great as to bring re-alignment of the i.f. transformer in the receiver beyond the minimum capacity of its own trimmer.

In order to get an accurate check on signal distortion it is necessary to accurately align the entire receiver from a sine-wave source since the gain control has some effect on the output waveform in this system. The transmitting station will then have to modulate his signal with a wave which he knows to be sinusoidal. This is the most difficult check to make, the others being very simple by comparison.





How readings of Figs. 1 and 2 are combined on a QSL card to give a permanent record of signal characteristics and receiving conditions. Heterodyne interference may be marked in with a dotted line.

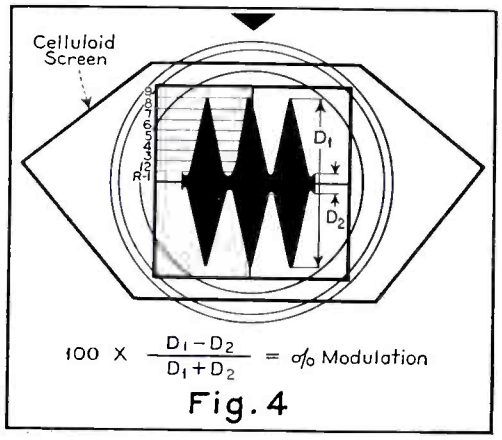


Fig. 4

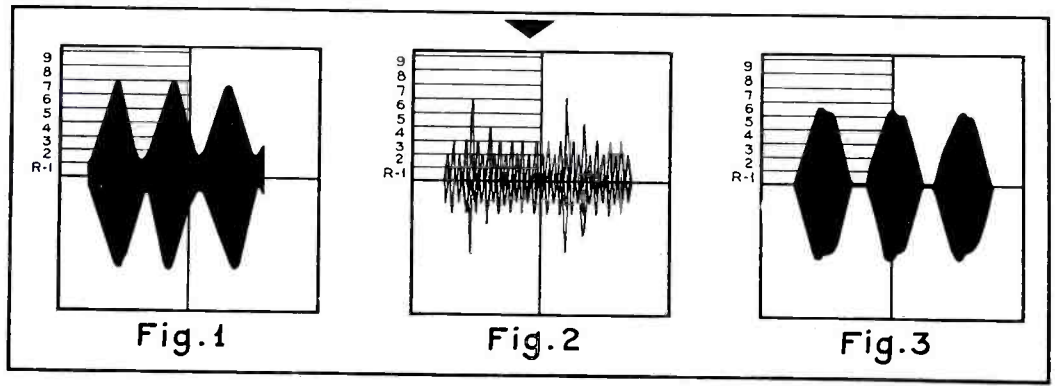
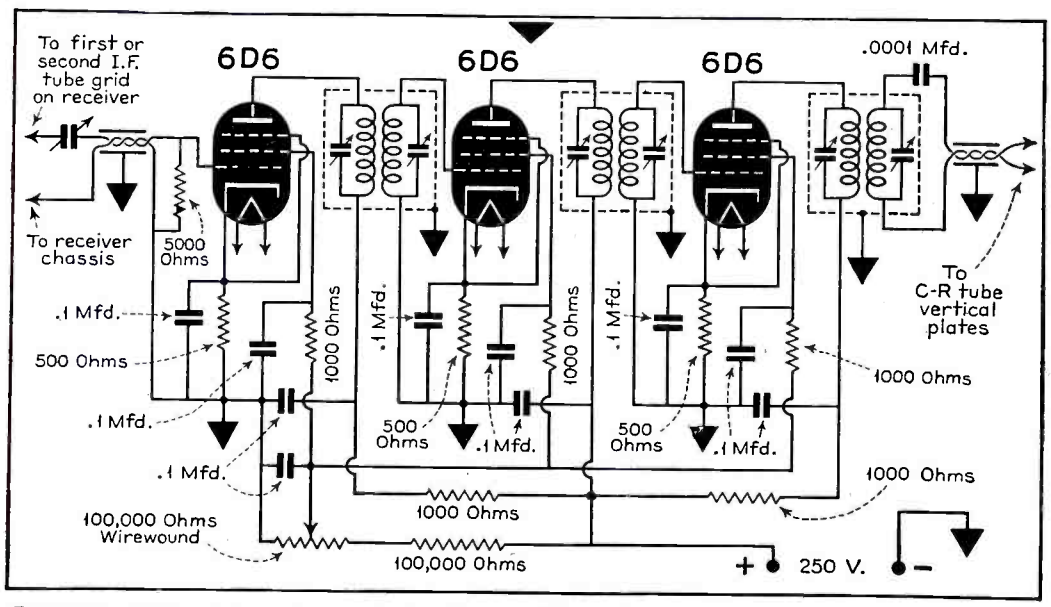


Fig. 1 Fig. 2 Fig. 3



Diagram, with parts values, of the i.f. amplifier which has sufficient gain to provide an output voltage to give full vertical deflection on an RCA 3-inch cathode-ray tube. A gain control is provided to insure proper deflection on signals of various levels.

Fig. 1—R8 sig. with good waveform modulated with fixed frequency a.f. oscillator. Fig. 2—Oscillogram with signal off, showing R3 QRM and occasional R7 QRN. Fig. 3—Overmodulation and distortion. Fig. 4—Celluloid screen for calibrating ray tube, showing method of checking modulation.

Scope of System

Some of the readings which can be made with this system are QRM and QRN level, carrier level, audio harmonic distortion, modulation percentage on both

(Continued on page 333)

Hamfest

By W8QMR
ex-2PI : LU4S

fone exams . . . cq theme songs . . . fist of the month . . . qrg at ur svc

WE were listening the other morning to a couple of feminops working 20-meter fone. One of the ladies mentioned that she preferred code for dx work, and suggested that the two of them work c.w. sometime. Whereupon the other yl said no—admitted that she wasn't much on code, that she hadn't had a key in the rig since she got her license, and in addition stated that she never expected to work anything but fone. This brings to light an interesting situation, and we hope no one jumps on our neck until we get it thoroughly aired (the subject—not our neck.)

The feminop in question took her license test during the 10-wd-per-minute era. From her own admission, she was probably just good enough to get by. A couple of years from now she will know that A is dot dash, but in all probability will be unable to pass a code test. (The opr to whom code is a second language—the yl or lad who has topped 30 words per minute—will never drop below 20, even after decades of inactivity. But the person who could "get by" at 15 can actually forget the letters of the code in one year of abstinence.) However, this feminop will not have to take a code examination when she renews her license. She will merely have to provide written proof that she has communicated with three other stations "by radio" during the three months prior to filing her application for renewal. *She does not have to make her QSOs in code.*

There is an inconsistency here. If code ability is essential when first becoming licensed, it must be equally essential at the time of renewal. It follows then that proof *of one's code qualifications* should be submitted along with an application for license renewal—something in the nature of notarized logs showing code operation totalling at least ten hours during the three months immediately preceding the application. There is a parallel to this in flying. The Department of Commerce requires proof of at least ten hours of solo flying during a period shortly previous to the application for a renewal of a transport license—lacking which a new flight test must be taken.

The gentle reader will of course point out that while no sane person will deny that one's skill as a pilot is essential to safe flying, no one will be killed if a poor code op works fone. Granted—but as far as the FCC is concerned, this code ability *is* essential, or it wouldn't be required in the first place! And about this time the ungentle reader will remark that we are adding fuel to the fone-vs.-c.w. argument, and being an old-time code opr we're taking a nasty slam at the fone ops. But we're NOT!

The point we have been leading up to is this: We do not think that a code examination should be required at any time for a person who merely desires to function on fone. Obviously such an examination means next to nothing—and a good stiff technical quiz on oscillators, amplifiers and modulators, plus the usual questions on laws and regulations, should suffice. The code operator should of course pass a code test and the rest of the exam—*less the dope on modulators.* A code or fone ticket could be modified to include both forms of operation by passing both code and fone requirements. Renewal of code privileges would be granted only upon adequate proof of continued code ability—such as by submission of logs as suggested above.

This procedure would merely *be consistent* with the FCC's regulation governing commercial operators! Commercial radio-telephone operators do not have to pass a code test (however radiotelegraph operators may be required to show knowledge of radiotelephone apparatus). Upon passing the supplementary examination, either type of license can be endorsed to cover both services.

So, say we, if a person wants to talk, let him or her talk without requiring the operator to learn something that he or she *is not required* to remember!

The crop of antenna systems at W4DDM. A 20-meter vertical has been erected since this foto was taken.

◆

ONE OF THE finest antenna (or rather antennae!) layouts we've ever seen is the installation (or rather installations) at W4DDM, Davis Island, Tampa, Fla. Fours masts—two of them eighty feet high—provide plenty of room for perfect combinations from a half-wave 160-meter zep to a Johnson Q on ten meters. The shack itself is in proportion, as will be observed from the photo snapped when W8QMR was portable for the winter.

◆

W8QGD, OF DETROIT, Mich., checked our QRA (which is Livingstonville, N. Y.) in the call book after having a QSL card returned as undeliverable. It appears that someone is taking the call of W8QMR in vain, and giving 12902 or 13902 Lappin, Detroit, as the QRA. Personally, we don't like the call anyway. (Try and send it sometime without stumbling all over *W8QRM.*) So it's all right with us if the bootlegger uses good English, sends nice snappy calls, can give and take at 35 w.p.m., makes judicious use of abbreviations, has a nifty swing on the bug, perfect modulation and no harmonics. We appreciate all these little touches which might enhance our reputation. However, the FCC might object—and then again a party who lifts a call probably doesn't possess the qualifications listed above which might do right by it.

Hence any further dope on the culprit will be welcome.

◆

WE HAVE JUST checked our RCA piezo-electric calibrator against WWV's standard frequency transmissions and found it right on the dot—within 100 cycles on 15 mc. So we'll be glad to oblige any ham asking QRG? on 40, 20 and 10.

(Continued on page 312)

Globe Girdling

By J. B. L. Hinds

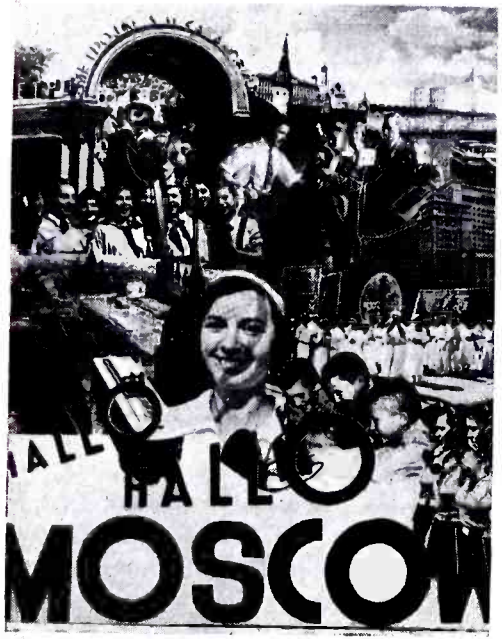
collective reporting . . . trip below 5000 . . . tg2 veries . . . the ceb mystery . . . french communist station . . . new german list . . . german ships . . . war stations

DUE to the rapid growth of radio in short-wave broadcasting and with it the continual changing in frequencies and the numerous additions of stations, the writer is confronted with the problem of gathering and presenting the information which you as listeners desire. This is being accomplished by your generous assistance. No one person can assemble it alone.

As our contact direct by letter with the listeners widens, we are both surprised and pleased at the response from readers and the willingness displayed in furnishing items of interest in exchange for similar information given. And while our correspondence is exceedingly heavy, we might say we enjoy the contacts as well as our duties in radio. The spirit shown demonstrates the desire of all to assist in obtaining the latest information available.

Each listener can assist in perfecting the Station List, Address, and Station Signature sections by comparing each new verification or letter received with the present lists and promptly advising this department of all changes noted in frequencies, time on the air, etc., as well as giving information as to new stations heard or other items of interest to the listeners. In sending information please give source from which received in each case.

And while it is not possible to give credit or recognition to each who so willingly contributes to the section, the writer extends his thanks to you collectively for your assistance and continued loyalty.



Composite picture postcard from RAN, Moscow.

NEW STATIONS

K.C.	*Meters*	*Call*	*Location*
31600	9.4	W1XKA	Boston, Mass.
27800	10.79	DGF	Nauen, Germany
27400	10.95	DGE	Nauen, Germany
26800	11.19	DGX	Nauen, Germany
24300	12.35	DGV	Nauen, Germany
23350	12.85	DGT	Nauen, Germany
22800	13.16	DGS	Nauen, Germany
20500	14.63	DGQ	Nauen, Germany
20140	14.90	DGW	Nauen, Germany
19947	15.04	DLO	Rehmate, Germany
19700	15.23	DFJ	Nauen, Germany
19460	15.42	DFM	Nauen, Germany
18700	16.04	DFQ	Nauen, Germany
17650	17.00	XGM	Shanghai, China
17341	17.30	DGR	Nauen, Germany
17265	17.38	DAF	Norddeich, Germany
15280	19.63	HI3X	Ciudad Trujillo, R.D.
14665	20.46	DFD	Nauen, Germany
14605	20.54	DGZ	Nauen, Germany
14410	20.82	DOT	Konigs, W'n., Germany
13275	22.60	DAF	Norddeich, Germany
13100	22.90	DAF	Norddeich, Germany
12035	24.93	DGL	Nauen, Germany
11730	25.57	XETM	Villahermosa, Mexico
11340	26.46	DAF	Norddeich, Germany
10210	29.38	DGD	Nauen, Germany
10128	29.62	DON	Konigs, W'n., Germany
9920	30.24	DGM	Nauen, Germany
9590	31.28	VK6ME	Perth, W. Australia
9523	31.50	"Radio Liberte"	Paris, France
8765	34.23	DAF	Norddeich, Germany
8670	34.60	YN1PR	Managua, Nicaragua
8330	36.01	DAS	Rugen, Germany
7812.5	38.40	DFT	Nauen, Germany
7380	40.65	"Radio Liberte"	Paris, France
7332.5	40.92	DLC	Rehmate, Germany
6600	45.45	DAF	Norddeich, Germany
6250	48.00	YV5RJ	Caracas, Venezuela
6070	49.42	CFRX	Toronto, Ont.
6045	49.62	XETW	Tampico, Mexico
5635	53.24	DAS	Rugen, Germany
5355	56.23	DOG	Konigs, W'n., Germany
5255	57.09	DOF	Konigs, W'n., Germany
4500	66.67	DAS	Rugen, Germany
4400	68.18	DAF	Norddeich, Germany

STATION CHANGES

New Frequency	*New Call*	*Old Call*	*Old Frequency*
31600		(1)W1XKB	31600
20020	DFZ	DHO	20020
15360	DZG	DJT	15360
15230		OLR5A	15220
11795		DJO	11800
10670	HPH	HBP	10670
9650		CT1AA	9665
9650		DGU	9620
9540		VPD-2	8720
9480		EAQ-2	9490
6668		HC2RL	6635
6310		TG-2	6300
6260		OAX4G	6230
6150		(2)HI5N	6150
6120		XEUZ	6117
5905	TILS	(3)TIMS	5905
5670	DAF	(4)DAN	5670

(1) Location changed to Springfield.
(2) Location changed to Moca.
(3) Location changed to San Jose.
(4) Location changed to Norddeich.

STATIONS DELETED

K.C.	*Meters*	*Call*	*Reason*
19235	15.60	DFA	Not in service
17260	17.37	DAN	Not in service
15595	19.24	DFR	Not in service
14410	20.80	DIP	Not in service
12394	24.21	DAN	Not in service
9810	30.58	DFE	Not in service
8470	35.39	DAN	Not in service
7445	40.30	HBQ	Not in service
6680	44.94	DGK	Not in service
4795	62.56	VE9BK	Not in service

NON-AUTHENTICATED STATIONS

Frequency	*Call*	*Location*
21550	GST	England (June)
11760	XETA	Mexico (June)
11730	XETM	Mexico (June)
9565	HP5S	Panama (May)
8910	"Radio Eritrea"	Africa (May)
8600	HC1EC	Ecuador (May)
7600	HC1RJ	Ecuador (May)
7200	HC1AJ	Ecuador (May)
6600	HI6H	Dom. Rep. (May)
6500	YV1RM	Venezuela (Feb.)
6425	OAX4K	Peru (May)
6420	YV6RC	Venezuela (May)
6320	HC1RE	Ecuador (May)
6128	OAX7A	Peru (May)
6122	OAX4P	Peru (May)
6122	OAX6A	Peru (May)
6122	HP5H	Panama (May)
6120	HP5Z	Panama (May)
6110	"Radio Guardia Civil"	Sp. Morocco (May)
6035	CXA-2	Uruguay (June)
6000	OAX5C	Peru (May)
5940	"Radio Curom"	Curacao (May)
	HP5A	Panama (May)

Radiophone and Experimental Stations

OPL, 20040 kc., Leopoldville, Belgian Congo, heard phoning ORG, 19200, Brussels, Belgium between 7 and 8 A.M.

PLW, 9480 kc., Bandoeng, Java, heard talking with KWX, 7610 kc. Dixon, Calif., between 9:45 and 10 A.M.

PSE, 14935, kc., Rio de Janeiro, recently heard broadcasting a program in German, about 4 P.M.

VE9AS, 6425 kc., Fredericton, New Brunswick, gives weather reports at 11 A.M. and 10 P.M.

XOJ, 15800 kc., Shanghai, China, heard working IRY, Rome, Italy 7:28 to 7:41 A.M. Also Tokyo 8 P.M. to 1 A.M.

KAX, 19980 kc., Manila, P. I., heard calling JVF, 15620 kc., Nazaka, Japan at 8:10 P.M.

LSL-3, 15810 kc., Buenos Aires, Argentina, heard working with PSE, 14935 kc., Rio de Janerio, Brazil at 8 P.M.

SUZ, 13820 kc., and SUV, 10055, Cairo, Egypt, recently heard with R7-8 signals sending program material to GBB, 13585 kc., Rugby, England, which in turn was relayed to CGA-3, Drummondville, Quebec, Canada, for the Canadian network.

XGM, 17650 kc. and XOJ, 15800 kc., Shanghai, China, heard phoning KWU, 15355 kc., Dixon, Calif., and JVE, 15660 kc., Nazaki, Japan, respectively, between 6 and 9 P.M.

ITK, 16385 kc., Mogdishu, Somaliland, Africa, is heard often phoning IBC, 14410 kc., San Paolo, Italy, between 9 and 11 A.M.

Veri Slow

The following stations are still being listed as slow in forwarding verifications covering reception reports filed:

HJ1ABB, HJ4ABD, HJ4ABB, Colombia; HCETC, Ecuador; HRN, Honduras, CB960, Chile; HI2D, Dominican Republic; TIEP, TIGPH, TIPG, Costa Rica; VP3BG, British Guiana; PZH, Dutch Guiana.

Station Flashes

VPD-2, 8720 kc., Suva, Fiji Islands, has changed to 9540 kc., its former frequency as it is being heard there regularly and not on 8720 kc. Some say that it will also transmit on 8720 and 13075 kc., but we will await word from the station before making any further statement.

VPB, 6160 kc., Colombo, Ceylon, which was mentioned in March "Globe Girdling"—The Secretary of the Radio Club of Ceylon and South India advises that the short-wave transmitter at present in use was constructed by the Departmental Engineers and has an approximate power of 300 watts. It was built, primarily, to enable listeners in Ceylon to hear Colombo's programs when static conditions during the monsoonal seasons prevent reception of the medium wave station, but the signal of the short-wave transmitter is probably better received at greater distance, such as Singapore and Australia; it has also been frequently reported from England. At 14.30 GMT or 9:30 A.M., EST, a time signal of six "pips" is given. Interval signal of station is "Bow Bells," but infrequently used.

GST, 21550 kc., or 13.92 meters, has been added to the calls used by the British Broadcasting Corporation.

VP3MR, 6010 kc., "The Voice of Guiana," Georgetown, British Guiana, is broadcasting on a new daily schedule. This station opens its programs with a march, "Empire Parade" and advise that

This honey from YV1RK-L, Venezuela, is in blue and magenta.

they usually close at night with Ted Lewis' "Good-night Melody," followed by the National Anthem. Station announcements are made every fifteen minutes. The time signal given at intervals by the studio clock. (Westminster Chimes.) VP3MR began operations in January 1935 and is working to fill the needs of the public and to take the place of the pioneer broadcasting station VRY, formerly located at Georgetown, which operated from late in 1928 to March 1931, when it was closed due to the then existing financial stringency. Many of the old-time listeners have pleasant memories of VRY and prize their neat veri card from Guiana, "Land of Many Waters and Eternal Summer," printed in red lettering on a blue background under the seal of the country.

Last Minute Flashes

CR6AA, Lobito, West Africa, advise they are now transmitting on both 7177 kc. and 9666 kc., the first-mentioned frequency being the old one formerly used by them.

HCETC, Guayaquil, Ecuador, state they are on 6975 kc. until 8 P.M. and 9350 kc. after 8 P.M. on Mondays and Saturdays.

HP5H is the call of the latest station in Panama City on 6122 kc.

XEFT, Vera Cruz, Mexico is not using 6120 kc. All programs on 9510 kc. only.

HC2RI, Guayaquil, Ecuador, changed in this issue from 6635 kc. is on 6668 kc. according to letter just received from station.

"Radio Guardia Civil" is transmitting nightly except Sunday on 6508 kc. from 7 to 8 P.M. from Tetuan, Spanish Morocco.

YV5RJ, 6250 kc., Caracas, Venezuela. Reports would indicate short-wave call is YV5RI and long-wave call YV5RJ.

EATA is the call of new short-wave station at Monterrey, Mexico, which is mentioned in this section.

SM5SX, 11705 kc., Stockholm, Sweden, is probably not call for frequency. New station at Motala, Sweden, on 25.63 meters or 11705 kc. and also on 49.46 meters. SM5SX thought to be on 20 meters only.

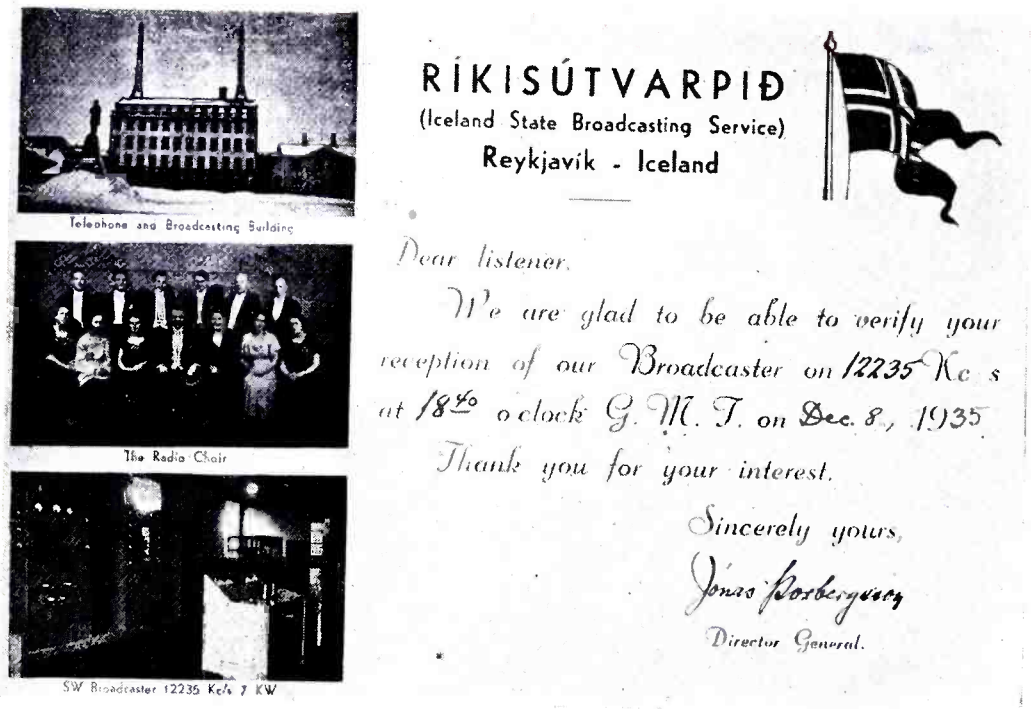
HJ1ABB, 6128 and 9560 kc., Barranquilla, and HJ2ABC, 9575 kc., Cucuta, Colombia, are not now being heard on these frequencies regularly of late. HJ1ABB is being heard near 4780 kc. and signs off with the usual announcement, "La Voz de Barranquilla, and the familiar "La Golondrina" when closing at 11 P.M. At about 4790 kc. it is thought that HJ2ABC is carrying on with its usual interesting Spanish programs.

What's Below 5000?

The writer ventures to say that the majority of listeners do not listen a great deal below 5000 kc. It might be interesting to make an exploration trip below that frequency, even if some are required to change coils in order to do so.

Belgrade, 6100 kc. Mention was made in "Last Minute Flashes" in May issue that Belgrade had been heard on 9590 kc. It is learned from the station direct that arrangements have been made with PCJ to relay an occasional broadcast over PCJ on 9590 kc. Two of these rebroadcasts were made on April 1st and 14th. Special aerials are used on these transmissions. The programs are transmitted by Belgrade on 6100 kc. and relayed by PCJ. These broadcasts are designed for the benefit of Yugoslavian residents in North and South America. It is understood that Belgrade has set aside sufficient funds to erect a new 10 kw. station and when this transmitter has been completed and placed in operation, the rebroadcasts in question will be discontinued over PCJ and transmitted directly by Belgrade.

EAQ-2, 9490 kc. has been changed in station list to 9480 kc. and 31.65 meters, as frequent announcements are to that effect. The complete schedules



A neat veri from Iceland. Flag is blue with red cross.

for EAQ on 9860 kc. and EAQ-2 have not as yet been received or heard. One announcement was made that the call EAQ-2 would be changed to EAR on April 20th, but to continue making reports for a while to EAQ-2. At least all listeners are no doubt able to hear the latter station, as it is a good R9.

Mexican Stations

XETW, 6045 kc., Tampico, Mexico, has been added to lists. This station was mentioned in this section in May issue.

XETM, 11730 kc. Villahermosa, Mexico, is another new short-wave station shown in list and is in line with recent lists of stations received from the Mexican Government.

Another new short-wave station is said to be in operation at Monterrey and relaying programs on 11760 kc. transmitted by long-wave station XET, known as "El Pregonero del Norte," Apartado 203, Monterrey, Mexico.

TG-2, Guatemala City, Guatemala, is now broadcasting on 6310 kc. The station advises that the new veri cards will be forwarded to all listeners who have sent in correct reports, as quickly as possible after their receipt from the printers.

2RO-3, 9635 kc. and 2RO-4, 11810 kc. are still carrying the Rome programs as shown in station list. It is understood, however, that the afternoon and evening programs will be switched from 9635 to 11810 kc. The time on the air has not been changed, so tune for them on 11810 kc. if not found on 9635 kc.

VK6ME, 9590 kc., Perth, West Australia, is on the air each day except Sunday between 6 and 7 A.M. It is assumed that this is a tentative schedule.

VE9DN, 6005 kc., Montreal, Quebec, Canada, is now broadcasting personal messages to the inhabitants of the extreme northern portion of this continent on each Saturday from 11 P.M. to 12 Midnight.

RNE, 12000 kc., Moscow, U.S.S.R., is now being used in place of RV59, 6000 kc. and will continue to carry the English programs on Sundays, Mondays, Wednesdays and Fridays, between 4 and 5 P.M.

VE9BK, 4795 kc., Vancouver, British Columbia, Canada, has been deleted from station lists as advice has been received from the station that the transmitter has been dismantled and they doubt very much if it will be in operation during the present year.

CT1AA, 9665 kc., Lisbon, Portugal, has changed its frequency to 9650 kc. It is on the air from 4 to 7 P.M. on Tuesdays, Thursdays and Saturdays. World Radio, London, says CT1AA is also on 11830 kc. A recent card from them, however, shows no other frequency than 9650 kc.

HCODA, 9440 kc., Guayaquil, Ecuador. Several listeners report hearing the call as above in English, so at least we are progressing. No veri cards or letters yet received according to reports received at the time of writing. Excellent programs and a steady, consistent carrier.

CEB Mystery

CEB, 12300 kc., Santiago, Chile. Barry Sesma, Los Angeles, Calif., reports receipt of letter verification covering his reported reception on the above frequency. Call shown as CB615. Station slogan "Radio Service." Owned by Desmaras and Cia, Ltd., Bandera 176, Casilla 761, Santiago, Chile. No mention of frequency or time on the air. The mystery deepens!

CR7BH, 11718 kc., Lourenco Marques, Portuguese East Africa, is being heard in the East, but the greater majority of reports are from the west. As stated in this section in April, other frequencies in 19-25-31 and 48 meter bands will be used, with directional aerials to South Africa and Portugal, when their new 10 kw. transmitter is placed in operation.

TI4NRH, 9670 kc, Heredia, Costa Rica, is said to have laid plans to broadcast simultaneously on 9670 kc. and 14428 kc., the report being that special antennas will be erected to improve the service for South Africa, the West Coast of the United States and Japan.

HAT-4, 9125 kc., Budapest, Hungary, is now broadcasting regular programs on Sundays and Wednesdays from 7 to 8 P.M. and on Saturday evening from 6 to 7 P.M. HAS-3, 15370 kc., will continue to carry its Sunday morning broadcast from 9 to 10 A.M.

OLR2A, 6010 kc., OLR3A, 9550 kc., OLR4A, 11840 kc and OLR5A, 15230 kc. are now being used for the transmission of Czechoslovakian program. They are now printing a detailed program and forwarding to listeners covering Transmissions 1-2 and 3.

TIMS, 5905 kc., Puntarenas, Costa Rica, has been changed to TILS, and location to San Jose. Their address is P. O. Box 3, San Jose, Costa Rica.

SM5SX, Stockholm, Sweden, is said to be broadcasting on 11705 kc. and 6063 kc. No reports, however, have been received of transmitter on 6063 being heard. The Engineer in charge of the installation of the new facilities is Frank Hammar, who operated the Addis Ababa stations in Ethiopia prior to the occupation by the Italians.

French Communist Station?

"Radio Liberte," 9523 and 7380 kc., Paris, France, is on nightly between 7 and 8 P.M. Station transmits simultaneously on both frequencies, and has a strong consistent carrier, though meeting with considerable interference from other carriers on 9523 kc. and a great amount of c.w. on 7380 kc., but overriding all very well. Music and songs at stated periods, the balance of the hour consumed in talks, apparently in Italian. It is said to be operated by Communist agents in France. Address is Stato Operai, 25 Liberte, Paris, France.

YV5RJ, 6250 kc., Caracas, Venezuela, one of the new stations listed in the non-authenticated block, is on the air with test programs and therefore has been added to the station lists. It has been heard in the late afternoons and early evenings. Station called "La Voz de la Esfera" and owned by Senor Edmundo Suegart.

HI4V, 6450 kc., San Francisco de Macoris, Dominican Republic, signs at 8:45 and 9:15 P.M. with the "Main Stein Song," which was quite popular one day, and yet well known. Station announces each 15 minutes in Spanish, English and French.

W9XAA, 6080 kc. and 11830 kc., Chicago, Ill., are said to be off the air temporarily, making changes in transmitter due to increase in power.

YNLAT, 7200 kc., Granada, Nicaragua, reported heard irregularly. Station called "La Voz del Mombacho," and owned and operated by Sr. Leonidas A. Tenorio, Apartado 17, Granada. Department of Commerce bulletin, however, shows frequency as 7280 kc., but reports no call letters.

CXA-2, 6035 kc., Montevideo, Uruguay, is reported on the air, or soon to be on the air, with 500 watts power and operating from 10 A.M. to 12 Noon and 4 to 10 P.M. Address given as Rio Negro, 1631, Montevideo.

LZA, 14970 kc., Sofia, Bulgaria. Late information direct from station is that it is broadcasting on the above mentioned frequency with 1.5 kw. power and on the air Sundays from 12 A.M. to 4:30 P.M. and week days from 5 to 6:30 A.M. and 11:30 A.M. to 2:45 P.M. E. S. Times.

PPQ, 11670 kc., Rio de Janerio, Brazil, has been quite active of late broadcasting evening programs, usually closing down from 8:15 to 8:30 P.M. It is not known if there is a probability of regular service.

XEPW, 6110 kc., Mexico City, "La Voz del Aguila Azetca Desde Mexico" (From all over the world) advise that at 11:30 P.M. E. S. Time each night on the air they thank all listeners who take time to write them. Station signal 4 or 5 chimes of gong. Programs opened and closed daily with the march, "Valladolid Azteca."

YN1PR, 8670 kc., Managua, Nicaragua, is now shown in station list.

Java Frequency

YDB, 9610 kc., Soerabaja, Java. A recent list from Bandoeng gave the frequency as listed above, but listeners report a Java station on 9540 kc., and insist no carrier on 9610. It may be that YDB has again changed frequencies. Further reports would be appreciated.

HIN, 11260 kc. Reports are still coming in that this station is being heard on 12500 and 12100 kc. They are still on 6243 kc. with regular evening programs. Any report received direct from the station will be appreciated.

HI3X, 15280 kc., Ciudad Trujillo, Dominican Republic, has been added to station list and the complete time schedules of HI1X, 6340 kc., HI2X, 11960 kc. and HI3X, 15280 kc. are now shown in station lists.

HI5N, 6150 kc., Santiago, has changed its location to Moca, Dominican Republic and is now known as "La Voz de Moca."

TFJ, 12235 kc., Reykjavik, Iceland, has a new veri card which is reproduced in this section. Iceland advises that they broadcast each Sunday from 1:40 to 2:30 P.M., E. S. Time. During the first half of this time they broadcast in English. Programs are finished by singing the Icelandic National Anthem. Programs in German 2:05 to 2:40 P.M. first and third Sundays of each month, and in Danish, Norwegian or Swedish at same time on second and fourth Sundays of each month.

The British Broadcasting Corporation advise that the work in connection with the installation of the new high power transmitters and aerial arrays at Daventry is progressing in a very satisfactory manner and before you shall have read this it is possible that you have heard these transmitters carrying out their service tests. They would be interested in any reports you might make to them should you notice any considerable increase in the signals you receive from Daventry.

EAQ, Madrid, advises that due to the war and all the difficulties it has brought with it, they were obliged to discontinue the publication of their monthly magazine. They state that when things return to normal they shall resume forwarding to their subscribers.

German Stations

Germany: A complete revision of all radiophone and experimental stations is reflected in the station list in this issue and the changes and additions are shown under the captions "New Stations," "Station Changes" and "Stations Deleted."

We are also listing below the station calls of German ships where power is 400 watts or more and which may be interesting and helpful.

Ship	*Call*	*Watts*	*K.C.*
Bremen	DOAH	700	4050
Arcona	DHDL	700	4050
Deutschland	DJNB	700	8470
Europa	DOAI	700	11140
Hamburg	DHJZ	400	12600 & 16665
New York	DJNY	700	12600 & 16665
Ostmark	DORM	600	12600 & 16665
Westfalen	DODB	700	12600 & 16665
Schwabenland	DOFN	700	12600 & 16665

The station near 9460 kc., mentioned in May article, evidently was not so keen on its location there and since has been heard sparring for an opening around 5940 kc. Some say it styles itself "Radio Curom" and announces its frequency as 5930 kc. or 50.6 meters and it is heard from 6:30 to 8:30 or 8:45 P.M. It is surmised that station is on the Dutch West Indies island, Curacao, and possibly located at Willemsted, about the only place it could be located on the island mentioned.

Japanese Overseas Programs. The schedules shown in station list of time on the air for JVM, 10740 kc., JVN, 10660 kc., JZJ, 11800 kc. and JZ1, 9535 kc. were taken from the detailed printed programs being sent to listeners by Japan. The signals of these stations are not coming into Eastern United States any too well and improvement is not looked for until the new 50-kw. stations are in operation.

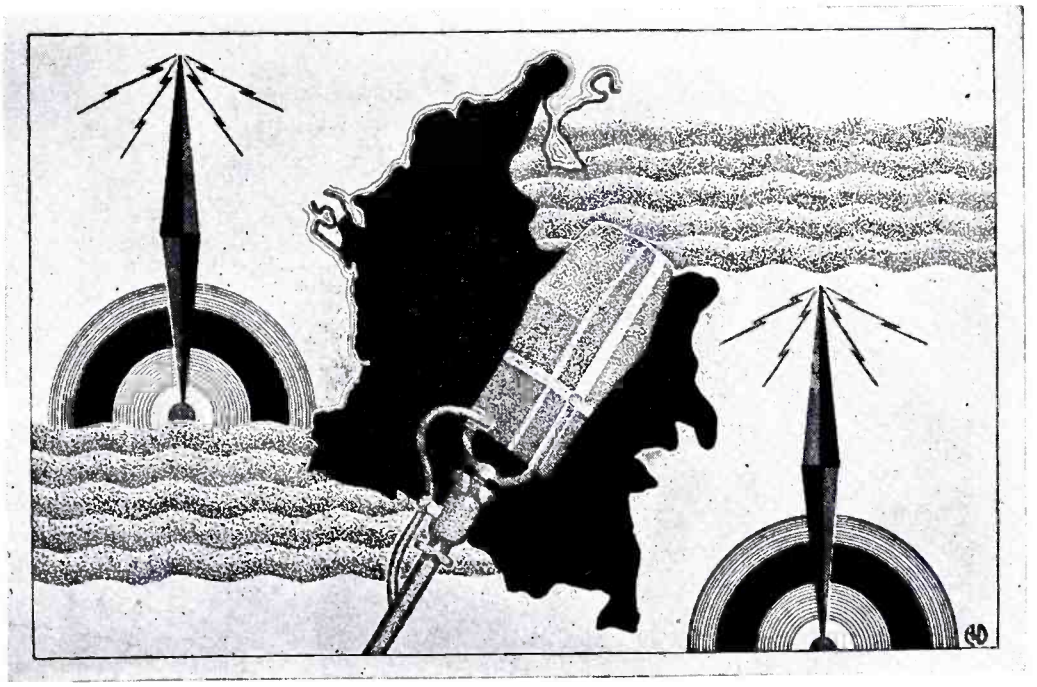
The Turkish Government is contemplating the erection of a powerful short-wave station to be located in the capital city, Ankara.

Czechoslovakia, as well as Japan, are now sending to listeners detailed printed programs covering their various transmissions, namely Nos. 1, 2 and 3.

"War Stations"

Below is a list of "War Stations" assembled from various sources, and while the writer will not vouch for correctness, or even state that they are all in existence, they are being offered for what they are worth.

Call	*Location*	*Frequency*	*Time*
ECNI	Barcelona	6990	12-7 P.M.
PSUI	Barcelona	7120	2:30-5:30 P.M.
ECP-2	Barcelona	7143	1-3:30 A.M.
EAH	Valeras	9480	4-5 P.M.
SNU	Barcelona	7000	2 P.M.
EAPI	Barcelona	7080	5 P.M.
EDNEHY	Madrid	10070	3:30-5:30 P.M.
ETQ	Madrid	9680	5:15-9:15 P.M.



Modernistic veri in blue and yellow from HJ4ABE-K. Unfortunately the calls do not appear here, but they are on the card.

Card is pink, printing is blue and call is red. Pretty in the original.

EARR	Madrid	14500	4-5 P.M.
2FP	Bilbao	7000	4:30-4 P.M.
ZB1H	Malta	14500	5:30-7:30 P.M.

Amateur 'Phones

The following is a list of 20-meter amateur 'phone stations reported in late lists and which have not been listed in previous reportings in this section.

Country	*Frequency*	*Calls*	*Time*
Australia	HF	VK2EX-2VV-2CP-2CE-2DK-2ZC-3WD-3XZ-3HF-3XR-4VD-4VJ-6MW	1-8 A.M.
Australia	LF	VK2BK-2XF-2ADY-2VB-2ADV-2LX-2GU-3RW-3ZZ-3PL-3HW-3LI-4BS-4RG-4JU-4TU-4GG-4JX-4JS-5WJ-6H1	1-8 A.M.
Antigua	LF	VP2BC	11:47 P.M.
Argentina	LF	LU1QA-2CA-7AC-9BV	5-10 P.M.
Argentina	HF	LU9KA	9 P.M.
Belgian Congo	LF	OQ5AA	5:29 P.M.
Belgium	LF	ON4ZA	1:30 A.M.
Brazil	HF	PY2AC	7:20 P.M.
Brit. Honduras	LF	VP1WP	9:32 A.M.
Bolivia	LF	CP1AA	11 P.M.
Canary Islands	LF	EA8AE	9 P.M.
Chile	LF	CE1AO	8:32 P.M.
Colombia	LF	HK1AM-1BK-3LB-4NE	11 P.M.-1 A.M.
Colombia	HF	HK2GK	11:42 P.M.
China	LF	VS6AJ-XU8HW	8:30-9:52 A.M.
Cuba	LF	CO2OK-2ON-2WM-2QQ-2MT-2JG-7ZA-7CW-8OG	5-11 P.M.
Costa Rica	LF	TI3AW-2LR	9-10:30 P.M.
Dominican Rep.	LF	HI7I	9 P.M.
England	LF	G2NQ-2CU-5TH-5OV-5LV-6KV-6JF-6DL-8HH	2:15-8:15 A.M.
England	HF	G5ZJ-6DT-8BK	2:15-8:15 A.M.
Ecuador	HF	HC1ABM-1JB	11 P.M.-12:51 A.M.
France	HF	F8QD	3:12 A.M.
France	LF	F3HZ-3FA-3CP	2:45-3:45 A.M.
Greece	LF	SV1KE	5:48 P.M.
Greece	HF	SV1NK	5 P.M.
Hawaii	AB	K6MZK-FAB	1:10-3:50 A.M.
Italy	LF	I1TKM-CKN	8-10 P.M.
Java	HF	PK2VD	8 A.M.
Java	LF	PK1AR-1VM-1PM-1ZZ-1DX-3WI-3EB-3GD-4MX-6CI	7:30-9:55 A.M.
Malaya States	LF	VS2OA	9:50 A.M.
Mexico	LF	XE1AX-1LC-1BT-3W	7:55 P.M.-1 A.M.
Porto Rico	LF	K4UG	.....
Philippine Is.	LF	KA1AN-1DL-1ER	9-9:51 A.M.
Peru	LF	OA4AQ	1:30 A.M.
Peru	HF	OA4AC	12:50 A.M.
So. Africa	HF	ZS2X	11:50 P.M.
Sierre Leone, Af.	LF	ZD1JR	9:45 A.M.
Sweden	LF	SM7UC	9:40 P.M.
Sweden	HF	SM5SV	6:04 P.M.
Scotland	LF	GM6NX	5:36 P.M.
Scotland	HF	GM2BI-6RG-6WD	6 P.M.-1:51 A.M.
Venezuela	LF	YV4AM-5ABE	5:33 P.M. & 6 A.M.
Venezuela	HF	YV5AZ	11:20 P.M.

While it is not possible to list the names of those sending in reports we are grateful to the many who have supplied the information for this 20-meter section.

As information to those interested we are listing below the addresses of certain stations which may not appear in the Amateur Call Book: OQ5AA (formerly ON4CGW) Dr. George W. Westcott, Tondo via Irebu, Belgian Congo, Africa. OQ5AE (formerly ON4CSL) Carroll R. Stegall, American Presbyterian Congo Mission, La Bondai, via Tshimbulu, Kasai, Belgian Congo. SV1KE (14460) C. Tavaniotis, 17 Bucharest St., Athens, Greece. SV1NK 23 Invorou St., Athens, Greece.

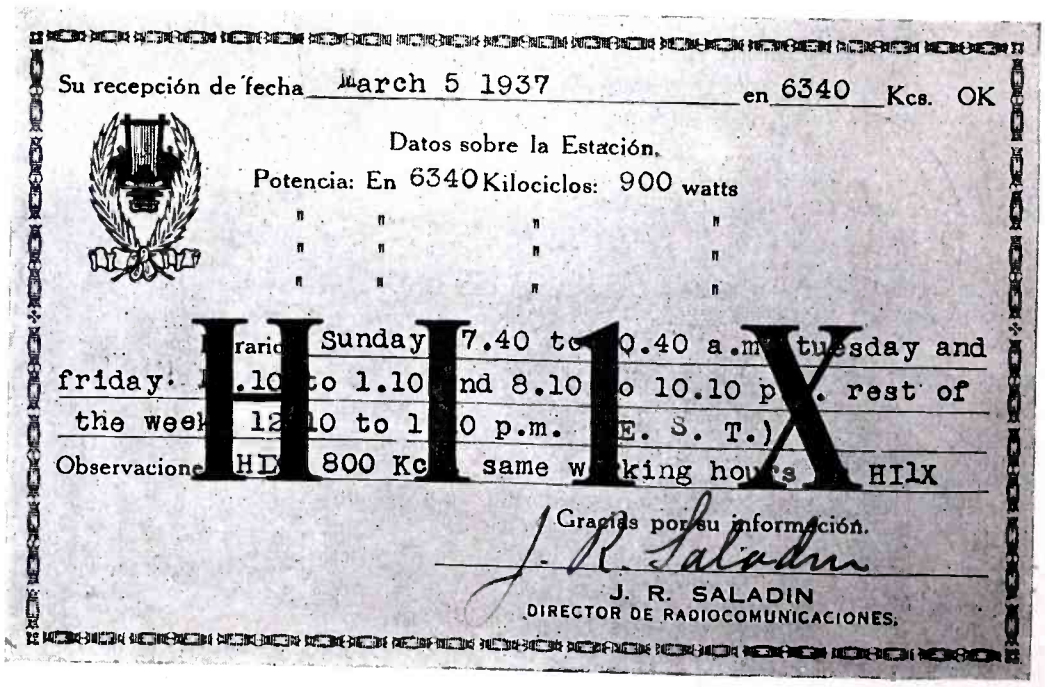
The prefix letters of amateur stations in Scotland have been changed to "GM" and those of the Belgian Congo to "OQ."

Acknowledgements

It is with pleasure that we acknowledge letters and reports from Mr. T. G. Brawley, Greenville, Ohio; Frank Burgess, Hollywood, Calif.; G. H. Boggs, Jr., Atlanta, Ga.; Samuel Brodsky, New York, N. Y.; Art Church, Edmonton, Alberta, Canada; Edmund H. Davenport, Pittsford, Vt.; W. A. Dean, Hartford, Conn.; William Doniger, Cedarhurst, N. Y.; Charles W. Eggenweiler, Los Angeles, Calif.; A. M. Ferrin, Yucaipa, Calif.; Paul Hultquist, Holdrege, Neb.; Oscar Jaime, Jr., Havana, Cuba; D. R. McCarrick, Natick, Mass.; Art E. MacLean, Calgary, Alberta, Canada; Albert F. Mitchell, Cuyahoga Falls, Ohio; LeRoy F. Nice, Souderton, Pa.; Dunlap W. Oleson, Ellyn, Ill.; Joseph A. Piechuta, Meriden, Conn.; William C. Porteous, Lachine, Que., Canada; Barry Sesma, Los Angeles, Calif.; Edwin Schneider, Glade, Kans.; Carl B. Sweet, Red Hook, N. Y.; George Swanson, Englewood, N. J.; C. H. Tanis, Ridgewood, N. J.; John M. Unkefer, Minerva, Ohio; Erskine Walker, Jacksonville, Fla.; Larrie Williams, Port Elizabeth, South Africa; J. W. Watts, Akron, Ohio; and Joe Williams, Belton, Mo., and to extend to them and the many others who have assisted us so greatly the thanks of ALL-WAVE RADIO and the writer. Your continued interest is very much appreciated by all and your many kindnesses will spur us on.

It will be our pleasure to continue to answer your questions pertaining to reception, unknown stations, or station matters in general. Address your letters to me at 85 Saint Andrews Place, Yonkers, N. Y., enclosing self-addressed stamped envelope if you desire a reply.

All questions of a technical nature should be sent to Queries Editor, ALL-WAVE RADIO, 16 E. 43rd Street, New York, N. Y.



HI1X has a white card with call and design in red-brown. The Mr. Saladin is not the same one whose name appeared in the Old Gold Contest!

Channel Echoes

By Zeh Bouck

radiodors . . . two prize contests . . . a palm to brinkley

WE realize that the large majority of AWR readers are experimenters, amateurs and long- and short-wave dx fans. Their interest in radio is not primarily that of program enjoyment. Nevertheless, there comes to all of us an occasional urge to slop down in an easy chair, pipe in one hand, perhaps a mint julep in the other, and listen to some local program for the sheer pleasure of listening. It is in protest against the desecration done our ears on such occasions that this column is written —protest against the asininities, the applause and laughter enforced upon the studio audience by the program director holding up a commandatory sign, against the over-plugged and stupid advertising, the prostitution of genuine talent, against the nauseating drivel—a protest against the consistent insult to the intelligence of the average listener.

These programs can be described only in terms of stench. We shall therefore term them "radiodors." That they may be duly aired—subjected to the powerful deodorants of open sunshine and printers' ink—we offer as a monthly prize a year's subscription (or extension if you already subscribe) to ALL-WAVE RADIO for the best, or worst, radiodor of the month. Name the program, sponsor, date and hour. Describe briefly its malodorous qualities—announcer, over-advertising, idiotic applause and laughter, pathetic comedians, etc.

To start the ball rolling, we nominate the recent broadcast of "Madame Butterfly" by the Lux Theater of the Air, and starring Grace Moore. Miss Moore, the only element that could possibly have elevated the broadcast above the submediocre, was permitted one song—the inevitable "Un Bel Dei." Discounting the usual advertising rubbish, our main objection to the performance was the perversion of a perfectly good story. A bit of real life was metamorphosed into a Sunday school lesson in such a manner that poor Puccini must have turned into a whirling Dervish in his grave!

The opera, as you will recall, concerns a naval Lieutenant, one Pinkerton, who plays around with Madame Butterfly, by benefit of a mock marriage, during his stay in Japan. Upon his return home he immediately does what he always intended to do—marries an old flame. Later he returns with his bride to Japan, and Butterfly commits hari kari. In the radio version, the naughty sailor man is completely white-washed. He never marries the American gal—remaining true to Butterfly. But he does sorta become engaged to her upon being falsely informed that Butterfly has forgotten him and remarried, herself (after a due and moral divorce). You can imagine how the poor sailor's heart is broken when he discovers the true state of affairs. Following Butterfly's suicide (the program management probably argued for hours on the possibility of having her die from measles or prickly heat) one gets the impression that Pinkerton enters a monastery.

We have heard many shows twisted around for a radio presentation—but when it comes to making an "honest man" of an American gob, why that's just a little too much.

In contrast, we have the recent highly artistic Shakespearean programs from Daventry, England, in which the original language of the immortal bard is retained in all its lusty and unexpurgated vigor!

◆

SPEAKING OF PRIZES, with this issue we revive our old timers' guessing contest—with a free sub for the best identification of the accompanying photograph (from anyone except the party appearing therein). Most of us will recognize the face —but the time, place and event are other factors that will be considered in designating the winnah.

◆

MAJOR BOWES, late radiorator for dated coffee, got his dates mixed up on a recent Chrysler program. Describing one of his daily (so it seems) tours through the Chrysler, Dodge, DeSoto and Plymouth plants (with no mention of stumbling over the tootsies of sit-down strikers), the genial Major, by means of that leger-de-manipulation known only to radioracles, mentioned that one hundred years ago a steam locomotive could do one hundred miles an hour.

Can it be that the Major is slipping?—he that knows the exact population, the name of the first white child born there, the number of automobiles, sewing machines, number of bricks in the city hall, the number of inches of street car lines, the weight of the town hall clock, the number of bath tubs, annual tonnage of

(Continued on page 333)

You'll recognize this well-known announcer, but can you place the event? If you can, there's a surprize waiting for you.

Night-Owl Hoots

By Ray La Rocque

colombian list . . . contest home stretch . . . fishing for veries bulova widens network . . . mexican mystery . . . brinkley belches

SURPRISING as it seems, most of the principal cities of the Republic of Colombia are many air miles nearer New York City than Los Angeles, California. This fact may account for the reason that many Colombians have been heard by DXers during the past season despite the low power used by most of these BCB transmitters. Information from Colombia has been at a premium for a long time due to the constant shifting of stations on this band. A short time ago many short-wave broadcasters were forced to move into the broadcast band when the government restricted S.W. broadcasting to stations of over one kilowatt. Stations seem to have settled down now and we are fortunate to be able to offer the first complete list of Colombian broadcast stations:

City	*Call*	*K.C.*	*Watts*
Armenia	HJ4-ABN	1364	25
Armenia	HJ4-ABO	1400	500
Barranquilla	HJ1-ABA	1300	500
Barranquilla	HJ1-ABG	1060	500
Barranquilla	HJ1-ABN	1220	25
Barranquilla	HJ1-ABK	1350	25
Bogota	HJ3-ABD	1111	1000
Bogota	HJ3-ABC	860	25
Bogota	HJ3-ABE	1220	500
Bogota	HJ3-ABH	1005	500
Bogota	HJ3-ABX	1050	1000
Bogota	HJ3-ABO	1350	25
Bogota	HJ3-ABJ	1160	25
Bogota	HJN	680	1000
Cali	HJ5-ABC	1300	25
Cali	HJ5-ABD	1150	500
Cali	HJ5-ABE	1450	500
Cartagena	HJ1-ABE	1250	500
Cartagena	HJ1-ABR	1400	500
Cienaga	HJ1-ABI	1450	25
Manizales	HJ4-ABX	1200	500
Medellin	HJ4-ABA	1490	500
Medellin	HJ4-ABD	1176	50
Medellin	HJ4-ABK	1250	500
Medellin	HJ4-ABQ	1320	25
Medellin	HJ4-ABS	1071	25
Medellin	HJ4-ABT	1020	25
Medellin	HJ4-ABV	1370	25
Santa Marta	HJ1-ABJ	1150	1000
Tunja	HJ2-ABA	1300	25

Contest News

As we go into the "home stretch" the contest reaches its peak. Approximately 1050 reports were received and turned over to stations during March. Barney Ahman's avalanche of reports sent him soaring into the lead during March after slipping into third place the previous month. Hesterman continued his unusually fast scoring and Hidalgo also gained ground on the field. However, Weyrich, Brode (who has led since October), and Forestieri suffered a momentary let-down and dropped a notch or so lower. One month remains and each contestant mentioned above has a chance of putting on a winning spurt during April and of emerging with the 1936-37 DX Championship. Though entering the action quite late, Bob "directional antenna" Wilson up thar in Maine had somewhat of a feast on TA's and SA's and jumped way ahead of many who have been in the contest from the start. How DO he DO it? Standing of leaders:

Bernard Ahman, Baltimore, Md.	5381
Charles Hesterman, Saskatoon, Sask.	4536
Carroll Weyrich, Baltimore, Md.	4454
George Brode, Philadelphia, Penna.	4210
Enlique Hildalgo, Cienfuegos, Cuba	3526
Carl Forestieri, New York, N. Y.	3029
Joe Lippincott, Medford, Mass.	2569
C. Robert Wilson, Portland, Maine	1541
Earl Lever, Worcester, Mass.	1131
Leroy Nice, Souderton, Penna.	1076
Harry M. Gordon, Erie, Penna.	1072
Kendall Walker, Yamhill, Oregon	858
John Gardner, New York, N. Y.	186
Bob Beadles, Salt Lake City, Utah	154
Harry E. Snyder, Trenton, N. J.	100
Carl Sylvester, Yale, Mich.	83
Fred L. Van Voorhees, Millers Place, N. Y.	69
Vincent Stasen, Philadelphia, Penna.	48
Bernard Alcazar, Cienfuegos, Cuba	28
David Herbert, Lancaster, Calif.	4

Last month one Baltimorian led the scoring, and just so the honor of good old Baltimore would not suffer a let-down, Barney Ahman just missed his attempt to get 300 reports in during the month, but succeeded in compiling the highest score with 2160 points. Still concentrating only on TP reception, Charles Hesterman managed to follow Barney on his way to the top by scoring 2028—which isn't bad in any man's contest! Other scores follow: Wilson 1541, Hidalgo 1140, Weyrich 989, Forestieri 615, Gordon 597, Lippincott 573, Nice 535, Brode 452, Walker 407, Lever 175, Snyder 100, Stasen 22, Beadles 4. Though a few other contestants reported TP reception during March, Hesterman's catches gave him the nod in the bull's-eye department. The Saskatoon Night Owl hit 17 of them on the nose for 100 points each. He rung the bell with each of the following: 3YA, 1YA, 4BK, 4BC, 2NR, KGU, 4QN, 4QG, 3LO, 7ZL, 3G1, 7NT, 4RK, 3WR, 4BH, 2CO, 4AK. From under his mass of antennas, Bob Wilson managed to amass himself 100 points each on the following 14 stations: XGOA, Nice PTT, Leipzig, Berlin, Breslau, TIGPH, Brussels No. 1, TINRH, JOAK-1, Hamburg, Poste Parisien, Ljubjana, Cote d'Azur, I-1FI. Other "bull's-eye" were: Ahman 9, CMK, KFBB, KMAC, XED, XEH, CMCQ, CMGC, CMJF, CMJI; Weyrich 8, YV5RA, CMBG, CMBD, CMGF, XEBH, Vienna, Brno, Brussels No. 2; Hidalgo 6, TG-1, XEZ, YV1RF, YV-4RA, CX28, XEU; Walker 3, XEFL, XEAF, XEAO; Nice 2, CMOA, Belfast; Froestieri 1, KOTN; Lever 1, CMOX; Lippincott 1, LS-2; Snyder 1, XENC. Those stations reported most often during March are listed below showing the number of times each was reported: XENT 116, XERA 106, XEAW 95, CMQ 63, XEPN 59, CM-CD 52, XEFO 44, XELO 41, XEMO 35, CMX 33, XEW 32. For information as to other stations reported write the Chief. Just as a notice—the winners will not be announced next month. It will take some time before all the stations have checked the avalanche of reports for March and those expected during April, and of course there will be a few penalties due to unintentional mistakes on the part of contestants.

Beautiful three-color veri from PRF3, S. Paulo, South America.

Station Changes, U. S. A.

New Stations: Only two construction

permits were granted for new stations during the past month. They were granted to stations WGVA, Indianapolis, Indiana, 1050 kc., 1000 watts; and WMBS, Uniontown, Penna., 1450 kc., 250 watts. Both stations to operate daytime only.

Call Letters Assigned: KATE to the station in Albert Lea, Minn., on 1200 kc. WJOY to Saginaw, Mich. (950 kc.). KGFG changed to KTOK (1370.)

Locations: KGFI (1500) will move from Corpus Christi to Brownsville, Tex.

Station Changes, Foreign

New Stations

Call	*Location*	*K.C.*	*Watts*
———	Limoges, France(IDA)	895	100000
———	Reuil, France(IDA)	832	400
———	Varna, Bulgaria(IDA)	1276	2000
CMAB	Pinar del Rey, Cuba	1340	....
CMCK	Havana, Cuba	560	....
CMKX	Santiago, Cuba	1190	....
CMKO	Holguin, Cuba	1280	250
HCJB	Quito, Ecuador	1200	30
PRI-4	Joao Pessoa, Brazil	1080	10000
TG-1	Guatemala City, Guate.	1510	300
XEBO	Irapuato, Mexico(IDA)	1310	25
XEL	Mexico City, Mexico	1100	1000
XGOE	Nanking, China(UDXC)	1360	1000
2BS	Bathurst, Aus.(IDA)	1500	100
7HT	Rosny Hill, Aus.(IDA)	1330	300
2ZB	Wellington, N.Z.(IDA)	1120	....

Power Changes: CMCG (680) 150-1000; CMJA (1010) 50-300; CMKM (1120) 50-200; CMJI (1130) 50-150; CRCV (1100) 500-5000; HC2ET (1160) 300-40; HC2ROZ (900) 350-100; HC2JSB (1100) 30-200; LKK (629) 500-20000 (IDA); LKS (850) 500-10000 (IDA); LKD (850) 500-10000 (IDA); OAX4A (854) 1500-10000; OAX4B (1200) 250-350; OAX-4E (960) 50-200; OAX40 (1000) 100; OAX4F (1080) 50-100; OAX4J (1100) 250; OAX4H (1150) 60; OAX4L (1250) 100-60; OAX4C (1300) 60; OAX6B (1405) 150-60; 2TM (1300) 1000-2000 (IDA); 3SR (1260) 50-200 (IDA); Graz (886) 7500-15000 (IDA).

Frequency Changes: HC2ET 1150-1160; HC2JSB 1250-1100; LKB 850-722 (IDA); LKK 1276-629 (IDA); LKF 776-722 (IDA); LKS 1276-850 (IDA); LKD 686-850 (IDA); OAX4A 1050-854; OAX4H 1050-1150; XEBZ 1160-810; XGOF 850-943 (IDA); XGOH 590-896 (IDA); 2BH 1330-1050 (IDA).

Calls Changed: XEXM (610) to XEDP; CMJP (1150) to CMJF; 3WR (1260) to 3SR (IDA).

Delete: CMCX (570); CMJW (1340); RW39 (832) (IDA). Re-instate CMCR (1280).

With the Night Owls

The following quotations from Night Owls' letters are selected as containing information of interest to DXers in general:

Clarence Burnham, Gloucester, Mass.: "CX28-1090 kc. are R5-7 till midnight many evenings. CX30—1130 kc. R7 evenings till midnight. They sign with chimes. YV1RF—1120 kc. R6-7 after 10 P.M. OAX4A 855 kc. with 10 kw., R-8. PR? in Rio on 1285 R5-6 evenings. Who is it?" (may be PRG3 10 kw.—*Chief*).

Perfectly swell card from CMKG, Cuba, the home of Bacardi Rummmmm!

Clifford D. Kruse, Dubuque, Iowa: "Did you ever fish for verifications? I did. One day last week while watching the high water in the river from the dam, I saw something floating in the water that resembled a veri. I succeeded in rescuing the card from a trip to the Gulf of Mexico and found it to be a QSL from W9PBF, an amateur up the river. Patient fishing netted me six other cards, all of course badly damaged by water. I'm going to keep them as souvenirs. Quite a novel way of getting veries, what?"

Morton Blender, Mattapan, Mass.: "The Mass. Broadcasting Corp. has just purchased WORL, 920 kc. Bulova Watch interests are connected with this purchase. The associated stations of Bulova now include WCOP, WORL, WELI, WOV, WSPR, WNBC, WSAR. What Bulova has in mind, of course, is starting a new network. Just how many stations come under his wing, I can't say, but from indications it may turn out to be a large Atlantic coast hook-up. And to add to that, the FCC examiners have recommended that WCOP be granted Salt Lake City sunset time for sign-off, thus adding 3 hours to sked. 7:15 winter, 11:15 summer are the limits."

E. L. (Pete) Peters, Westport, Nova Scotia: "The days are now too long for good reception on long waves. Last evening, however, Reykjavik was putting close to an R9 signal here around 7:30 P.M. AST. Droitwich and Moscow No. 1 were also fine, till they signed at 8 P. M."

C. R. Wilson, 69 Grant St., Portland, Me.: "I'd like to have you mention in AWR that I'd like to hear from DXer's outside of the U. S. and Canada. I'll answer all letters."

Thanks are also due to the following who either have helped compile this month's data or inspired us with friendly encouragement and criticism: A. Emerson, Cleveland, Ohio; John R. Griggs, XEMO, San Diego, Calif; Enrique Hidalgo, Cienfuegos, Cuba; Carl Forestieri, New York City; Harry E. Snyder, Trenton, N. J.; Anthony C. Tarr, Seattle, Wash.; Kenneth Albrecht, Hartford, Conn.; Charles Hesterman, Saskatoon, Sask.; Leroy F. Nice, Souderton, Penna.; Vincent Stasen, Philadelphia, Penna.; Harry Gordon, Erie, Penna.; Walter V. Scholz, Carlinsville, Ill.; Carl and Anne Eder, Willmar, Minn.; Carroll Weyrich, Baltimore, Md.; George Brode, Philadelphia, Penna.; Bernard Ahman, Baltimore, Md.; Kendall Walker, Yamhill, Ore.; Raymond Prutting, Bridgeport, Conn.; John Gardner, New York, N. Y.; Harry F. Hawkins, Manchester, N. H.; George Bird, Pawhuska, Okla.; F. Joslin, W1KJS, Southbridge, Mass.; William Wheatley, Brooklyn, N. Y.; C. Vassalo Gomez, Barranquilla, Colombia (HJ1ABK); J. R. Saladin (HIX), Ciudad Trujillo, Dominican Republic.

Kilocycling Around

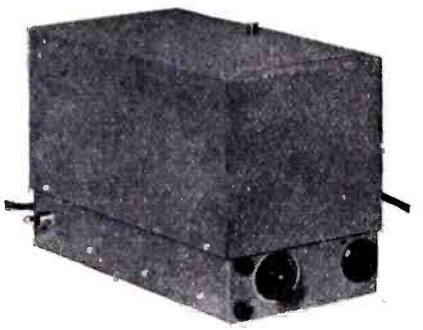
The problem of the day seems to be, how to keep up with the Mexicans? XEBZ has bobbed up again on 810 kc. after the government listing placed them on 1160 kc. Then XEL has fooled everyone by not changing over to 780 kc. as publicized. This caused much controversy as some "mystery Mexican" has appeared on 780 and many have mistaken it to be XEL. Wild guesses have the call sounding something like XETR and the slogan "Radio Mundial." Those are the clues. Now solve the mystery! . . . CMCR evidently has righted themselves with the Cuban Radio Bureau as they are again on the air daily . . . The state

(Continued on page 332)

HIGH-FIDELITY AUDIO AND POWER UNIT FOR HOME BUILDER OR LABORATORY

High-Gain Amplifier With 32 Watts Output With Beam Power Tubes Feeding 18" Speaker

BY McMURDO SILVER • McMURDO SILVER CORP.



The high-fidelity audio and power unit chassis with protective cover in place. On-Off switch on left side, volume control and power-supply receptacle at front end.

ALTHOUGH designed primarily for P.A. use, the audio amplifier illustrated and described herewith should interest an unusually large group of readers, so flexible is it and so manifold its uses. In line with the modern school of P.A. engineering thought which is rapidly realizing the efficiency and economy of separating low-level, high-gain voltage amplifying equipment from power amplifying apparatus, it may serve as the complete power amplification unit of a P.A. system large enough to serve twenty thousand people or more —while the addition of one or two more of these units with suitable speakers would serve half a million people quite easily.

Most important to ALL-WAVE RADIO readers, it ideally serves as the complete audio and power supply for a high fidelity radio receiver. In order that it may be quite flexible, and be capable of being driven by detectors or pre-amplifiers having little or no actual audio power output, it must require no driving power, and have sufficient gain in itself to require no excessive prior-circuit gain. Its gain is such that it may be driven directly by a crystal or good magnetic phonograph pickup. Thus it may serve, not only as the complete amplifying system for an unusually powerful and fine electric phonograph, but as the audio and power system for home-built radio receivers.

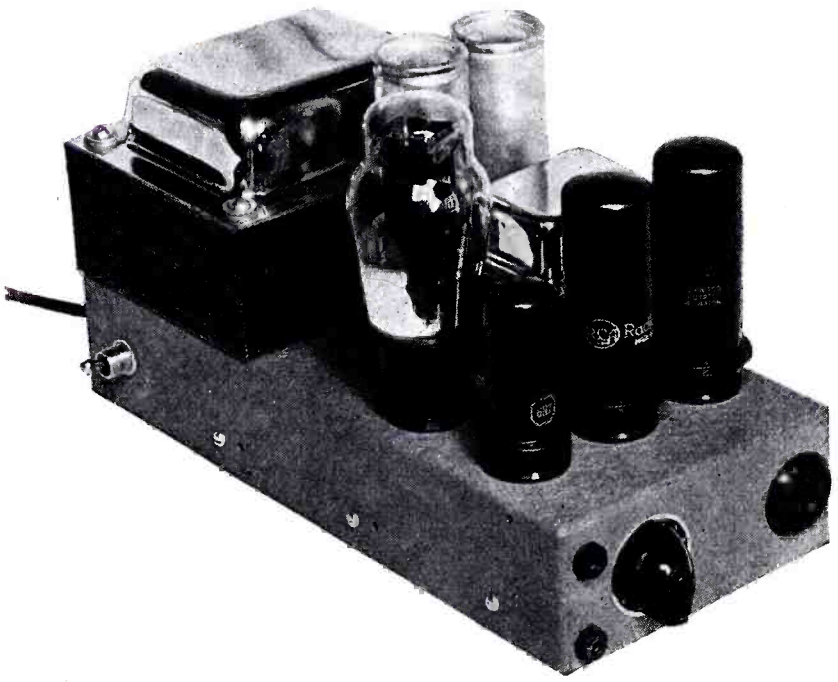
High Gain and Power

With 55 db. voltage gain, it requires only one volt of a.f. to produce a full 32 watts power output at not over 2% total harmonic distortion, and has a frequency characteristic flat to less than 1 db. from 30 to over 20,000 cycles—a far greater audio range than will ever be needed outside a laboratory.

Taking its own operating power from any 115-volt, 50-to-60-cycle a.c. light socket, it not only provides 32 watts of excitation to the field of its own 18-inch speaker, but has a power socket from which can be drawn 4.5 amperes at 6.3 volts a.c. and 110 ma. at 300 volts of well filtered d.c. This extra power can be used to power a multi-tube radio tuner, a pre-amplifier, or to deliver 33 watts for the excitation of additional speaker fields. Yet this amplifier is only 3½ inches wide, 7½ inches high and 11 inches long!

In its thorough and up-to-the-minute design lies the secret of its unusually fine performance and almost equally in the 18-inch loudspeaker which is a fundamental part of it. This speaker covers the full audio tone range of 30 to 9000 cycles with unequalled fidelity, while its 7 times customary efficiency of 35% results in an acoustic or sound power output equal to 224 watts fed into any ordinary 5% efficient speaker, i.e.; 32 watts into 35% efficient transducer (loudspeaker) gives 11.2 acoustic watts, and 224 watts fed to 5% efficient transducer likewise gives 11.2 acoustic watts output—an order of power ample to handle the full loud-to-soft volume range of a symphony orchestra.

Extra speakers are provided for, if desired, through separate secondaries on the large and efficient transformer mounted on the speaker frame. One 16-ohm secondary tapped at 8 ohms, gives a choice of 4, 8 and 16 ohms for needed voice-coil matching. A switch on the speaker connects its own 8-ohm voice coil either to the 8-ohm secondary, or



Close-up view of the amplifier and power-supply chassis with protective cover removed. The 6N7 dual amplifier tube and the two 6L6 beam power tubes are in the same row. The rectifier tube is directly behind the 6N7. The filter choke is mounted behind the 6L6 tubes, and the power transformer and filter condensers occupy the rear of the chassis. The input jacks are to the left of the volume control.

The 18-inch dynamic loudspeaker.

frees it to an external jack for wiring into series or parallel voice-coil circuits with other speakers. Another secondary gives 500 ohms, (or 125 ohms each side of its electrical center tap) from which remote speakers can be fed through a 125-ohm line (or 500 ohm balanced line) of sufficiently high impedence to avoid the loss of valuable audio power in the usually long relatively high-resistance, low impedance voice-coil circuits as in P. A. work.

The Circuit

The photos and circuit diagram show, despite its wide range of usefulness, how simple the power amplifier is—and thoroughly good engineering is always simple and straightforward. There are several fine points of design, however, that the home constructor (standard parts are available) can profit watching. Fundamentally, the circuit consists of a 6N7 dual triode voltage amplifier and phase inverter driving a pair of 6L6 tubes in Class AB1 push-pull.

Power is had through a choke-input filter, with an effective .25 mfd. of input capacity used only to kill the lamination hum customary to unbypassed filter input chokes. Since a choke input filter inherently possesses excellent and very flat voltage vs. current regulation, the simple exchange of the single 5Z3 rectifier for an 83-v allows the extra 33 watts of power for radio receiver, or other unit powering to be had, without upsetting operating voltages.

A 0.5-megohm gain control is included, since the voltage gain of 55 db. is more than is ordinarily needed in a power amplifier, so that gain may be adjusted to exactly balance with preceding input equipment. This 0.5-megohm input gain control can be fed directly by any preceding equipment, through a 0.1-mfd. coupling condenser from a diode load resistor, a line-to-grid transformer, (or even line-to-plate transformer, in a pinch) or directly from a 125-to-500-ohm line, by simply terminating the line at the amplifier in a suitable value of 1-watt matching resistor. Such is the input flexibility.

ATTENTION DXERS!

In line with the policy of ALL-WAVE RADIO *to promote the activities of listeners in all bands, plans are being concluded which will bring recognition to those who have chalked up unusual records of reception. There are few fields where the competitive spirit is at a higher pitch than in DX reception. Exceptional merit is given recognition in other fields of non-professional competition, and it is therefore only fitting that some form of authentic recording of merit should be accorded those DXers who, by virtue of their ability, patience and long hours of listening, stand out from the rest of us and set the pace and the records.*

The plan does not embrace the awarding of prizes nor the acclaiming of champions; it is, rather, a system of counts, not necessarily new to the field, but convincing in its results and fair to all. Full details will appear in the July issue. By all means, don't miss them.

Filtering

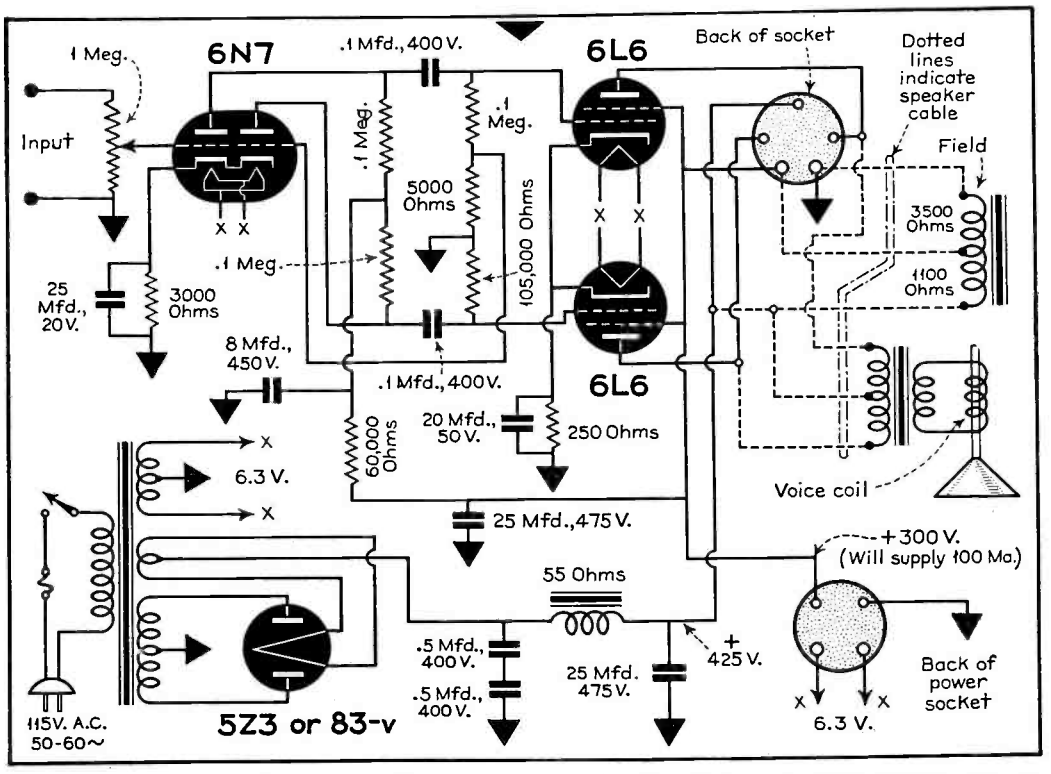
The choice of coupling condensers and resistors is such as to give a response flat to less than 1 db. from 30 to above 20,000 cycles, as is that of bypass condenser values. The order of plate filtration required by the 6L6 power stage being less than that needed by the 6N7 voltage amplifier, the needed additional filtration for the 6N7 is had by a resistance-capacity filter of 50,000 ohms and 8 mfd., a compact and economical means of filtering and isolating the two stages. For radio receiver operation, one additional filter choke and 8 to 10 mfd. of electrolytic capacity may occasionally be needed.

The bypassing of the 6L6 push-pull cathode bias resistor is a quite important point. This is unnecessary in a push-pull stage to obtain a good frequency characteristic *if* matched tubes are used. Of course they always will be initially, but during use they *may* become unmatched. The cathode bypass nicely takes care of such tube mismatch as may develop during use, when new tubes are only too usually hard to get just when badly needed, and allows continued use of tubes which might be so badly mismatched as to have to be discarded without such precaution.

As only one volt input and no driving *power* is needed for full output, and since input impedances are far from critical, almost any number of these amplifiers can be driven by a single small pre-amplifier in P.A. operation.

Pre-amplification

No pre-amplification is needed for radio or phono operation. If a crystal or similar "well-down" microphone is used, a single 6J7 audio pentode with .25-megohm plate resistor and 0.1-mfd. coupling condenser will lift the total gain to over 95 db. which is plenty. This will cost only a dollar or two since the 6J7 will get its A, B and C power from the power amplifier. This will provide a complete, distortionless and ultra-powerful P.A. system.



Complete schematic diagram, with parts values, of the high-gain, high-fidelity power amplifier. Note separate plug receptacle which provides voltage for external equipment.

THE USE OF CONDENSERS IN MULTIMETERS

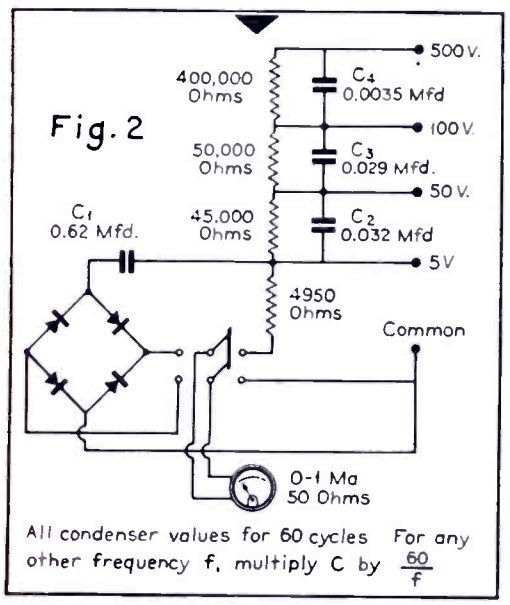
BY ENGINEERING DEPT., AEROVOX CORPORATION

NEARLY every experimenter is familiar with the a.c.-d.c. voltmeter consisting of a milliammeter with multiplier resistors for various d.c. ranges and a copper-oxide rectifier to make it serve on a.c. Lately, condensers have become popular for use as multipliers on a.c. ranges with the copper-oxide rectifier. This article serves to point out the advantages gained by such a procedure and the reasons for them. Furthermore, it will be shown how one can calculate the proper size of condenser for any given meter and range.

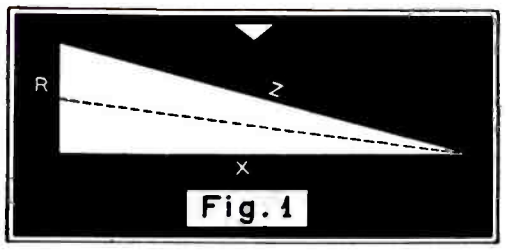
The advantages of the use of condensers in a.c.-voltmeter circuits are: They permit the use of the same scale divisions for d.c. and a.c., including the low voltage a.c. ranges. They enable one to use the *same* set of multiplier resistors for the d.c. and a.c. ranges by placing condensers in parallel with the resistors. The switching can be very much simplified while the terminals remain the same for a.c. and d.c. Against all these advantages there is but one disadvantage: the meter thus equipped is accurately calibrated for one frequency only. Any other frequency requires different values of capacity. However, since most measurements are made at one frequency this is hardly an objection.

Scale Calibrations

It is well known that the low-voltage a.c. scales require a separate calibration



Complete circuit for a multimeter employing condensers.



Capacitive reactance and resistance add vectorially, as indicated.

on the meter, while the higher voltage scales are again different from the d.c. scales unless the sensitivity of the meter has been changed by means of a shunt or a different set of multipliers is employed. The reason for the non-linearity of the low-voltage scale is the variation of the rectifier resistance with current density. So, the total resistance in use for a five-volt scale may vary as much as 10 percent. The current shown by the meter is not proportional to the applied voltage in this case and a special scale is needed. On the higher voltage ranges, the variation in resistance of the rectifier is but a small part of the total resistance in the circuit. Therefore a linear scale can be employed with a maximum error not exceeding one percent.

The calibration for the higher a.c. voltage ranges still cannot be the same as the one for the d.c. ranges if multiplier resistors are used in both cases and the sensitivity of the meter remains the same. The deflection of the meter of the d'Arsonval type is proportional to the *average* current passing through it while the root-mean-square value is desired. The average value is .636 of the peak value while the root-mean-square value is .707 of the peak value. According to these figures the reading will be .636/.707 = .9 of what it ought to be. However, due to the fact that the rectifier is not perfect, the meter shows only about .88 of the correct value. This factor varies with different makes of rectifiers and the home constructor would do well to determine the factor for his own combination of meter and rectifier. How this can be done will be shown below.

In order to be able to use the same scale divisions for the higher voltage ranges on a.c. and d.c., it is necessary to employ a second set of multiplier resistors each of which is .88 of the corresponding d.c. multiplier resistor. Another solution is to employ a meter with a shunt, changing the sensitivity of the meter by placing a shunt across it on the d.c. ranges. This is being done in the "universal meter."

Determining Resistance Factor

Returning now to the man who possesses a d.c. milliammeter and wishes to use it for a.c. as well as d.c. without having to add scales, this is what can be done with condensers. Let us take as example an instrument having a range of 0-1 ma. The d.c. voltmeter ranges will require a resistance of 1,000 ohms-per-volt and should not offer any difficulty. The first thing to do is to find the required "ohms-per-volt" for a.c. Connect the meter in series with the rectifier and a variable resistor of 50,000 ohms or more and connect the combination across an a.c. source of about 50 volts which is being measured at the same time by a standard a.c. meter. Adjust the variable resistor until the meter shows full scale. Measure the resistance of the variable resistor when the proper setting has been found. Repeat the process with a higher applied voltage and a higher value of resistance. Let this second a.c. voltage be 100 volts and the variable resistor a maximum of 100,000 ohms. Again adjust for full-scale deflection and measure the resistance at this setting of the rheostat. The difference between the two resistance readings divided by the difference in volts is the required "ohms-per-volt". This is probably somewhere between 880 and 830 ohms. In the following example a factor of .88 will be assumed, that is, the ohms-per-volt on a.c. is .88 that on d.c.

The five-volt range will then require a series impedance of 4400 ohms. The resistance of the rectifier plus the meter may vary anywhere from 400 to 1600 ohms for various points on the scale. So, if this varying resistance is placed in series with a 3400-ohm resistor, the total resistance wil be correct only at one point of the scale while it will vary from 3800 to 5000 ohms.

Now suppose the meter is placed in series with a condenser of such a reactance that the impedance of the two in series is 4400 ohms when the resistance of the rectifier plus the meter is 1000 ohms. In that case the variation in the total impedance due to the rectifier characteristic becomes very little. Fig. 1 il-

(Continued on page 334)

Queries

using 'phones with your set . . . hearing aids . . . shock hazard

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

Question Number 34:

I am muchly interested in dx short-wave reception late at night. Unfortunately I live in a small apartment, and both my family and the people downstairs fail to share my enthusiasm. I should like to use telephone receivers if possible, but no provision is made for such connections on my set—a Silvertone Model 4465. This receiver has eight tubes including a magic eye for tuning. I'd appreciate it if you'd tell me how to use telephone receivers with this set.—*L. A. B., The Bronx, N. Y. C.*

Answer:

Telephone receivers can of course be utilized with any receiver. There are two general ways of doing it—one by inserting a jack, usually in the first audio stage, into which the 'phones are plugged, and the other by means of an adaptor. The adaptor plugs into an audio tube socket, and the tube into the adaptor. The adaptor is wired to a control block, with a jack or switch, into which the telephone receivers are plugged. This connects the 'phones into the plate circuit of the tube when desired—usually simultaneously cutting out the loudspeaker. When the adaptor is plugged into the output stage, an extra volume control is provided to reduce the sound in the headphones to a comfortable intensity.

Where the adaptors are designed for specific receivers such as RCA, Zenith, Philco, etc., they are perfectly satisfactory and easy to attach. However, results with the so-called universal adaptors are not always so happy, as more than one writer to this department has demonstrated. With the vast variety of amplifying tubes, it is very easy to select an adaptor not altogether suited to the circuit with results that vary from unsatisfactory reception to more disastrous consequences.

When in doubt, it will be safer to install a jack yourself—or have a serviceman do it for you at nominal cost. All you need is a closed-circuit jack—selling for a few cents. Usually this can be mounted without difficulty on the side of the wooden cabinet. The jack is merely connected in series with an audio frequency plate lead—as close to the plate as possible (electrically, not mechanically)—preferably to the tubes electrically nearest to the output tube. Such a connection is shown in Fig. 1, where A is the circuit before the jack is connected and B with the jack wired in. Note that the jack is connected next to the plate, rather than at point X, where the bypassing effect of the coupling condenser C might have some effect on the tone quality in the headphones.

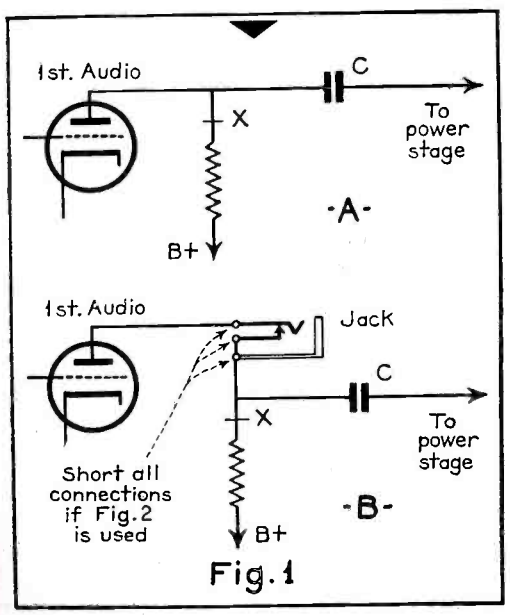
While the output of most detector circuits is sufficient for headphone reception—particularly in the instances of such tubes as the 6Q7 which combines a diode with a triode audio stage—it is best to place the jack in the plate circuit inputting to the power stage. In this position full benefit can usually be had of the receiver's volume control and tone control. On the other hand, if the jack is inserted in the power tube circuit, the hum level is likely to be high and an additional volume control will be necessary.

It should be borne in mind that the terminals of the telephone receivers will be at high potential in these circuits—which fact holds for many adaptor arrangements. So watch out if the telephone terminals are exposed!

This high potential can be eliminated if desired by connecting the 'phones as shown in Fig. 2 Only one wire goes to the plug, and this will make connection with the plate prong of the jack in Fig. 1-B, *if all jack terminals are shorted.*

None of the circuits so far suggested eliminates the loudspeaker, though if the plug arrangement of Fig. 2 is employed, the loudspeaker response will be cut considerably. If speaker elimination is desired, the jack arrangement of Fig. 3 should be employed. However, if the 'phones are plugged in directly, the re-

(Continued on page 315)



Simplest method of connecting a jack in an a.f. plate circuit to permit the use of 'phones.

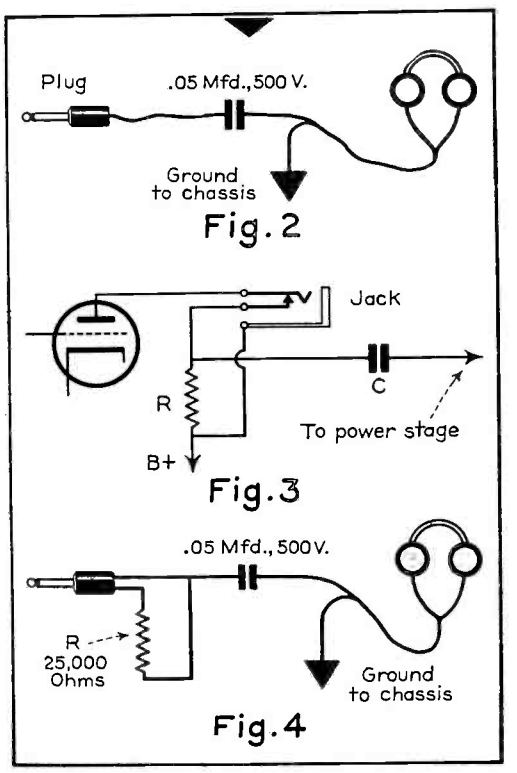


Fig. 2 used with Fig. 1-B will isolate the 'phones from the high voltage. Fig. 3 permits cutting out the speaker. Fig. 4 puts 'phones at ground potential when plugged into Fig. 3.

R. S. S. L. NEWS

guatemalian survey results . . . magnetic storm . . . new sectional managers . . . r.s.s.l. chapters . . . class a monitoring stations . . .

AT this writing the survey reports on stations TG1 and TG2, Guatemala City, Guatemala, are still arriving at Headquarters. The majority of eastern states have been heard from, as well as a number of Canadian provinces, the Canal Zone, and Cuba. Reports from the far west should arrive in another few days.

As soon as all areas have been heard from, the individual reports will be analyzed and a map prepared indicating the coverage of each of the two stations, as well as the field strengths. We intend reproducing one or both of these official maps next month as we believe they will be a matter of interest to all R.S.S.L. members. The originals will, of course, be forwarded to Guatemala.

Freak Conditions

Though it is a bit too early to form a definite opinion, it is our belief that the results of the first official R.S.S.L. survey will be of more interest and value to our members than to the officials of the Guatemalian stations. This is unfortunate in one respect, as we would have preferred a summarized report that would have shown TG1 and TG2 to advantage. But, as often happens at this time of year, nature stepped into the picture and disrupted practically all frequency bands during the week of the test. As a matter of fact, from April 25th on the earth was subject to severe magnetic storms, attributed by scientists to sun spots. Most newspapers carried items on this on April 28th, and according to the dispatches wire services were also disrupted.

Many complete fadeouts were observed throughout the world, and the aftermath of the disturbance assumed the form of heavy atmospherics in both the standard broadcast and short-wave bands. Nevertheless, there were certain areas where freak reception prevailed. We believe that an analysis of the reports on the Guatemalian survey may bring to light some highly interesting observations in this respect. It remains to be seen if these observations will be of any practical value, but if they are not, they will at least indicate that with a more widespread membership and a standing request for voluntary reports on freak conditions, the R.S.S.L. can maintain a constant check on radio conditions.

It is an interesting fact that two days previous to the announcements of the magnetic storm in the newspapers, Mr. H. J. duMoulin, W10P1, R.S.S.L.. Sectional Manager for the State of Alabama, sent in two detailed reports to Headquarters regarding the appearance of freak conditions in the 20-meter amateur band. Had we known that these conditions were a forewarning of the approaching magnetic storm, we could have radioed Guatemala and put off the tests until the storm had worked itself out. But neither we nor the scientists have sufficient data at hand to provide the necessary clues to the sunspot riddle or the specific effects magnetic disturbances have on radio waves.

Value of Surveys

But is it unreasonable to assume that we might now have at least a part of the answer had Headquarters received voluntary reports of the freak conditions from members in all parts of the world? We don't think so. Until the formation of the R.S.S.L. there has been no widespread body of listeners available to keep check on the ether lanes. Consequently it has never been possible to collect sufficient first-hand data to draw any reliable conclusions, for a knowledge of freak conditions in a single area does not even begin to tell a story. For the same reason it is impossible for the engineering staff of a broadcast station to determine how well the signal may be getting out by measuring the local field strength. It is absolutely essential that they receive reports from beyond their own area if they are to learn the extent and nature of the station coverage.

Won't you fellows keep this in mind—and the next time freak conditions prevail, send in a brief report to the Director of your Division. In the meantime we trust that the Guatemalian reports may cast some light on the subject. Any conclusions we may be able to draw from the data on hand will be presented next month.

Now, back to the subject of the Guatemalian survey itself: Some members complained of the hours chosen for the tests. After all, some of us cannot or do not wish to burn the midnight oil, but in this instance the tests were made on two new stations not as yet on regular schedules. The staff, normally employed at other stations, had to work overtime in order to conduct the tests.

This does not mean, however, that future surveys will be conducted around or after midnight. On the contrary, few surveys will be restricted to specific hours and dates; instead of this, members will have the opportunity of monitoring stations during their regular program schedules and on any day they please, with the provision, of course, that the report is forwarded to the Sectional Manager within a certain specified time. This method will simplify monitoring and will be decidedly more convenient. So, in the future you may count on most of the surveys as being unscheduled.

New Sectional Managers

Two new Sectional Managers have been appointed this month. They are:

NORTH CAROLINA
Miles I. Hart, W6M1,
P. O. Box 76, Cary.

SOUTH DAKOTA
Clarence E. Brownson, W16F2,
P. O. Box 310, Brookings

If you reside in one of these states, send reports to your Sectional Manager in the future and not to Headquarters.

ACE REPORTERS

WE wish to accord special recognition to those R.S.S.L. members who submitted particularly fine reports on the Guatemala survey. Their splendid work is greatly appreciated by the Headquarters Staff. The names of these members follow:

Capt. R. B. Oxrieder, W6H5,
State College, Penna.
W. A. Howald, W29M8,
Los Angeles, Calif.
Dr. G. C. Wallman, W29M2,
Alhambra, Calif.
T. G. Brawley, W9J6,
Greenville, Ohio.
J. D. Gallivan, K5Z1,
Balboa, Canal Zone.
Li Chi Chiang, VE1C1,
St. Johns, Quebec, Can.
Oscar Jaime Jr., CO1,
Havana, Cuba.

And to the Sectional Managers who handled the reports for their respective States.

R.S.S.L. Chapters

The League Directors have finally worked out definite plans for the formation of local R.S.S.L. Chapters. A Certificate of Charter will be issued to each Chapter formed. It will be left to the members of a given Chapter to vote on a name for their unit, but the name selected will not become official until it has been determined at Headquarters that the same or a similar name has not been previously chosen for another Chapter.

There are a number of favorable features to the Chapter Plan and it is hoped that local groups will take advantage of the opportunity of forming a unit at the earliest possible moment. It will afford you the chance of meeting your fellow members at frequent intervals, of comparing notes, of working together on surveys and joint reports, of holding joint meetings with nearby chapters, and of developing a voice in your community with regard to the elimination of local noise conditions, etc.

There are, of course, certain requirements to be met before a local Chapter may be formed. These are quite simple, and full details may be obtained by written request to Headquarters.

Class A Stations

The League Directors and Sectional Managers have also expressed their unanimous approval of the proposal to institute "Class A Monitoring Stations" throughout the world. It is the belief that such a group of special stations will not only serve effectively as the League "backbone" but will stand out as examples for other members to follow. Though the selection of such stations will depend a great deal on the equipment available for reliable monitoring purposes, the appointments will by no means be restricted to the more fortunate members who have expensive equipment. The man himself will be an important factor, and appointments will go to those who have shown themselves to be reliable, efefficient, and active in League work. Everyone will therefore have the opportunity of obtaining a Class A Certificate; some on the basis of their technical knowledge, others by virtue of their station equipment, and still others in recognition of their reliable and efficient services in connection with League activities.

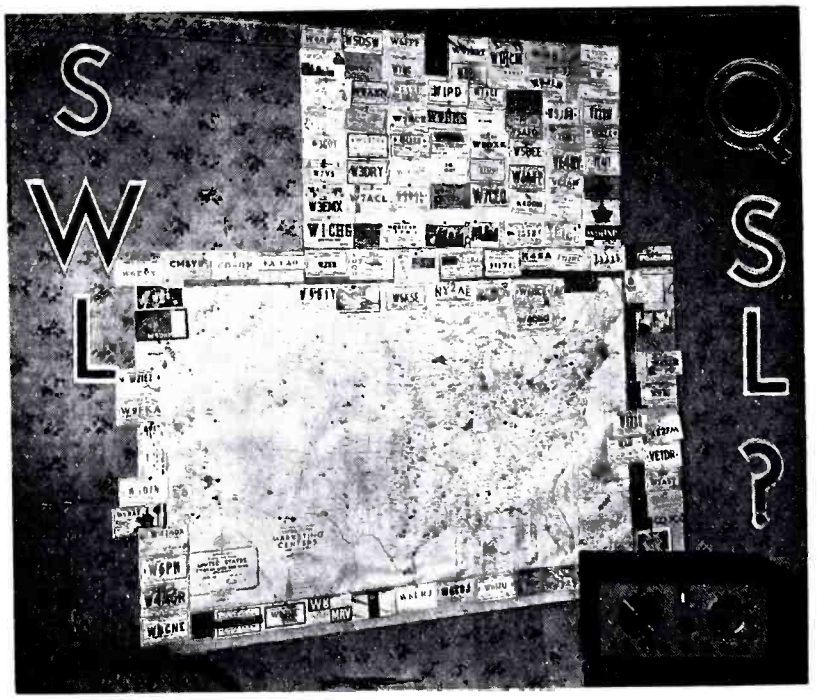
Many appointments will be made on the recommendation of Section Managers who are in a position to judge individual merit; others will be made by the League Directors who have intimate knowledge of the character of certain members and the excellence of their station equipment.

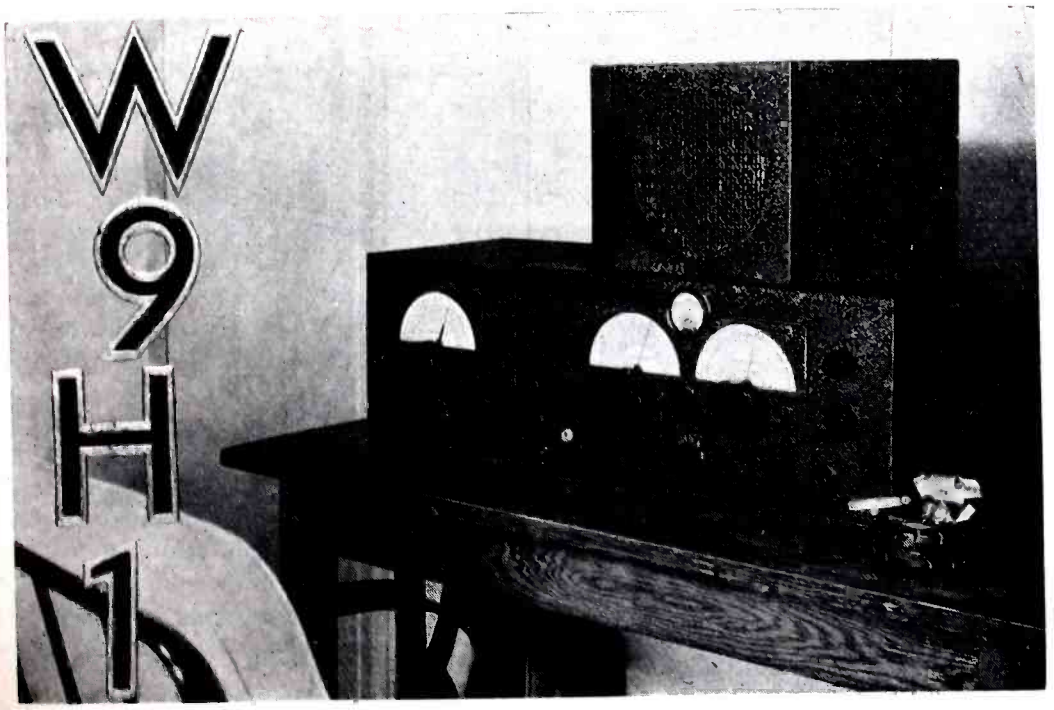
Final decision in each case rests with the League Directors. Recommendations received from Sectional Managers will be carefully checked, and the appointments as they are made will be announced in this department. The certificates that will be issued are suitable for framing.

R.S.S.L. Monitoring Station

We can't all visit each other's Monitoring Stations, yet most of us are curious as to what sort of a layout the fellow has. Consequently the next best thing is to publish photos of such stations as in our opinion will be of general interest. Therefore, if there is something special about your own station that would serve as a pointer for other R.S.S.L. members, you are invited to send in a photo together with a short description, such as dope on antenna used, any special equipment employed, the manner in which you keep records, or any other data of general interest. And, if you wish, a few words about yourself.

This month we are publishing two views of the R.S.S.L. Monitoring Station owned and operated by J. F. Satterthwaite, W9H1, Sectional Manager for the State of Ohio. As will be seen, Mr. Satterthwaite has two listening positions, one using a Super Sky Rider and the other an RME-69 together with an RME DB-20 Preselector.





Two views of R.S.S.L. Monitoring Station W9H1, owned and operated by J. F. Satterthwaite, Sectional Manager for the State of Ohio. Mr. Satterthwaite specializes in the 10- and 20-meter amateur bands and makes a study of skip conditions.

Mr. Satterthwaite spends his time in the short-wave bands only, and specializes in observations on skip-distance effects in the 10- and 20-meter amateur bands. He also experiments with various types of antenna systems.

He spots his local catches with colored pins on a large map of the U. S. These markers, we understand, also indicate local skip effects and are therefore valuable in his studies. A card-file record is kept on all stations received, and this has reached such proportions that it would seem he would require a separate room for it. His stacks of QSL cards, from practically every country in the world—including PK's, VU's and EI's—would make the average s.w.l. green with envy.

M. L. MUHLEMAN
Acting Director

RADIO PROVING POST

THE RCA ACT-20 HAM TRANSMITTER

THE ACT-20, as its model number implies, has an output of 20 watts (16 watts on phone). The tube of most interest and importance in the transmitter is that used in the final r.f. stage. This is the relatively new 807, which is the RCA transmitting version of the 6L6 type of beam tube. Another 807 is used in the crystal oscillator stage. For the buffer-doubler stage the screen-grid 802 is employed. With this tube complement neutralization of the final stage only is required.

The audio section of the transmitter also employs three stages. A pair of metal 6L6's in push-pull in the output stage furnish more than sufficient audio power to fully modulate the plate and screen of the 807. A 6F6, triode connected, is used as a driver of good regulation for the 6L6's. A 6F5, which is a high-gain triode, is resistance coupled to the 6F6. The input to this 6F5 in the first audio stage is for either a double-button carbon microphone—or a 500-or 600-ohm line, in the event that a crystal microphone and its associated preamplifier is preferred over a carbon microphone.

The power supply portion of the ACT-20 is a single unit. A pair of 83's in parallel handle the current requirements with ease.

Referring to the front view photograph, Fig. 1, it will be seen that the front panel contains a meter, two dials and four toggle switches. The dial at the right tunes the final r.f. stage, while the dial at the left is the audio gain control. The toggle switch at the left, marked "Power," is the main a.c. control switch of the entire transmitter. Throwing this switch lights up all tubes, as well as the red pilot light located directly under the meter. The next toggle switch to the right, marked "Plate," switches on all plate power. It is connected in series with the "Power" switch, so that it is impossible to turn on the plate power with the tubes unlit.

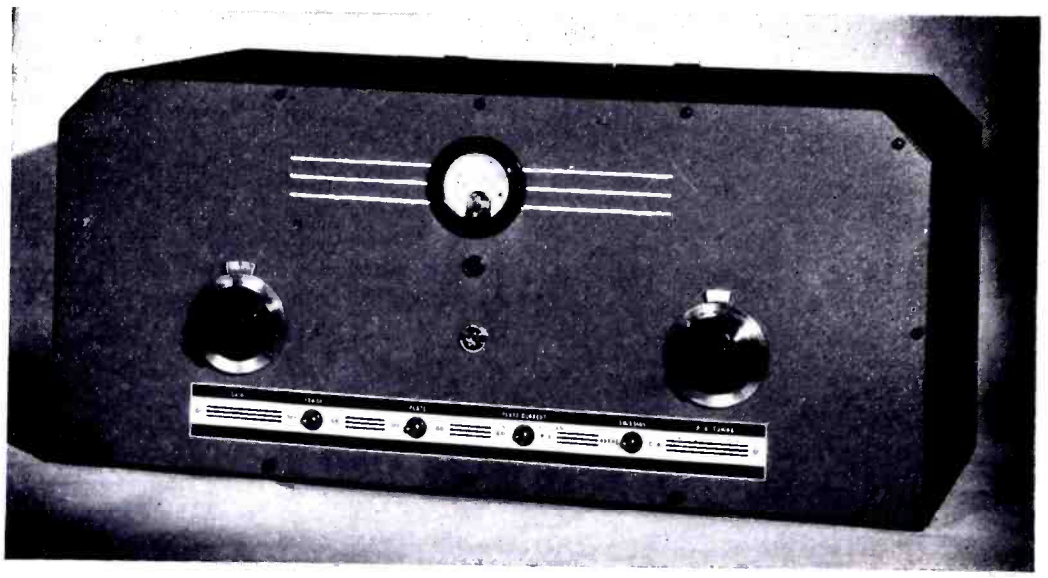


Fig. 1. Front view of the ACT-20. Covers all bands and has power output of 30 watts c.w. and 16 watts fone.

The next switch to the right is marked "Plate Current" and switches the meter from the buffer to the amplifier stage The switch at the extreme right, marked "Emission," throws the transmitter from Phone to C.W. In the C.W. position this switch disconects the plate voltage to the 6F5 and 6F6 tubes in the first two audio stages, as well as the screen voltage to the 6L6 modulators. The 6L6's can draw no plate current with their screen voltage removed. This switch also substitutes a compensatory bleeder resistor when in the C.W. position.

Fig. 2 is a top view of the transmitter chassis. The glass tube nearest to the left is the 807 crystal oscillator. The crystal is plugged in directly behind this tube. A pair of G.R. jacks take the crystal holder, the RCA TMV-135 holder being equipped with G.R. plugs.

The plate tuning condenser for the oscillator stage is of the air-trimmer type. The adjusting screw for this condenser is mounted on the chassis between the oscillator tube and its plate coil, which is the plug-in coil just to the right of the tube.

The tube and plug-in coil next in line is the 802 buffer and its plate coil. This coil is tuned by another chassis-mounted air trimmer, which is located directly behind the 807 final amplifier tube. The 80-and 160-meter buffer coils have additional trimmers mounted in them to obviate the necessity for overlarge buffer coils.

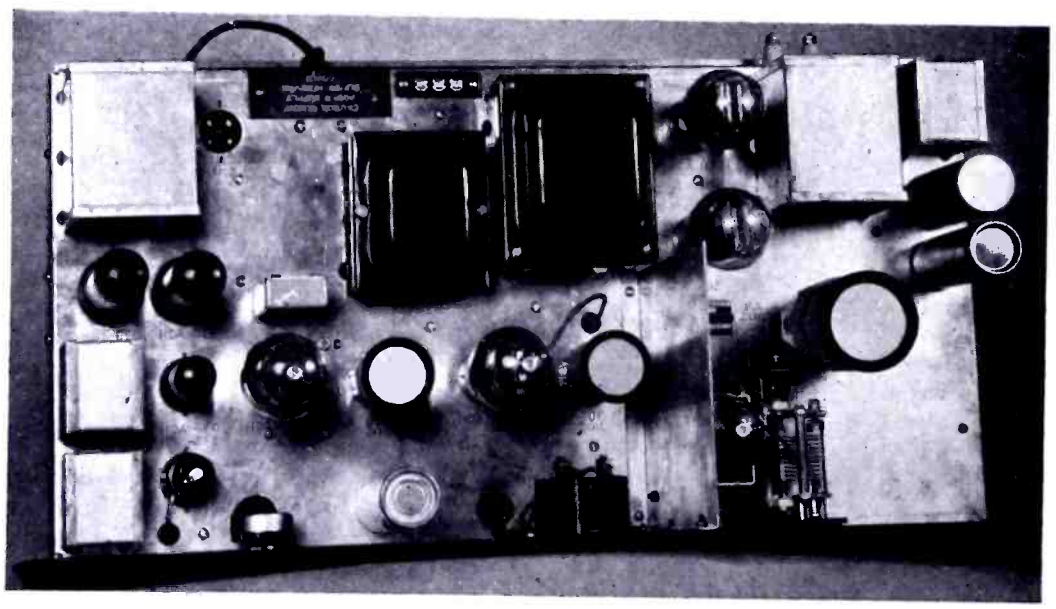


Fig. 2. Chassis view of the ACT-20. The r.f. uses two 807's and an 802.

The tube, tuning condenser and coil for the final stage can be plainly identified to the right of the baffle plate. A box shield encloses the lower portion of the tube. The contraption directly behind the tuning condenser is the neutralizing condenser, which is also screw tuned. Antenna coupling is taken care of by an extra winding at the bottom of the coil form on each of the final amplifier coils.

It is this screwdriver tuning of the oscillator and buffer stages that meets with our personal disapproval. While this feature in no way affects the performance of the transmitter, it does make frequency changing more inconvenient than if these two tuning condensers were panel mounted.

The audio section of the transmitter takes up the entire left end of the chassis. The metal tube nearest the panel is the 6F5, the tube in back of that the 6F6, while the larger pair is the 6L6's. The four-prong socket at the rear of the chassis is for microphone or line input. One nice feature of this input is that a voltage of 5¾ volts is taken from the B supply for button current on the carbon microphone. The RCA MI-6225-A double-button microphone, which is recommended for use with this transmitter, has a shielded cable with a four-prong connection plug to fit the socket.

The power-supply section occupies the back portion of the chassis, as is quite evident. A two-section filter with a 300-ma. input choke and 20 mfd. provides adequate filtering. An additional 18 mfd. of filter is used for the first two audio tubes. The voltage from this supply is 340 volts, which is applied to the buffer, amplifier and modulator plates. When switching to phone the voltage on the final is dropped to 325 volts.

Frequency Ranges

The frequency range of the ACT-20 (with stock coils) is 1715 to 2000 kc., 00 to 4000 kc., 7000 to 7300 kc, 14000 to 14400 kc., and 28000 to 30000 kc. The nominal power output is 20 watts on c.w. and 16 watts on phone. The power-supply requirements are 105/115 volts, 50/60 cycles, while the maximum primary power input is 200 watts. This low input makes the transmitter desirable for use on farms and various remote locations where but a few hundred watts of power are available.

The cabinet dimensions are: height 11⅛ inches, width 24¾ inches and depth 12½ inches. The cabinet finish is two-tone gray wrinkle, the same as the ACR-155 receiver described in the March issue.

The transmitter works either on the crystal frequency, with both the 802 and the 807 final working straight through, or on the second harmonic of the crystal frequency, with the 802 doubling. This permits operation on two bands with any one crystal. For 10-meter operation a 20-meter crystal is used.

In fairness to the use of screwdriver tuning in the oscillator stage, it may be stated that adjustment of this trimmer is minimized because one setting of the oscillator condenser will suffice for all crystals in any given band, except 20 meters.

Connections are provided for two types of keying for c.w. operation. A three terminal strip is mounted at the back of the chassis. By proper connection of the key to these posts it is possible to either leave the oscillator running and key the buffer and amplifier, or else key all three r.f. stages simultaneously for break-in operation. This crystal keying may be employed with all crystals except the 20-meter ones. As 40-meter crystals may be used for 20-meter operation, this means that crystal keying may be employed, when desired, on all bands except 10 meters.

Air Tests

An ACT-20 was shipped to us for test in the ALL-WAVE RADIO Laboratory.

(Continued on page 323)

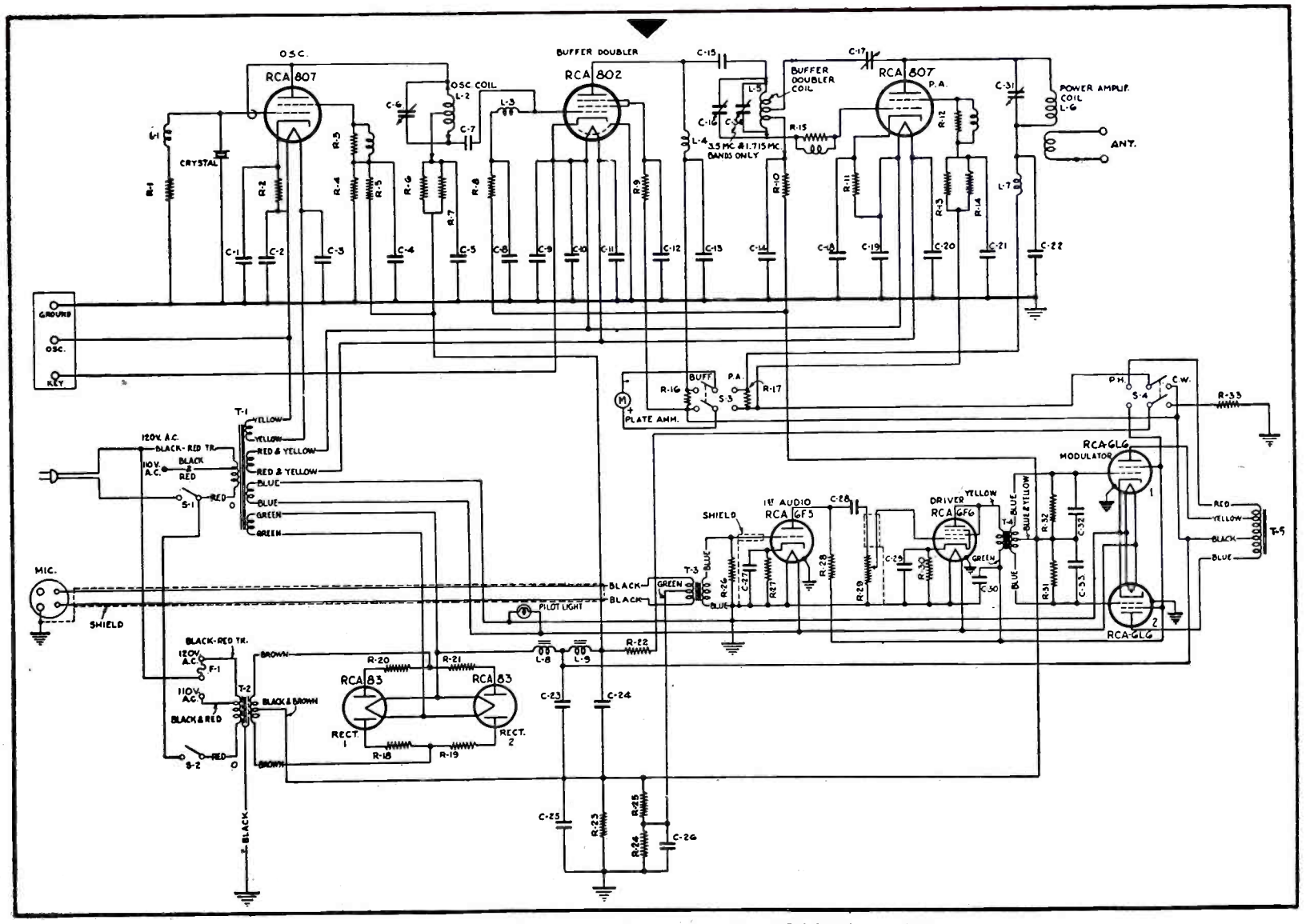


Fig. 3. Schematic diagram of the ACT-20 Transmitter.

What Is Your Power?

BY GEORGE B. HART • W8GCR

FEW amateurs know what their true output power is, and fewer know how to calculate it. The unfortunate practice has been to give *input* power when asked the question, and guess at the rest.

Power in Antenna

The measurement of *r-f power* in the antenna is one of the most important steps in getting the maximum operation out of a rig. After all, no matter how much power we use, it is the power *in the antenna* that counts and brings in the QSL cards.

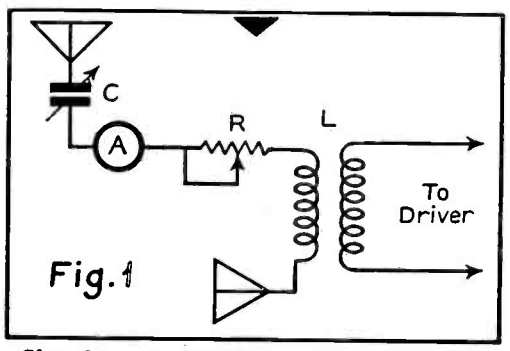
First of all, it is necessary to measure the radio-frequency resistance of the antenna circuit at its resonant frequency in order to employ the formula for r.f. power: $P = I^2R$, where *I* is the r-f current measured in amperes and *R* is the r-f resistance of the circuit.

The radio-frequency resistance of a circuit worked at its resonant frequency may be measured with a fair degree of accuracy by means of the "half-deflection" method. Since Ohm's Law applies to circuits worked at their resonant frequencies, the job is comparatively simple. If we have a constant source of power supply we may assume a constant voltage across the circuit. Then, if we were to double the resistance of the circuit the current would be decreased to exactly one-half of its former value.

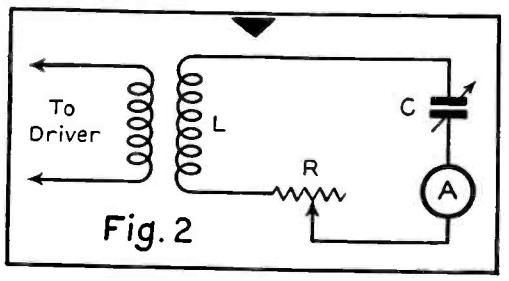
Method of Measurement

Knowing this, we couple our transmitter tank coil to the antenna as shown in Fig. 1. The variable resistor, R, which we have introduced into the antenna circuit is a pure resistance (one possessing the minimum of Xc and XL characteristics). It should be variable from 5 to 300 ohms in steps of not more than 5 ohms.

With the driver adjusted to the frequency at which a measurement is desired, the resistance R should be set at zero and the antenna tuned to resonance



Showing connections for measuring actual output power by means of a variable resistor and a thermocoupled ammeter.



Connections used to determine the resistance of an antenna.

by means of the thermocoupled ammeter, A. The resistance should then be increased until the current indicated by the meter is exactly one-half of its former value. At this point the inserted resistance, R, is equal to the antenna resistance plus the resistance of L, A, and C, or the total antenna circuit resistance. If it is desirable to know the resistance value of the antenna alone, it is only necessary to connect L, C, and A as in Fig. 2 and repeat the same procedure to obtain the total antenna circuit resistance. This value is then substracted from the former figure and the result is the r-f resistance of the antenna at its resonant frequency.

Precautions

In making this measurement it is important that the voltage induced in the antenna circuit by the driver be induced at one point only, and that this point be adjacent to ground. Every effort should be made to induce a voltage only in the pick-up coil L.

If the measurement is to be accurate the power must be kept absolutely constant during the entire procedure. This may be checked by quickly cutting out the inserted resistance, R. If the ammeter reading does not change it may be assumed that the power remained constant during the measurement.

For greater accuracy it is suggested that several measurements be made at different driving powers. An average of all the measured values will then approach very closely the total resistance of the circuit.

R-F Power Calculation

Assuming that our antenna was operated at its fundamental frequency and showed a resistance of 20 ohms at resonance, and that a current of 2.5 amperes was found to flow, we find that the r-f power in the antenna circuit is: $2.5^2 \times 20 = 6.25 \times 20 = 125.00$ watts, for $I^2R =$ R-F Watts.

Common values of antenna resistance are 20-25 ohms when the antenna is operated at its fundamental, 35-70 ohms when ⅜ wavelength long, 250-500 ohms when ½ wavelength long, and 100-150 ohms when ⅝ wavelength long.

HAMFEST

(Continued from page 295)

A "CONSTANT READER" of *Radio Guide* magazine recently wrote to the editor that he had heard amateurs without number endeavoring to raise a very illusive station the call of which was CQ. Which brings us to amateur radio's ace believe-it-or-not. They say that practice makes perfect, and yet CQ, the two letters most employed by hamdom, are those upon which the c.w. artists perform the most violent mayhem.

It is said that there are some 60,000,000 ways of spelling the word scissors which conform with English orthography. We are inclined to believe this, as with comparatively simple mathematics we have estimated that there are at least 25,000,000 acceptable variations in the spelling of this word. We nominate CQ as a runner up (in all seriousness, as any student concerned with the mathematics of choice can tell you). We of course refer to the various possible combinations of the dots and dashes which represent the letters CQ. To mention a few of those heard on the air any day—when the perpetrator thinks he's sending CQ: NNQ, NNMA, NNGT, CMA, CGT, NNTK, CTK, TRQ, TRMA, TRGT, TRTK, etc., etc.

As some sage put it—"There goes W—— sending sick Q again."

✦

FROM THE RIDICULOUS to the sublime, we nominate as the Fist of The Month, W5KC, in Plaquemine, La. Excellent bug sending at a wide variety of speeds, sensible use of abbreviations and sane CQing. Runner-up: W1CBJ with the unique ability to send slowly with a comfortable swing.

✦

"DEAR W8QMR: Wot's all this baloney abt qrm on the ham bands? Wot's qrm aniwa? Just whistles—heterodynes. So watt? All you need is an extra oscillator. Set it on the qrming sig and tune to zero beat. Wot happens? U can't hr it ani more. Simple. 73—H. I."

Not a bad idea. It sounds good—for about five seconds.

U. S. BROADCAST STATION LIST

POWERS IN ITALICS INDICATE STATION IS LICENSED TO OPERATE DAYTIME ONLY

550 KC		
KFUO	St. Louis, Mo.	500
KFYR	Bismark, N. D.	1000
KOAC	Corvalis, Ore.	1000
KSD	St. Louis, Mo.	1000
KTSA	San Antonio, Texas	1000
WDEV	Waterbury, Vt.	*500*
WGR	Buffalo, N. Y.	1000
WKRC	Cincinnati, Ohio	1000
WSVA	Harrisonburg, Va.	*500*
560 KC		
KFDM	Beaumont, Texas	500
KLZ	Denver, Colo.	1000
KSFO	San Francisco, Calif.	1000
KWTO	Springfield, Mo.	*5000*
WFIL	Philadelphia, Pa.	1000
WIND	Gary, Ind.	1000
WIS	Columbia, S. C.	1000
WQAN	Miami, Fla.	1000
570 KC		
KGKO	Wichita Falls, Texas	250
KMTR	Hollywood, Calif.	1000
KVI	Tacoma, Wash.	1000
WKBN	Youngstown, Ohio	500
WMCA	New York, N. Y.	1000
WNAX	Yankton, S. D.	1000
WOSU	Columbus, Ohio	750
WSYR	Syracuse, N. Y.	250
WWNC	Asheville, N. C.	1000
580 KC		
KMJ	Fresno, Calif.	1000
KSAC	Manhattan, Kans.	500
WCHS	Charleston, W. Va.	500
WDBO	Orlando, Fla.	1000
WIBW	Topeka, Kans.	1000
WILL	Urbana, Ill.	250
WTAG	Worcester, Mass.	1000
590 KC		
KHQ	Spokane, Wash.	1000
WEEI	Boston, Mass.	1000
WKZO	Kalamazoo, Mich.	*1000*
WOW	Omaha, Nebr.	5000
600 KC		
KFSD	San Diego, Calif.	1000
WCAO	Baltimore, Md.	500
WICC	Bridgeport, Conn.	500
WMT	Waterloo, Iowa	1000
WREC	Memphis, Tenn.	1000
610 KC		
KFRC	San Francisco, Calif.	1000
WDAF	Kansas City, Mo.	1000
WIP	Philadelphia, Pa.	1000
WJAY	Cleveland, Ohio	*500*
620 KC		
KGW	Portland, Ore.	1000
KTAR	Phoenix, Ariz.	1000
WFLA	Clearwater, Fla.	1000
WHJB	Greensburg, Pa.	*250*
WLBZ	Bangor, Me.	500
WSUN	St. Petersburg, Fla.	1000
WTMJ	Milwaukee, Wis.	1000
630 KC		
KFRU	Columbia, Mo.	500
KGFX	Pierre, S. D.	*250*
WGBF	Evansville, Ind.	500
WMAL	Washington, D. C.	250
WPRO	Providence, R. I.	500
640 KC		
KFI	Los Angeles, Calif.	50000
WGAN	Portland, Me.	500
WHKC	Columbus, Ohio	500
WOI	Ames, Iowa	*5000*
650 KC		
WSM	Nashville, Tenn.	50000
660 KC		
WAAW	Omaha, Nebr.	*500*
WEAF	New York, N. Y.	50000
670 KC		
WMAW	Chicago, Ill.	50000
680 KC		
KFEQ	St. Joseph, Mo.	*2500*
KPO	San Francisco, Calif.	50000
WPTF	Raleigh, N. C.	5000
700 KC		
WLW	Cincinnati, Ohio	500000
710 KC		
KIRO	Seattle, Wash.	1000
KMPC	Beverly Hills, Calif.	500
WOR	Newark, N. J.	50000
720 KC		
WGN	Chicago, Ill.	50000
740 KC		
KMMJ	Clay Center, Nebr.	*1000*
KTRB	Modesto, Calif.	*250*
WHEB	Portsmouth, N. H.	*250*
WSB	Atlanta, Ga.	50000
750 KC		
KGU	Honolulu, Hawaii	2500
WJR	Detroit, Mich.	50000
760 KC		
KXA	Seattle, Wash.	250
WBAL	Baltimore, Md.	2500
WEW	St. Louis, Mo.	*1000*
WJZ	New York, N. Y.	50000
770 KC		
KFAB	Lincoln, Nebr.	10000
WBBM	Chicago, Ill.	50000
780 KC		
KEHE	Los Angeles, Calif.	500
KFDY	Brookings, S. D.	*1000*
KFQD	Anchorage, Alaska	250
KGHL	Billings, Mont.	1000
WEAN	Providence, R. I.	1000
WMC	Memphis, Tenn.	1000
WTAR	Norfolk, Va.	1000
790 KC		
KGO	San Francisco, Calif.	7500
KOAM	Pittsburg, Kans.	*1000*
800 KC		
WBAP	Fort Worth, Tex.	50000
WFAA	Dallas, Texas	50000
WTBO	Cumberland, Md.	*250*
810 KC		
WCCO	Minneapolis, Minn.	50000
WNYC	New York, N. Y.	*1000*
820 KC		
WHAS	Louisville, Ky.	50000
830 KC		
KOA	Denver, Colo.	50000
WEEU	Reading, Pa.	*1000*
WHDH	Boston, Mass.	*1000*
WRUF	Gainesville, Fla.	*5000*
850 KC		
KIEV	Glendale, Calif.	*250*
WESG	Elmira, N. Y.	1000
WKAR	East Lansing, Mich.	*1000*
WWL	New Orleans, La.	10000
860 KC		
WABC	New York, N. Y.	50000
WHB	Kansas City, Mo.	*1000*
870 KC		
WENR	Chicago, Ill.	50000
WLS	Chicago, Ill.	50000
880 KC		
KFKA	Greeley, Colo.	1000
KLX	Oakland, Calif.	1000
KPOF	Denver, Colo.	500
WCOC	Meridian, Miss.	500
WGBI	Scranton, Pa.	500
WRNL	Richmond, Va.	*500*
WQAN	Scranton, Pa.	250
WSUI	Iowa City, Iowa	500
890 KC		
KARK	Little Rock, Ark.	250
KFNF	Shenandoah, Iowa	500
KFPY	Spokane, Wash.	1000
KUSD	Vermilion, S. D.	500
WBAA	West Lafayette, Ind.	*1000*
WGST	Atlanta, Ga.	1000
WJAR	Providence, R. I.	500
WMMN	Fairmont, W. Va.	500
900 KC		
KGBU	Ketchikan, Alaska	500
KHJ	Los Angeles, Calif.	1000
KSEI	Pocatello, Idaho	250
WBEN	Buffalo, N. Y.	1000
WELI	New Haven, Conn.	*500*
WFMD	Frederick, Md.	*500*
WJAX	Jacksonville, Fla.	1000
WKY	Oklahoma City, Okla.	1000
WLBL	Stevens Point, Wis.	5000
WTAD	Quincy, Ill.	*500*
920 KC		
KFEL	Denver, Colo.	500
KOMO	Seattle, Wash.	1000
KPRC	Houston, Texas	1000
KVOD	Denver, Colo.	500
WAAF	Chicago, Ill.	*1000*
WORL	Boston, Mass.	*500*
WPEN	Philadelphia, Pa.	250
WRAX	Philadelphia, Pa.	250
WSPA	Spartanburg, S. C.	*1000*
WWJ	Detroit, Mich.	1000
930 KC		
KGBZ	York, Nebr.	1000
KMA	Shenandoah, Iowa	1000
KROW	Oakland, Calif.	1000
WBRC	Birmingham, Ala.	1000
WDBJ	Roanoke, Va.	5000
940 KC		
KOIN	Portland, Ore.	1000
WAAT	Jersey City, N. J.	*500*
WAVE	Louisville, Ka.	1000
WCSH	Portland, Me.	1000
WDAY	Fargo, N. D.	1000
WHA	Madison, Wis.	2500
WICA	Ashtabula, Ohio	250
950 KC		
KFWB	Hollywood, Calif.	1000
KMBC	Kansas City, Mo.	1000
WRC	Washington, D. C.	500
970 KC		
KJR	Seattle, Wash.	5000
WCFL	Chicago, Ill.	5000
WIBG	Glenside, Pa.	100
980 KC		
KDKA	Pittsburgh, Pa.	50000
990 KC		
WBZ	Boston, Mass.	50000
WBZA	Springfield, Mass.	1000
1000 KC		
KFVD	Los Angeles, Calif.	*1000*
WHO	Des Moines, Iowa	50000
1010 KC		
KGGF	Coffeyville, Kans.	1000
KQW	San Jose, Calif.	1000
WHN	New York, N. Y.	1000
WNAD	Norman, Okla.	1000
WNOX	Knoxville, Tenn.	1000
1020 KC		
KYW	Philadelphia, Pa.	10000
WDZ	Tuscola, Ill.	250
1040 KC		
KRLD	Dallas, Texas	10000
KYOS	Merced, Calif.	*250*
KWJJ	Portland, Ore.	500
WTIC	Hartford, Conn.	50000
1050 KC		
KFBI	Abilene, Kans.	*5000*
KNX	Hollywood, Calif.	50000
WEAU	Eau Claire, Wis.	250
1060 KC		
KTHS	Hot Springs, Ark.	10000
WBAL	Baltimore, Md.	10000
WJAG	Norfolk, Nebr.	*1000*
	College Park, Md.	100
1070 KC		
KJBS	San Francisco, Calif.	*500*
WCAZ	Carthage, Ill.	*100*
WTAM	Cleveland, Ohio	50000
1080 KC		
WBT	Charlotte, N. C.	50000
WCBD	Waukegan, Ill.	*5000*
WMBI	Chicago, Ill.	*5000*
1090 KC		
KMOX	St. Louis, Mo.	50000
1100 KC		
KGDM	Stockton, Calif.	*1000*
KWKH	Shreveport, La.	10000
WLWL	New York, N. Y.	5000
WPG	Atlantic City, N. J.	5000
1110 KC		
KSOO	Sioux Falls, S. D.	*2500*
WRVA	Richmond, Va.	5000
1120 KC		
KFIO	Spokane, Wash.	*100*
KFSG	Los Angeles, Calif.	500
KRKD	Los Angeles, Calif.	500
KRSC	Seattle, Wash.	250
WCOP	Boston, Mass.	*500*
WDEL	Wilmington, Del.	250
WISN	Milwaukee, Wis.	250
WJBO	Baton Rouge, La.	500
WTAW	College Station, Texas	500
1130 KC		
KSL	Salt Lake City, Utah	50000
WJJD	Chicago, Ill.	*20000*
WOV	New York, N. Y.	*1000*
1140 KC		
KVOO	Tulsa, Okla.	25000
WAPI	Birmingham, Ala.	5000
WSPR	Springfield, Mass.	500
1150 KC		
WHAM	Rochester, N. Y.	50000
1160 KC		
WOWO	Fort Wayne, Ind.	10000
WWVA	Wheeling, W. Va.	5000
1170 KC		
WCAU	Philadelphia, Pa.	50000
1180 KC		
KEX	Portland, Ore.	5000
KOB	Albuquerque, N. M.	10000
WDGY	Minneapolis, Minn.	*1000*
WINS	New York, N. Y.	1000
WMAZ	Macon, Ga.	1000

1190 KC		
KTKC	Visalia, Calif.	*250*
WATR	Waterbury, Conn.	*100*
WOAI	San Antonio, Texas	50000
WSAZ	Huntington, W. Va.	1000
1200 KC		
KADA	Ada, Okla.	*100*
KBTM	Jonesboro, Ark.	*100*
KDNC	Lewiston, Mont.	100
KFJB	Marshalltown, Iowa	100
KFXD	Nampa, Idaho	100
KFXJ	Grand Junction, Colo.	100
KGDE	Fergus Falls, Minn.	100
KGEK	Sterling, Colo.	100
KGFJ	Los Angeles, Calif.	100
KGHI	Little Rock, Ark.	100
KGSS	Sioux Falls, S. D.	100
KMLB	Monroe, La.	100
KSUN	Lowell, Ariz.	100
KVCV	Redding, Calif.	100
KVEC	San Luis Obispo, Calif.	*250*
KVOS	Bellingham, Wash.	100
KWG	Stockton, Calif.	100
KWNO	Winona, Minn.	*100*
WABI	Bangor, Me.	100
WAIM	Anderson, S. C.	100
WAYX	Waycross, Ga.	100
WBBZ	Ponca City, Okla.	100
WBHP	Huntsville, Ala.	100
WBNO	New Orleans, La.	100
WCAT	Rapid City, S. D.	*100*
WCAX	Burlington, Vt.	100
WCLO	Janesville, Wis.	100
WCPO	Cincinnati, Ohio	100
WDSN	Superior, Wis.	100
WEST	Easton, Pa.	100
WFAM	South Bend, Ind.	100
WFTC	Kinston, N. C.	100
WHBC	Canton, Ohio	100
WHBY	Green Bay, Wis.	100
WIBX	Utica, N. Y.	100
WIL	St. Louis, Mo.	100
WJBC	Bloomington, Ill.	100
WJBL	Decatur, Ill.	100
WJBW	New Orleans, La.	100
WJNO	West Palm Beach, Fla.	100
WJRD	Tuscaloosa, Ala.	*100*
WKBO	Harrisburg, Pa.	100
WLVA	Lynchburg, Va.	100
WMFR	High Point, N. C.	*100*
WMPC	Lapeer, Mich.	100
WNRI	Newport, R. I.	100
WOLS	Florence, S. C.	*100*
WRBL	Columbus, Ga.	100
WTHT	Hartford, Conn.	*100*
WWAE	Hammond, Ind.	100
	Albert Lea, Minn.	*100*
1210 KC		
KANS	Wichita, Kans.	100
KASA	Elk City, Okla.	100
KDLR	Devils Lake, N. D.	100
KDON	Del Monte, Calif.	100
KFJI	Klamath Falls, Ore.	100
KFOR	Lincoln, Nebr.	100
KFPA	Helena, Mont.	100
KFPW	Fort Smith, Ark.	100
KFRO	Longview, Texas	100
KFVS	Cape Girardeau, Mo.	100
KFXM	San Bernardino, Calif.	100
KGLO	Mason City, Iowa	100
KGY	Olympia, Wash.	100
KIUL	Garden City, Kans.	100
KLAH	Carlsbad, N. M.	100
KOCA	Kilgore, Texas	100
KPPC	Pasadena, Calif.	100
KVSO	Ardmore, Okla.	*100*
KWTN	Watertown, S. D.	100
WALR	Zanesville, Ohio	100
WBAX	Wilkes-Barre, Pa.	100
WBBL	Richmond, Va.	100
WBLY	Lima, Ohio	100
WBRB	Red Bank, N. J.	100
WCOL	Columbus, Ohio	100
WCRW	Chicago, Ill.	100
WEBQ	Harrisburg, Ill.	100
WEDC	Chicago, Ill.	100
WFAS	White Plains, N. Y.	100
WFOY	St. Augustine, Fla.	100
WGBB	Freeport, N. Y.	100
WGCM	Gulfport, Miss.	100
WGNY	Chester Township, N. Y.	100
WHBF	Rock Island, Ill.	100
WHBU	Anderson, Ind.	100
WIBU	Poynette, Wis.	100
WJBY	Gadsden, Ala.	100
WJEJ	Hagerstown, Md.	*100*
WJIM	Lansing, Mich.	100
WJTN	Jamestown, N. Y.	100
WJW	Akron, Ohio	100
WKOK	Sunbury, Pa.	100
WLMU	Middlesboro, Ky.	100
WMBG	Richmond, Va.	100
WMFG	Hibbing, Minn.	100
WMFN	Clarksdale, Miss.	100
WOMT	Manitowoc, Wis.	100
WPAX	Thomasville, Ga.	*250*
WSAY	Rochester, N. Y.	*100*
WSBC	Chicago, Ill.	100
WSIX	Nashville, Tenn.	100
WSNJ	Bridgeton, N. J.	*100*
WSOC	Charlotte, N. C.	100
WTAX	Springfield, Ill.	100
1220 KC		
KFKU	Lawrence, Kansas	1000
KTMS	Santa Barbara, Calif.	500
KTW	Seattle, Wash.	1000
KWSC	Pullman, Wash.	1000
WCAD	Canton, N. Y.	*500*
WCAE	Pittsburgh, Pa.	1000
WDAE	Tampa, Fla.	1000
WREN	Lawrence, Kans.	1000
1230 KC		
KGBX	Springfield, Mo.	500
KGGM	Albuquerque, N. M.	1000
KYA	San Francisco, Calif.	1000
WFBM	Indianapolis, Ind.	1000
WNAC	Boston, Mass.	1000
WOL	Washington, D. C.	1000
1240 KC		
KLPM	Minot, N. D.	250
KTAT	Fort Worth, Texas	1000
KTFI	Twin Falls, Idaho	1000
WKAQ	San Juan, Porto Rico	1000
WXYZ	Detroit, Mich.	1000
1250 KC		
KFOX	Long Beach, Calif.	1000
KIT	Yakima, Wash.	250
KXOX	St. Louis, Mo.	1000
WAIR	Winston Salem, N. C.	*250*
WCAL	Northfield, Minn.	1000
WDSU	New Orleans, La.	1000
WHBI	Newark, N. J.	1000
WLB	Minneapolis, Minn.	1000
WNEW	New York, N. Y.	1000
WTCN	Minneapolis, Minn.	1000
1260 KC		
KGVO	Missoula, Mont.	1000
KHSL	Chico, Calif.	*250*
KOIL	Council Bluffs, Iowa	1000
KPAC	Port Arthur, Texas	*500*
KRGV	Welasco, Texas	1000
KUOA	Fayetteville, Ark.	*1000*
WHIO	Dayton, Ohio	1000
WNBX	Springfield, Vt.	1000
WTOC	Savannah, Ga.	1000
1270 KC		
KGCA	Decorah, Iowa	*100*
KOL	Seattle, Wash.	1000
KVOR	Colorado Springs, Colo.	1000
KWLC	Decorah, Iowa	*100*
WASH	Grand Rapids, Mich.	500
WFBR	Baltimore, Md.	500
WJDX	Jackson, Miss.	1000
WOOD	Grand Rapids, Mich.	500
1280 KC		
KFBB	Great Falls, Mont.	1000
KLS	Oakland, Calif.	*250*
WCAM	Camden, N. J.	500
WCAP	Asbury Park, N. J.	500
WDOD	Chattanooga, Tenn.	1000
WTNJ	Madison, Wis.	1000
WIBA	Worcester, Mass.	500
WORC	Dallas, Texas	500
WRR	Trenton, N. J.	500
1290 KC		
KDYL	Salt Lake City, Utah	1000
KLCN	Blytheville, Ark.	*100*
KTRH	Houston, Texas	1000
WEBC	Superior, Wis.	1000
WJAS	Pittsburgh, Pa.	1000
WNBZ	Saranac Lake, N. Y.	*100*
WNEL	San Juan, Porto Rico	1000
1300 KC		
KALE	Portland, Ore.	500
KFAC	Los Angeles, Calif.	1000
KFH	Wichita, Kans.	1000
KFJR	Portland, Ore.	500
WBBR	Brooklyn, N. Y.	1000
WEVD	New York, N. Y.	1000
WFAB	New York, N. Y.	1000
WFBC	Greenville, S. C.	1000
WHAZ	Troy, N. Y.	500
WHBL	Sheboygan, Wis.	500
WIOD	Miami, Fla.	1000
1310 KC		
KAND	Corsicana, Texas	*100*
KCKN	Kansas City, Kans.	100
KCRJ	Jerome, Ariz.	100
KFPL	Dublin, Texas	1000
KFXR	Oklahoma City, Okla.	100
KFYO	Lubbock, Texas	100
KGEZ	Kalispell, Mont.	100
KGFW	Kearney, Nebr.	100
KHUB	Watsonville, Calif.	*250*
KINY	Juneau, Alaska	100
KPDN	Pampa, Texas	*100*
KRKV	Sherman, Texas	100
KRMC	Jamestown, N. D.	100
KRMD	Shreveport, La.	100
KROC	Rochester, Minn.	100
KROY	Sacramento, Calif.	*100*
KRQA	Santa Fe, N. M.	100
KSRO	Santa Rosa, Calif.	*250*
KSUB	Cedar City, Utah	100
KTSM	El Paso, Texas	100
KVOL	Lafayette, La.	100
KVOX	Moorhead, Minn.	100
KWOS	Jefferson City, Mo.	*100*
KXRO	Aberdeen, Wash.	100
WAML	Laurel, Miss.	100
WBEO	Marquette, Mich.	100
WBOW	Terre Haute, Ind.	100
WBRE	Wilkes-Barre, Pa.	100
WCLS	Joliet, Ill.	100
WCMI	Ashland, Ky.	100
WDAH	El Paso, Texas	100
WEBR	Buffalo, N. Y.	100
WEMP	Milwaukee, Wis.	*100*
WEXL	Royal Oak, Mich.	100
WFBG	Altoona, Pa.	100
WFDF	Flint, Mich.	100
WGH	Newport News, Va.	100
WHAT	Philadelphia, Pa.	100
WJAC	Johnstown, Pa.	100
WLAK	Lakeland, Fla.	100
WLBC	Muncie, Ind.	100
WLNH	Laconia, N. H.	100
WMBO	Auburn, N. Y.	100
WMFF	Plattsburg, N. Y.	*250*
WNBH	New Bedford, Mass.	100
WRAW	Reading, Pa.	100
WROL	Knoxville, Tenn.	100
WSAJ	Grove City, Pa.	100
WSGN	Birmingham, Ala.	100
WSJS	Winston-Salem, N. C.	100
WTAL	Tallahassee, Fla.	100
WTEL	Philadelphia, Pa.	100
WTJS	Jackson, Tenn.	100
WTRC	Elkhart, Ind.	100
1320 KC		
KGHF	Pueblo, Colo.	500
KGMB	Honolulu, Hawaii	1000
KID	Idaho Falls, Idaho	500
KRNT	Des Moines, Iowa	1000
WADC	Akron, Ohio	1000
WORK	York, Pa.	1000
WSMB	New Orleans, La.	1000
1330 KC		
KGB	San Diego, Calif.	1000
KMO	Tacoma, Wash.	1000
KSCJ	Sioux City, Iowa	1000
WDRC	Hartford, Conn.	1000
WSAI	Cincinnati, Ohio	1000
WTAQ	Green Bay, Wis.	1000
	Corpus Christi, Tex.	250
1340 KC		
KGDY	Huron, S. D.	*250*
KGIR	Butte, Mont.	1000
KGNO	Dodge City, Kans.	250
WCOA	Pensacola, Fla.	500
WFEA	Manchester, N. H.	500
WSPD	Toledo, Ohio	1000
1350 KC		
KIDO	Boise, Idaho	1000
KWK	St. Louis, Mo.	1000
WAWZ	Zarephath, N. J.	500
WBNX	New York, N. Y.	1000
1360 KC		
KCRC	Enid, Okla.	250
KGER	Long Beach, Calif.	1000
WCSC	Charleston, S. C.	500
WFBL	Syracuse, N. Y.	1000
WGES	Chicago, Ill.	500
WQBC	Vicksburg, Miss.	*1000*
WSBT	South Bend, Ind.	500
1370 KC		
KAST	Astoria, Ore.	*100*
KCMO	Kansas City, Mo.	100
KELD	El Dorado, Ark.	100
KERN	Bakersfield, Calif.	100
KFGQ	Boone, Iowa	100
KFJZ	Fort Worth, Texas	100
KGAR	Tucson, Ariz.	100
KGFG	Oklahoma City, Okla.	100
KGFL	Roswell, N. M.	100
KGKL	San Angelo, Texas	100
KICA	Clovis, N. M.	100
KIUP	Durango, Colo.	100
KLUF	Galveston, Texas	100
KMAC	San Antonio, Texas	100
KOBH	Rapid City, S. D.	100
KOKO	La Junta, Colo.	100
KONO	San Antonio, Texas	100
KRE	Berkeley, Calif.	100
KRKO	Everett, Wash.	50
KSLM	Salem, Oregon	100
KTEM	Temple, Texas	*100*
KUJ	Walla Walla, Wash.	100
KVGB	Great Bend, Kans.	100
KVI	Seattle, Wash.	100
KWYO	Sheridan, Wyo.	100
WABY	Albany, N. Y.	100
WAGF	Dothan, Ala.	*250*
WATL	Atlanta, Ga.	100
WBNY	Buffalo, N. Y.	100
WBTM	Danville, Va.	100
WCBM	Baltimore, Md.	100
WDAS	Philadelphia, Pa.	100
WDNS	Champaign, Ill.	*100*
WEOA	Evansville, Ind.	100
WEXP	Clarksburg, W. Va.	*100*
WFOR	Hattiesburg, Miss.	100
WGL	Fort Wayne, Ind.	100
WGRC	New Albany, Ind.	*250*
WHBQ	Memphis, Tenn.	100
WHDF	Calumet, Mich.	100
WHLB	Virginia, Minn.	100
WIBM	Jackson, Mich.	100
WLLH	Lowell, Mass.	100
WMBR	Jacksonville, Fla.	100
WMFD	Wilmington, N. C.	*100*
WMFO	Decatur, Ill.	*100*
WMIN	St. Paul, Minn.	100
WOC	Davenport, Iowa	100
WPAY	Portsmouth, Ohio	100
WPRA	Mayaguez, P. R.	100
WRAK	Williamsport, Pa.	100
WRDO	Augusta, Ga.	100
WRJN	Racine, Wis.	100
WSAU	Wausau, Wis.	*100*
WSVS	Buffalo, N. Y.	*50*
1380 KC		
KOH	Reno, Nevada	500
KQV	Pittsburgh, Pa.	500
WALA	Mobile, Ala.	500
WKBH	La Crosse, Wis.	1000

WNBC	New Britain, Conn.	*250*
WSMK	Dayton, Ohio	200
1390 KC		
KLRA	Little Rock, Ark.	1000
KRLC	Lewiston, Idaho	*250*
KOOS	Marshfield, Ore.	*250*
KOY	Phoenix, Ariz.	500
WHK	Cleveland, Ohio	1000
WQDM	St. Albans, Vt.	1000
1400 KC		
KLO	Ogden, Utah	500
KTUL	Tulsa, Okla.	500
WARD	Brooklyn, N. Y.	500
WBBC	Brooklyn, N. Y.	500
WEGL	Brooklyn, N. Y.	500
WHDL	Olean, N. Y.	250
WIRE	Indianapolis, Ind.	1000
WLTH	Brooklyn, N. Y.	500
WVFW	Brooklyn, N. Y.	500
1410 KC		
KFJM	Grand Forks, N. D.	500
KGCX	Wolf Point, Mont.	500
KGNC	Amarillo, Texas	1000
KMED	Medford, Ore.	250
WAAB	Boston, Mass.	500
WBCM	Bay City, Mich.	500
WHIS	Bluefield, W. Va.	250
WROK	Rockford, Ill.	500
WSFA	Montgomery, Ala.	500
1420 KC		
KABC	San Antonio, Texas	100
KABR	Aberdeen, S. D.	100
KALB	Alexandria, La.	*100*
KBPS	Portland, Ore.	100
KCMC	Texarkana, Ark.	100
KEUB	Price, Utah	100
KFIZ	Fond du Lac, Wis.	100
KGFF	Shawnee, Okla.	100
KGGC	San Francisco, Calif.	100
KGIW	Alamosa, Colo.	100
KHBC	Hilo, Hawaii	100
KIDW	Lamar, Colo.	100
KIUN	Pecos, Texas	100
KNET	Palestine, Texas	*100*
KORE	Eugene, Ore.	100
KRBC	Abilene, Texas	100
KRLH	Midland, Texas	*100*
KUMA	Yuma, Ariz.	100
KWBG	Hutchinson, Kans.	100
KXL	Portland, Ore.	100
WACO	Waco, Texas	100
WAGM	Presque Isle, Me.	100
WAPO	Chattanooga, Tenn.	*100*
WAZL	Hazleton, Pa.	100
WCBS	Springfield, Ill.	100
WCHV	Charlotteville, Va.	100
WEED	Rocky Mount, N. C.	100
WEHS	Cicero, Ill.	100
WELL	Battle Creek, Mich.	100
WGPC	Albany, Ga.	100
WHFC	Cicero, Ill.	100
WILM	Wilmington, N. C.	100
WJBR	Gastonia, N. C.	100
WJMS	Ironwood, Mich.	100
WKBI	Cicero, Ill.	100
WLAP	Lexington, Ky.	100
WLEU	Erie, Pa.	100
WMAS	Springfield, Mass.	100
WMBC	Detroit, Mich.	100
WMBH	Joplin, Mo.	100
WMFJ	Daytona Beach, Fla.	100
WMSD	Sheffield, Ala.	100
WNNY	Watertown, N. Y.	100
WPAD	Paducah, Ky.	100
WPAR	Parkersburg, W. Va.	100
WPRP	Ponce, P. R.	100
1430 KC		
KECA	Los Angeles, Calif.	1000
KGNF	North Platte, Nebr.	*1000*
KSO	Des Moines, Iowa	500
WBNS	Columbus, Ohio	500
WHEC	Rochester, N. Y.	500
WHP	Harrisburg, Pa.	500
WNBR	Memphis, Tenn.	500
WOKO	Albany, N. Y.	500
1440 KC		
KDFN	Casper, Wyo.	500
KXYZ	Houston, Texas	1000
WBIG	Greensboro, N. C.	1000
WCBA	Allentown, Pa.	500
WMBD	Peoria, Ill.	500
WSAN	Allentown, Pa.	500
1450 KC		
KIEM	Eureka, Calif.	500
KTBS	Shreveport, La.	1000
WGAR	Cleveland, Ohio	500
WHOM	Jersey City, N. J.	250
WSAR	Fall River, Mass.	1000
WTFI	Athens, Ga.	500
1460 KC		
KSTP	St. Paul, Minn.	25000
WJSV	Washington, D. C.	10000
1470 KC		
KGA	Spokane, Wash.	5000
WLAC	Nashville, Tenn.	5000
WMEX	Boston, Mass.	5000
1480 KC		
KOMA	Oklahoma City, Okla.	5000
WHIP	Hammond, Ind.	*5000*
WKBW	Buffalo, N. Y.	5000
1490 KC		
KFBK	Sacramento, Calif.	5000
WCKY	Covington, Ky.	5000
1500 KC		
KAWM	Gallup, N. Mex.	100
KBIX	Muskogee, Okla.	100
KBST	Big Springs, Texas	100
KDAL	Duluth, Minn.	100
KDB	Santa Barbara, Calif.	100
KGFI	Corpus Christi, Tex.	100
KGKB	Tyler, Texas	100
KGKY	Scottsbluff, Nebr.	100
KNEL	Brady, Texas	*100*
KNOW	Austin, Texas	100
KOTN	Pine Bluff, Ark.	*100*
KOVC	Valley City, N. D.	100
KPLC	Lake Charles, La.	100
KPLT	Paris, Texas	*100*
KPQ	Wenatchee, Wash.	100
KRNR	Roseburg, Ore.	*100*
KROD	El Paso, Texas	100
KSJS	Salina, Kans.	100
KUTA	Salt Lake City, Utah	100
KVOE	Santa Ana, Calif.	100
KXO	El Centro, Calif.	100
KYCA	Prescott, Ariz.	100
WCNW	Brooklyn, N. Y.	100
WDNC	Durham, N. C.	100
WGAL	Lancaster, Pa.	100
WHBB	Selma, Ala.	*100*
WHEF	Kosciusko, Miss.	100
WJBK	Detroit, Mich.	100
WKBB	East Dubuque, Ill.	100
WKBV	Richmond, Ind.	100
WKBZ	Muskegon, Mich.	100
WKEU	Griffin, Ga.	*100*
WMBQ	Brooklyn, N. Y.	100
WNBF	Binghamton, N. Y.	100
WNLC	New London, Conn.	*100*
WOPI	Bristol, Tenn.	100
WRDW	Augusta, Ga.	100
WRGA	Rome, Ga.	100
WRTD	Richmond, Va.	100
WSYB	Rutland, Vt.	100
WTMV	East St. Louis, Ill.	100
WWRL	Woodside, N. Y.	100
WWSW	Pittsburgh, Pa.	100
	El Paso, Texas	100
1530 KC		
KXBY	Kansas City, Mo.	1000
WBRY	Waterbury, Conn.	1000
1550 KC		
KPMC	Bakersfield, Calif.	1000
WQXR	Long Island City, N. Y.	1000

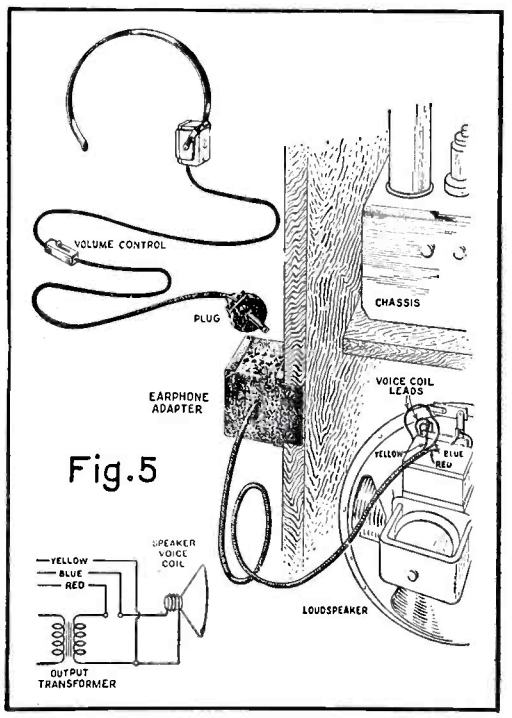
QUERIES

(Continued from page 307)

ceivers will be at high potential. If the amplifier is resistance-coupled, as is indicated by resistor R, it is possible that the substitution of the telephone receivers for the resistor may upset the balance of the circuit—though this will probably not be the case if a cathode bias resistor is used. If desired, a resistor of approximately the same value as R can be connected in series with one 'phone cord. If the amplifier is transformer or impedance coupled, the substitution of the 'phones will have little effect on the operating voltages.

To eliminate both the speaker and the high potential, Fig. 4 should be used in conjunction with Fig. 3. The lead from the .05-mfd. condenser must connect with the plug terminal that makes contact with the jack prong going to the plate of the tube. The value of 25,000 ohms given for resistor R will work in most instances. However, in the case of a resistance-coupled amplifier, it might be desirable to use the same value as R in Fig. 3 (which will depend upon the receiver). If transformer or impedance coupled, the primary of an old amplifying transformer can be substituted for R in Fig. 4.

As an aid for the hard-of-hearing, it will usually be desirable to have the loudspeaker operating at the same time as the 'phones, and the arrangement of Fig. 1-B should be chosen. An excellent device for the hard-of-hearing is made by RCA, and is illustrated pictorially in Fig 5. This can be connected to any receiver, and as it is wired to the voice coil of the loudspeaker, the entire apparatus is at low potential. (No trouble should be experienced in making the connection, as most receivers follow the RMA standard code, and the voice coil leads are indicated by maroon and white wires.) Also, operating at the output of the receiver, almost any degree of volume can be obtained through the separate volume control. Either the radio or earphone can be operated separately, or both together. The headset can be secured for either bone conduction or air conduction. The bone conduction instrument is recommended for those whose hearing is poorer than merely subnormal.



Pictorial diagram of the RCA 'phone adaptor system. This is designed especially for the hard-of-hearing.

In direct answer to L. A. B., he should connect the jack in the *first plate circuit* of the *power output tube.* This model Silvertone receiver employs a type 6N6G tube in the output. This is a combination tube with two plates, and functions as an intermediate audio-frequency amplifying tube outputting, through direct coupling (within the tube) to the output stage. The diagram of this receiver is shown on page 39 of ALL-WAVE RADIO for January, 1937, and the jack should be inserted in the lead located at E-30—just above the connection to the .005 mfd. condenser.

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.	7 A.M.-1 A.M. Daily
31600	9.4	W1XKB	• Springfield, Mass.	7 A.M.-1 A.M. Daily
31600	9.4	W8XKA	• Pittsburgh, Pa.	9 A.M.-1 A.M. Daily
31600	9.4	W3XKA	• Philadelphia, Pa.	10 A.M.-11 P.M. Daily
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.
27800	10.79	DGF	Nauen, Germany	(P) Phones irreg.
27400	10.95	DGE	Nauen, Germany	(P) Phones irreg.
26800	11.19	DGX	Nauen, Germany	(P) Phones irreg.
26100	11.49	GSK	• Daventry, England	Not in use
25950	11.56	W6XKG	• Los Angeles, Calif.	Continuously 24 hours each day
24380	12.3	CRCX	• Bowmanville, Ont.	Experimental
24300	12.35	DGV	Nauen, Germany	(P) Phones irreg.
23350	12.85	DGT	Nauen, Germany	(P) Phones irreg.
22800	13.16	DGS	Nauen, Germany	(P) Phones irreg.
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 daily
21520	13.94	JZM	• Nazaki, Japan	Irregular
21500	13.95	NAA	Washington, D. C.	(E) Time signals
21470	13.97	GSH	• Daventry, England	5:45-8:45 A.M., 9:15 A.M.-12 noon daily
21450	13.99	OLR6A	• Prague, Czechoslovakia	Irregular (see 6010-9550-15230-11840 kc.)
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 EastA.M.
20500	14.63	DGQ	Nauen, Germany	(P) Phones irreg.
20380	14.72	GAA	Rugby, England	(P) Phones LSL mornings; LSY-LSM-PPU irregular
20140	14.90	DGW	Nauen, Germany	(P) Phones irreg.
20040	14.97	OPL	Leopoldville, Belgian Congo, Africa	(P) Tests with ORG mornings and noon
20020	14.99	DFZ	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.
19947	15.04	DLO	Rehmate, Germany	(P) Phones irreg.
19820	15.14	WKN	Lawrenceville, N. J.	(P) Phones GAU A.M.
19720	15.21	EAQ	Madrid, Spain	(P) Relays & tests A.M.
19700	15.23	DFJ	Nauen, Germany	(P) Phones irreg.
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
19460	15.42	DFM	Nauen, Germany	(P) Phones irreg.
19355	15.50	FTM	St. Assise, France	(P) Phones LSM-PPU-YVR mornings
19345	15.52	PMA	Bandoeng, Java	(P) Phones Amsterdam 3-11 A.M.
19270	15.57	PPU	Rio de Janeiro, Brazil	(P) Phones DFB-EHY-FTM 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
18825	15.94	PLE	Bandoeng, Java	(P) Phones San Francisco 7-8:30 A.M. Tokyo 8:30 P.M.-7 A.M.
18776	15.98	TYD-3	Paris, France	(P) Phones Madagascar
18700	16.04	DFQ	Nauen, Germany	(P) Phones irreg.
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 Amsterdam 3-11 A.M.
18115	16.56	LSY3	Buenos Aires, Arg.	(E) Phones DFB-FTM-GAA-PPU A.M.; evening broadcasts occasionally
18090	16.58	TYE-1	Paris, France	(P) Phones New York evenings
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	12-2:15 A.M., 5:45-8:45 A.M., 9:15 A.M.-12 Noon, 4-6 P.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
17775	16.88	PHI	• Huizen, Holland	Sun. 7-10 A.M., Mon., Tues., Thurs., Fri. 8-9:30 A.M. Sat. 8-10 A.M.
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. Sun. 11:10 A.M-12:25 P.M.

Short-Wave Station List

KC	Meters	Call	Location	Time
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.
17650	17.00	XGM	Shanghai, China	(P) Phones irreg.
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
17341	17.30	DGR	Nauen, Germany	(P) Phones irreg.
17280	17.36	FZE8	Djibouti, French Somaliland, Africa	(P) Irregular
17265	17.38	DAF	Norddeich, Germany	(P) Phones ships irreg.
17260	17.37	CMA5	Havana, Cuba	(P) Phones and tests evenings
17260	17.37	DAN	Nordenland, Germany	(P) Phones ships A.M.
17120	17.52	WOO	Ocean Gate, N. J.	(P) Phones ships daytime
17120	17.52	WOY	Lawrenceville, N. J.	(P) Phones England irregularly
17080	17.56	GBC	Rugby, England	(P) Phones ships daytime
16910	17.74	JZD	Nazaki, Japan	(P) Phones ships irreg.
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.
15800	18.99	XOJ	Shanghai, China	(E) Phones GBA 6-7 A.M., KWO-KWU 8-11 P.M.
15760	19.04	JYT	Kemikawa-Cho, Japan	(E) Tests KKW-KWE-KWU evenings
15740	19.06	JIA	Chureki, Japan	(P) Nazaki early A.M.
15700	19.11	WJS	Hicksville, L. I., N. Y.	(P) Phones Ethiopia irregular
15670	19.15	WAE	Brentwood, N. Y.	(E) Tests afternoons
15660	19.16	JVE	Nazaki, Japan	(P) Phones PLE early A.M.; KTO 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.
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	DZG	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., 4:50-10:45 P.M. daily
15330	19.56	W2XAD	● Schenectady, N. Y.	10 A.M.-6 P.M. daily
15320	19.58	OLR5B	● Prague, Czechoslovakia	Irregular (see 6010-9550-15,230-11840 kc.)
15310	19.60	GSP	● Daventry, England	6:20-8:30 P.M. daily
15300	19.61	CP7	● La Paz, Bolivia	No regular schedule
15300	19.61	XEBM	● Mazatlan, Mexico	Daily 9-10 A.M., 1-2 P.M., 8-10 P.M.
15280	19.63	HI3X	● Ciudad Trujillo, R. D.	Sundays, 7:40-10:40 A.M.; weekdays, 12:10-1:10 P.M.
15280	19.63	LRU	● Buenos Aires, Arg.	6 A.M.-6 P.M.
15280	19.63	DJQ	● Zeesen, Germany	6-8 A.M., 8:15-11 A.M. 4:50-10:45 P.M., 12:05-5:15 A.M. daily. Sun., 11:10 A.M.-12:25 P.M.
15270	19.64	W2XE	● Wayne, N. J.	1-7 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	19.70	OLR5A	● Prague, Czechoslovakia	Daily, 7:55-9:50 A.M., 2-2:15 P.M.
15220	19.71	PCJ	● Hilversum, Holland	Tues., 4:30-6 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., 4:55-10:45 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	12-2:15 A.M. daily
15160	19.79	OLR5C	● Prague, Czechoslovakia	Irregular (see 6010-9550-15230-11840 kc.)
15160	19.79	JZK	● Nazaki, Japan	Irregular
15150	19.80	YDC	● Soerabaja, Java	5:30-10 A.M., 6-8:30 P.M., 10:30 P.M.-2 A.M. daily
15145	19.81	RKI	● Moscow, USSR.	Broadcasts irreg. Sun. Phones RIM A.M.
15140	19.82	GSF	● Daventry, England	5:45-8:45 A.M., 9:15 A.M.-12 Noon, 4-6 P.M., 6:20-8:30 P.M., 9-11 P.M. daily
15121	19.84	HVJ	● Vatican City, Vatican	10:30-10:45 A.M. weekdays
15110	19.85	DJL	● Zeesen, Germany	12-2 A.M., 8-9 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
14665	20.46	DFD	Nauen, Germany	(P) Phones irreg.
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
14605	20.54	DGZ	Nauen, Germany	(P) Phones irreg.
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	Phones irregular BC-6:45-8 P.M. Saturdays
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, Guat.	(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 day time

Short-Wave Station List

KC	Meters	Call	Location	Time
14460	20.75	DZH	● Zeesen, Germany	Irregular
14440	20.78	GBW	Rugby, England	(P) Phones Lawrenceville daytime
14410	20.82	DOT	Konigs W'n, Germany	(P) Phones irreg.
14410	20.82	IBC	San Paolo, Italy	(P) Irregular
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	12:30-1:30 P.M. Mon., Wed., Fri.
13610	22.04	JYK	Kemikawa-Cho, Japan	(E) Tests irregular A.M.
13600	22.06	ZMBJ	● "TSS Awatea," Wellington, N. Z.	See 8840 kc.
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
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
13275	22.60	DAF	Norddeich, Germany	(P) Phones ships irreg.
13240	22.66	KBJ	Manila, P. I.	(P) Phones nights and early A.M.
13220	22.70	IRJ	Rome, Italy	(P) Phones Japan 5-8 A.M., and works Cairo days
13180	22.76	DGG	Nauen, Germany	(P) Relays to Riverhead days
13100	22.90	DAF	Norddeich, Germany	(P) Phones ships irreg.
13020	23.04	JZE	Nazaki, Japan	(P) Phones ships irreg.
13000	23.08	TYC	Paris, France	(P) Phones CNR A.M.
12985	23.10	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	WQO	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.
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
12035	24.93	DGL	Nauen, Germany	(P) Phones irreg.
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

KC	Meters	Call	Location	Time
12000	25.00	RNE	● Moscow, USSR.	Sun. 6-7 A.M., 10-11 A. M., Wed. 6-7 A.M., Sun., Mon., Wed., Fri., 4-5 P.M.
11991	25.02	FZS	Saigon, Indo-China	(P) Phones FTA - FTK early A.M.
11960	25.08	HI2X	● Ciudad Tryillo, R. D.	Tues. & Fri., 8-10-10:10 P.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. 12:30-2 P.M. Mon., Wed., Fri., 3-4 P.M., 9 P.M.-12 A.M. Tues., Thurs.,, 7:30 P.M.-12 A.M. Sat., 9 P.M.-12 A.M. (see 6015 kc.)
11900	25.21	OLR4D	● Prague, Czechoslovakia	Irregular (see 6010-9550-15230-11840 kc.)
11895	25.22	XEXR	● Mexico City, Mexico	6-11:30 P.M.
11895	25.22	HP5I	● Aguadulce, Panama	7:30-9:30 P.M. daily
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	OLR4C	● Prague, Czechoslovakia	Irregular (see 6010-9550-15230 11840 kc.)
11870	25.26	W8XK	● Pittsburgh, Pa.	7-9 P.M. daily
11860	25.29	YDB	● Soerabaja, Java	10:30 P.M.-2 A.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	OLR4A	● Prague, Czechoslovakia	Daily 2:30-4:05 P.M. Mon. & Thurs. 8-10:10 P.M.
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	XEBR	● Hermosillo, Mexico	1-4 P.M., 9 P.M.-12 A. M. daily
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	9-10 A.M., 4-5 P.M., 2:30-3:30 P.M., 12-1 A.M. daily
11795	25.43	DIO	● 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	OLR4B	● Prague, Czechoslovakia	Irregular (see 6010-9550-15230-11840 kc.)
11750	25.53	GSD	● Daventry, England	12:15-4 P.M., 6:20-8:30 P.M.
11740	25.55	RKF	Moscow, U.S.S.R.	(P) Calls U.S.S.R. phones often
11740	25.55	HP5L	● David, Panama	4-7 P.M. daily
11730	25.57	XETM	● Villahermosa, Mexico	6-11 P.M. daily
11730	25.57	PHI	● Huizen, Holland	Irregular
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
11718	25.60	CR7BH	● Lourenco Marques, E. Africa	Sundays 6-8 A.M., 10 A. M.-12:30 P.M., 1:30-3:30 P. M. Weekdays, Mon. to Sat., 11:45 P. M. (Sunday)-12:30 A. M., 4:30-6:30 A.M., 9:30-11 A.M., 12:30-4 P.M.
11710	25.62	Philco Radio	● Saigon, Indo-China	Daily 6:30-9:30 A.M. News: French 9-9:10 A.M.
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-Price, 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	V1Z3	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.

Short-Wave Station List

KC	Meters	Call	Location	Time
11402	26.31	HBO	● Geneva, Switzerland	Phones irreg. BC 6:45-8 P.M. Saturdays
11340	26.46	DAF	Norddeich, Germany	(P) Phones ships 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
11040	27.17	CSW	● Lisbon, Portugal	12-6 P.M. daily
11000	27.27	PLP	● Bandoeng, Java	Phones Makasser 2-5 A.M., 8:30-10:30 P.M., BC 5-10 A.M., 6-8:30 P.M., 10:30 A.M.-2 A.M. daily
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; 2:30-3:30 P.M. daily. Overseas
10680	28.09	PLQ	Bandoeng, Java	(P) Phones Knala Lumpur, Medan and Makasser 5:30-9 A.M., 10 P.M.-2 A.M.
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	HPH	Panama City, Panama	(P) Phones 4:15-4:15 P.M.
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.; 4-5 P.M. daily
10620	28.25	WEF	Rocky Point, N. Y.	(E) Relays program service irregularly
10620	28.25	EHX	Madrid, Spain	(P) Phones CEC and EHZ afternoons
10610	28.28	WEA	Rocky Point, N. Y.	(E) Tests Europe irreg.
10550	28.44	WOK	Lawrenceville, N. J.	(P) Phones LSN-PSF-PSH-PSK nights
10530	28.49	JIB	Tawian, Japan	(P) Phones JVL-JVN early mornings to 8 A.M.; sp'l be'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.
10430	28.76	YBG	Medan, Sumatra	(P) Phones PLV-PLP early A.M.
10430	28.76	TYE-3	Paris, France	(P) Phones U.S.A. irreg.
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, 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	● Tablero, Tenerife, C. I.	(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	BC Phones Sydney and Medan 8:30-10:30 P.M., 2-5:30 A.M., 5:30-10 A.M., 6-8:30 P.M., 10:30 P.M.-2 A.M. daily
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.
10210	29.38	DGD	Nauen, Germany	(P) Phones 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
10128	29.62	DON	Konigs W'h., Germany	(P) Phones irreg.
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	WCU	San Juan, P. R.	(P) Phones WNC irreg., 6-8 P.M. daily
9940	30.18	CSW	● Lisbon, Portugal	6-8 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
9920	30.24	DGM	Nauen, Germany	(P) Phones irreg.
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	FYC-2	Paris, France	(P) Phones U.S.A. irreg.
9840	30.47	JYS	Kemikawa-Cho, Japan	(E) Tests irregular
9830	30.50	IRM	Rome, Italy	(P) Phones JVP-JZT-LSX-WEL A.M.
9800	30.59	GCW	Rugby, England	(P) Phones Lawrenceville eve. and nights
9800	30.59	LSI	Buenos Aires, Arg.	(P) Relays very irreg.
9760	30.74	VLJ	Sydney, Australia	(P) Phones PLV-ZLT early A.M.
9760	30.74	VLZ	Sydney, Australia	(P) Phones PLV-ZLT early A.M.
9750	30.77	COCQ	● Havana, Cuba	8 A.M.-12 mid. daily
9750	30.77	WOF	Lawrenceville, N. J.	(P) Phones GCU irreg.
9710	30.88	GCA	Rugby, England	(P) Phones LSL afternoons
9700	30.93	LQA	Buenos Aires, Arg.	(P) Tests and relays early evenings
9675	31.00	DZA	● Zeesen, Germany	Irregular
9670	31.02	TI4NRH	● Heredia, Costa Rica	Daily 9-10 P.M., 11:30 P.M.-12 A.M.; Sat. night to 2 A.M. Sun.
9660	31.06	CR6AA	● Lobito, West Africa	3:45-5:30 P.M. Wed. & Sat.
9660	31.06	LRX	● Buenos Aires, Arg.	6-11:30 P.M. daily
9660	31.06	PSJ	Rio de Janeiro, Brazil	(P) Irreg., Argentina
9650	31.09	CT1AA	● Lisbon, Portugal	Tues., Thurs., Sat., 4-7 P.M.
9650	31.09	DGU	Nauen, Germany	(P) Phones SUV in A.M. Relays irreg.
9635	31.13	2RO3	● Rome, Italy	12:30-6 P.M. daily ex. Sat. Sat., 1:20-5:30 P.M. Mon., Wed., Fri., Amer. Hour 6-7:30 P.M.; Tues., Thurs., Sat., Lat. Amer. 6-7:45 P.M.
9630	31.15	CFA5	Drummondville, Que.	(P) Phones No. America days
9620	31.17	HJ1ABP	● Cartagena, Colombia	7-9 A.M., 11 A.M.-1:20 P.M., 6-11 P.M. daily
9620	31.17	FZR	Saigon, Indo-China	(P) Phones Paris early A.M.

Short-Wave Station List

KC	Meters	Call	Location	Time
9610	31.22	YDB	● Soerabaja, Java	Sunday 5:30-10:30 A.M., 7:30 P.M.-2 A.M. Weekdays 5:30-10:30 or 11 A.M. (Sat. 11:30 A.M.), 6-7:30 P.M., 10:30 P.M.-2 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	XEYU	● Mexico D. F.	7-10 P.M. daily
9600	31.25	CB960	● Santiago, Chile	Daily 11:30 A.M.-2 P.M., 9:30 P.M.-12 A.M.
9595	31.27	HBL	● Geneva, Switzerland	5:30-6 P.M. Saturdays
9595	31.27	HH3W	● Port-au-Price, 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	VK6MS	● Perth, W. Australia	Daily ex. Sun., 6-7 A.M.
9590	31.28	W3XAU	● Philadelphia, Pa.	Daily ex. Sun. & Wed. 12-8 P.M. Sun. & Wed. 12-7 P.M. Also Thurs. 10-11 P.M.
9590	31.28	VK2ME	● Sydney, Australia	Sunday 1-3 A.M., 5-9 A.M., 10:30 A.M.-12:30 P.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	● Hilversum, Holland	Tues. 1:30-3 P.M., Thurs. 7-11 P.M.
9580	31.32	GSC	● Daventry, England	9-11 P.M. daily
9580	31.32	VK3LR	● Melbourne, Australia	Sun. 3-7 A.M., 8:45-9:45 A.M., Mon to Fri., 4-8:30 A.M., 8:45-9:45 A.M., Sat. 4-8:30 A.M., 8:45-9:45 A.M., 10 P.M.-3 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.
9565	31.36	YV3RB	● Barquisimeto, Venezuela	Daily 11:30 A.M.-12:30 P.M., 5:30-9:30 P.M.
9562	31.38	OAX4T	● Lima, Peru	7-11 P.M.
9560	31.38	DJA	● Zeesen, Germany	12:05-5:15 A.M., 4:50-10:45 P.M. daily
9560	31.38	HJ1ABB	● Barranquilla, Colombia	7 A.M.-12:30 P.M. daily
9550	31.41	HI5E	● Ciudad Trujillo, R. D.	Irregular
9550	31.41	OLR3A	● Prague, Czechoslovakia	Tues., Thurs., Sat., Sun. 4:10-4:30 P.M.
9545	31.44	HH2R	● Port-au-Prince, Haiti	Special programs irreg.
9540	31.45	VPD-2	● Suva, Fiji Is.	5:30-7:30 A.M. daily
9540	31.45	DJN	● Zeesen, Germany	12:05-5:15 A.M., 5:55-11 A.M., 4:50-10:45 P.M. daily
9535	31.46	IZI	● Nazaki, Japan	9-10 A.M. daily
9530	31.48	W2XAF	● Schenectady, N. Y.	4 P.M.-12 A.M. daily
9530	31.48	LKJ1	● 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.
9523	31.50	"Radio Liberte"	● Paris, France	7-8 P.M. daily (see 7380 kc.)
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	12-2:15 A.M., 12:15-4 P.M., 4-6 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.
9510	31.55	XEFT	● Vera Cruz, Mexico	(See 6120 kc.)
9504	31.57	OLR3B	● Prague, Czechoslovakia	Irregular (see 6010-9550-15.230-11840 kc.)
9500	31.58	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. 9A.M.-3P.M.
9490	31.61	KEI	Bolinas, Calif.	(P) Phones Indo-China and China A.M.
9480	31.65	EAQ-2	● Madrid, Spain	Tues. & Fri., 7:45-9 P.M. English and irregular
9480	31.65	PLW	Bandoeng, Java	(P) Phones Australia early A.M.
9480	31.65	KET	Bolinas, Calif.	(P) Phones WEL evenings & nights
9470	31.68	WET	Rocky Point, N. Y.	(E) Tests LSX-PPM-ZFD evenings
9460	31.71	ICK	Tripoli, Africa	(P) Phones Italy A.M.
9450	31.75	"Radio Fort de France"	● Fort de France, Martinique	11:30 A.M.-12:30 P.M., 6:15-7:15 P.M., 8-9 P.M. daily
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.
9440	31.78	HCODA	● Guayaquil, Ecuador	8-11 P.M. ex. Sunday
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 San Francisco 9:30-10:30 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.
9345	32.10	HBL	Geneva, Switzerland	(E) Broadcasts and phones irreg.
9340	32.12	OAX4I	● Lima, Peru	6-11:30 P.M. daily
9330	32.15	CGA4	Drummondville, Que.	(P) Phones GCB-GDB-GBB afternoons
9300	32.27	YNGU	● Managua, Nicaragua	Weekdays 12-2 P.M., 5-6 P.M. Sundays 11 A.M.-12 noon
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	Sun. 7-8 P.M., Wed. 7-8 P.M., Sat. 6-7 P.M
9120	32.89	CP6	● La Paz, Bolivia	No regular schedule
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
9037	33.19	TYA-2	Paris, France	(P) Phones Algiers, irreg.
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 - 8:45 A.M. daily. 11:30 A.M.-2:30 P.M., 5-10 P.M. ex. Mondays (To 7 P.M. on 4107 k.c., after 7 P.M. on 4107 and 8948 k.c.)
8930	33.59	WEC	Rocky Point, N. Y.	(P) Phones Ethiopia irregular
8900	33.71	ZLS	Wellington, N. Z.	(P) Phones VLZ early mornings
8840	33.94	ZMBJ	● TSS "Awatea," Wellington, N. Z.	B.C. Sundays 6:40 P.M. Daily 1-3 A.M.
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
8765	34.23	DAF	Norddeich, Germany	(P) Phones ships irreg.
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 afternoons
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
8670	34.60	YN1PR	● Managua, Nicaragua	8-10 P.M. 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	IAC	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	IZF	Nazaki, Japan	(P) Phones ships irreg.
8404	35.70	HC2CW	● Guayaquil, Ecuador	Weekdays 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.
8330	36.01	DAS	Rugen, Germany	(P) Phones ships 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.

Short-Wave Station List

KC	Meters	Call	Location	Time
8110	37.00	ZP10	● Asuncion, Paraguay	8-10 P.M.
8075	37.15	WEZ	Rocky Point, N. Y.	(E) Program service P. M.; irregular
8075	37.15	TYB-2	Paris, France	(P) Phones Morocco irreg.
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., 4-11 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.
7812.5	38.40	DFT	Nauen, Germany	(P) Phones irreg.
7797	38.47	HBP	● Geneva, Switzerland	5:30-6 P.M., Saturdays
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
7700	38.96	TYC-2	Paris, France	(P) Phones Cairo irreg.
7670	39.11	WDF	San Juan, P. R.	(P) Phones WNC irreg.
7669	39.11	TGF	Guatemala City, Guate.	(P) Phones TIU - HPF daytime
7650	39.22	TYE-4	Paris, France	(P) Phones U.S.A. irreg.
7626	39.31	RIM	Tashkent, USSR.	(P) Phones RKI early mornings
7620	39.37	IUB	● Addis Ababa, Ethiopia	Irregular
7610	39.42	KWX	Dixon, Calif.	(P) Phones KKH nights; KAZ - KTP - PLV - JVT - JVM A.M.
7565	39.66	KWY	Dixon, Calif.	(P) Phones Shanghai early mornings
7550	39.74	TI8WS	● Puntarenas, Costa Rica	Sun., 4-5 P.M. Weekdays, 5-7 P.M., 8:30-10 P.M.
7520	39.89	KKH	Kahuku, Hawaii	(P) KEE-KEJ evenings. KWX-KWV nights
7518	39.90	RKI	Moscow, USSR.	(P) Phones RIM early mornings
7510	39.95	JVP	● Nazaki, Japan	(P) Tests Point Reyes early A.M.; broadcasts 2:30-3:30 P. M. daily
7500	40.00	CFA-6	Drummondville, Que.	(P) Phones N. America days
7470	40.16	JVQ	Nazaki, Japan	(P) Relays and phones early A.M.; broadcasts Mon., Thurs., 2-3, 4-5 P.M.
7470	40.16	HJP	Bogota, Colombia	(P) Phones HJA3-YVQ early evenings
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	Wien, Austria	(P) Tests early evenings very irreg.
7380	40.65	'Radio Liberte"	● Paris, France	7-8 P.M. daily (see 9523 kc.)
7380	40.65	XECR	● Mexico City, Mexico	Sundays 6-8 P.M.
7370	40.71	KEQ	Kahuku, Hawaii	(P) Relays programs evenings
7345	40.84	GDL	Rugby, England	(P) Phones Japan irreg. A.M.
7332.5	40.92	DLC	Rehmate, Germany	(P) Phones irreg.
7211	41.60	EA8AB	● Santa Cruz, Tenerife, C. I.	Mon., Wed., Fri., Sat.. 3:15-4:15 P.M.
7203	41.64	EAJ	● San Sebastian. Tenerife, C. I.	4 P.M.-12 A.M. and later
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
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.
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	Weekdays 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	Weekdays 5:30-8:30 A. M., Sun. 7-9 A.M.
6800	44.12	HI7P	● Ciudad Trujillo, R. D.	Weekdays 12:40-1:40 P. M., 6:40-8:40 P.M. Sundays 9:40-10:40 A. M.
6795	44.15	GAB	Rugby, England	(P) Phones Canada irreg.
6788	44.20	PZH	● Paramaribo. D. Guiana	Sunday, 9:45-11:45 A.M. Weekdays 2:45 - 4:45, 5:45-9:45 P.M.
6780	44.25	HIH	● San Pedro de Macoris, R. D.	Daily 12:10-1:40 P.M., 7:40-9 P.M. Sunday 5:10-6:40 P.M. DX 2:40-3:40 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.	Weekdays 12:10-2:10 P. M., 6:10-7:40 P.M. Sun., 12:10-2:40 P.M.
6725	44.60	WOQ	Rocky Point, N. Y.	(E) Tests evenings irreg.
6720	44.64	PMH	● Bandoeng, Java	Phones early A.M. B.C. 5:30-11 A.M. daily
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
6675	44.94	HBQ	Geneva, Switzerland	(E) Broadcasts and phones irreg.
6668	44.99	HC2RL	● Guayaquil, Ecuador	Sun. 5:30 - 7:30 P.M. Tues. 9-11 P.M.
6650	45.11	GBY	Rugby. England	(P) Phones U.S.A. irreg.
6650	45.11	IAC	Pisa. Italy	(P) Phones ships irreg.
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.
6600	45.45	DAF	Norddeich. Germany	(P) Phones irreg.
6575	45.63	HC1VT	● Ambato, Ecuador	Mon., Wed., Fri., 8-10:30 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.-1:30 P.M., 5:30-9:30 P.M. daily
6500	46.15	HIL	● Ciudad Trujillo. R. D.	12-2 P.M., 6-8 P.M.
6482	46.28	HI4D	● Ciudad Trujillo. R. D.	Mon. & Sat., 11:55 A. M.-1:40 P.M., 4:40-7:40 P.M.
6480	46.30	EDR-4	● Palma de Mallorca, Balearic Is.	4:30-5:15 P.M. daily
6479	46.30	HI8A	● Ciudad Trujillo, R. D.	Daily 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., 6:40-9:15 P.M. daily
6445	46.55	YVQ	● Maracay, Venezuela	8-9 P.M. Saturdays
6445	46.55	YVQ	Maracay, Venezuela	(P) Phones LSL irreg.
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	Weekdays 11 A.M.-1:30 P.M., 4:30-9:30 P.M. Sun. 9:30 A.M.-1:30 P.M., 5-7:30 P.M.
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
6340	47.32	HI1X	● Ciudad Trujillo, R. D.	Sun. 7:40-10:40 A.M. Weekdays 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.
6310	47.54	TG2	● Guatemale City, Guatemala	11 P.M.-2 A.M.

Short-Wave Station List

KC	Meters	Call	Location	Time
6300	47.62	YV4RD	● Maracay, Venezuela	6:30-9:30 P.M. ex. Sun.
6280	47.77	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
6260	47.92	OAX4G	● Lima, Peru	7-11 P.M. daily
6250	48.00	YV5RJ	● Caracas, Venezuela	5:30-9:30 P.M. daily
6243	48.05	HIN	● Ciudad Trujillo, R. D.	(See 11260 kc.) Weekdays 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 PM
6235	48.11	OCM	Lima, Peru	(P) Phones afternoons
6235	48.11	HRD	● La Ceiba, Honduras	8-10:30 PM., Sundays 4-6 P.M.
6230	48.15	YV1RG	● Valera, Venezuela	11 A.M.-12:30 P.M., 5:30 8:30 P.M. daily
6210	48.31	YV1RI	● Coro, Venezuela	7:30-9:30 P.M. daily
6200	48.39	COKG	● Santiago, Cuba	Sundays 12:01-1 A.M., 5-6 P.M., 9:30-10:30 P.M. daily
6200	48.39	XEXS	● Mexico City, Mexico	7-11 P.M.
6190	48.47	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 7-11:30 A.M. To 12:30 P.M. Saturdays
6156	48.73	YV5RD	● Caracas, Venezuela	Weekdays 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, 6:15-10 P.M.
6150	48.78	CJRO	● Winnipeg, Manitoba	Weekdays 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	● Moca, 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	OAX1A	● Chiclayo, Peru	7-10:30 P.M. daily
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	Sundays 6-8 A.M., 10 A.M.-12:30 P.M., 1:30-3:30 P.M. Mon. to Sat., 11:45 P.M. (Sunday)-12:30 A.M., 4:30-6:30 A.M., 9:30-11 A.M., 12:30-4 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	LKJ1	● Jeloy, Norway	11 A.M.-5 P.M. daily
6130	48.94	COCD	● Havana, Cuba	Weekdays 9 A.M.-1 A.M. Sundays 1-3 A.M., 10 A.M.-8 P.M.
6130	48.94	VE9HX	● Halifax, Nova Scotia	Sun. 2-10:45 P.M., Mon. to Fri. 6:30 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	Weekdays 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
6120	49.02	XEUZ	● Mexico City, Mexico	8 P.M.-2 A.M. daily
6115	49.06	OLR2C	● Prague, Czechoslovakia	Irregular (see 6010-9550-15230-11840 kc.)
6110	49.10	HJ4ABB	● Manizales, Colombia	11 A.M.-1 P.M., 5-8 P.M.
6110	49.10	GSL	● Daventry, England	Not in use
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	Daily ex. Mon. 11 A.M.-4 P.M., 7 P.M.-12 A.M. Mondays 9 A.M.-4 P.M.
6100	49.18	Belgrade	● Belgrade, Yugoslavia	1 A.M.-5 P.M. daily
6100	49.18	W9XF	● Chicago, Illinois	Mon. to Fri. 11:05 P.M.-2 A.M. Sat. 12-2 A.M. Sun. 11:05-12 A.M., 1:05-2 A.M.
6100	49.18	W3XAL	● Bound Brook, N. J.	6-11 P.M. daily
6097.5	49.20	ZTJ	● Johannesburg, S. Africa	Sunday 4-5 A.M., 12:15-3:15 P.M. Weekdays 12-12:45 A.M., 3:15-5 A.M., 9 A.M.-4 P.M.
6097	49.20	HJ4ABE	● Medellin, Colombia	9:30 A.M.-1 P.M., 5-11:30 P.M. daily
6095	49.22	JZH	● Nazaki, Japan	Irregular
6092	49.24	OAX4Z	● Lima, Peru	7-11:30 P.M. daily
6090	49.26	CRCX	● Bowmansville, Ont.	Weekdays 12 noon-8 P.M. Sunday 11 A.M.-8 P.M. Sat. "Northern Messenger," 11 P.M.-12 A.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	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.	Weekdays 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	ZHJ	● Penang, S. S.	6:40-8:40 A.M.
6080	49.34	CP5	● LaPaz, Bolivia	No regular schedule
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	9-11 A.M., 1-4 P.M., 8-11:30 P.M. or 12 A.M.
6070	49.42	CFRX	● Toronto, Ont.	Daily 7:30-12.05 A.M.
6070	49.42	YV1RD	● Maracaibo, Venezuela	Daily 8 P.M.-12 A.M. Sun. 8 A.M.-8 P.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. Weekdays
6060	49.50	W3XAU	● Philadelphia, Pa.	8-11 P.M. daily ex. Thurs. (8-10 P.M.)
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	Not in use
6050	49.59	HJ3ABD	● Bogota, Colombia	Weekdays 9 A.M.-2 P.M., 6 P.M.-12 A.M. Tues. & Thurs. to 3 P.M. Wed. & Fri. begin 5:30 P.M.
6050	49.59	XEXF	● Mexico City, Mexico	8 P.M.-12 A.M.
6045	49.62	XETW	● Tampico, Mexico	7 P.M.-12 A.M. daily
6043	49.62	HJ1ABG	● Barranquilla, Colombia	Daily 11 A.M.-11 P.M. Sun., 11 A.M.-8 P.M.
6040	49.67	PRA8	● Pernambuco, Brazil	9:30-11:30 A.M., 2:30-8:30 P.M.
6040	49.67	YDA	● Tandjong Priok, Java	10:30 P.M.-2 A.M. daily
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	OLR2B	● Prague, Czechoslovakia	Irregular (see 6010-9550-15230-11840 kc.)
6030	49.75	HP5B	● Panama City, Panama	12-1 P.M., 5-10 P.M.
6030	49.75	HJ4ABP	● Medellin, Colombia	8 A.M.-11 P.M. daily
6030	49.75	PGD	Kootwijk, Holland	(P) Phones Java and E. Indies irreg.
6030	49.75	VE9CA	● Calgary, Alberta, Can.	Weekdays 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.
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.	Weekdays 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	Irregular (see 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	Weekdays, 4:45-8:45 P.M. Mon., Wed., Fri. 10:15-11:15 A.M. Sun. 8:45-11:15 A.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	OLR2A	● Prague, Czechoslovakia	Mon., Wed., Fri. 4:10-4:30 P.M.
6005	49.96	HP5K	● Colon, Panama	7:30-9 A.M., 11:30 A.M.-1 P.M., 6-11 P.M.

Short-Wave Station List

KC	Meters	Call	Location	Time
6005	49.96	CFCX	● Montreal, Que.	Weekdays 7:44 A.M.-1 A.M. Sundays, 9 A.M.-11:15 P.M.
6005	49.96	VE9DN	● Montreal, Que.	Sat. 11 P.M.-12 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 A.M. daily
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.	Not in use.
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.-11:30 P.M.; Sundays, 1-2 P.M.
5930	50.59	YV1RL	● Maracaibo, Venezuela	Weekdays, 11 A.M.-1 P.M., 4:30 - 9:30 P.M. Sun., 8:30 A.M.-2:30 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	TILS	● San Jose, Costa Rica	6-11 P.M. daily
5900	50.84	ZNB	● Mafeking, South Africa	Sun., 1:30 - 2:30 P.M. Mon. to Sat., 1-2:30 P.M.
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.)
5885	50.98	HI9B	● Santiago de los Caballeros, R. D.	Weekdays, 7:30 - 8:45 A.M., 12-2 P.M., 5-7:45 P.M. Sunday, 11:45 A.M.-2:45 P.M.
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.	11:40 A.M.-1:40 P.M., 5:40-9:40 P.M. daily
5853	51.20	WOB	Lawrenceville, N. J.	(P) Phones ZFA P.M.
5850	51.28	YV1RB	● Maracaibo, Venezuela	Daily ex. Sun. 10:45 A.M.-12:45 P.M., 4:45-9:45 P.M. Sun. 8:45 A.M.-9:45 P.M. Mon., Wed., Fri., 5:45-8:15 A.M. Tues., Thurs., Sat., 5:45-9:45 A.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	Sunday 8:30-11:30 A.M., 1:30-10 P.M. Weekdays 10:45 A.M.-1:30 P.M., 4-10:30 P.M. Sat. —close 9:30 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 ex. Sunday
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	Saturdays 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.	Sundays 5:30-10 P.M. Weekdays 11:30 A.M.-12:30 P.M., 5:30-9 P.M.
5705	52.59	CFU	Rossland, Canada	(P) Phones CFO and CFN eves.; news, 8:30-8:45 P.M.
5670	52.91	DAF	Norddeich, Germany	(P) Phones ships irreg.
5635	53.24	DAS	Rugen, Germany	(P) Phones ships irreg.
5445	55.10	CJA7	Drummondville, Que.	(P) Phones Australia early A.M.
5435	55.20	LSH	Buenos Aires, Afg.	(P) Relays LR4 and tests evenings
5395	55.61	CFA7	Drummondville, Que.	(P) Phones No. America irregular
5355	52.63	DOG	Konigs W'n., Germany	(P) Phones irreg.
5260	57.03	WQN	Rocky Point, N. Y.	(E) Program service; irregular
5255	57.09	DOF	Konigs W'n., Germany	(P) Phones irreg.
5140	58.37	PMY	● Bandoeng, Java	Daily 4:45-10:45 A.M., 5:45 P.M.-2:15 A.M.
5110	58.71	KRG	Bolinas, Calif.	(P) Phones irregularly evenings
5080	59.08	WCN	Lawrenceville, N. J.	(P) Phones GDW evenings seasonaliy
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
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
4500	66.67	DAS	Rugen, Germany	(P) Phones ships irreg.
4465	67.19	CFA2	Drummondville, Que.	(P) Phones No. America; irregular days
4420	67.87	ZMBJ	● TSS "Awatea." Wellington, N. Z.	(See 8840 kc.)
4400	68.18	DAF	Norddeich, Germany	(P) Phones ships irreg.
4355	68.88	IAC	Pisa, Italy	(P) Phones and tests irreg.
4348	69.00	CGA9	Drummondville, Que.	(P) Phones ships and Rugby evenings
4320	69.40	GDB	Rugby, England	(P) Phones CGA8 and tests evenings
4295	69.90	WTDV	St. Thomas, Virgin Is.	(E) Weather reports, 8 A.M.-12 noon; 3-6 P.M.
4295	69.90	WTDW	St. Croix, Virgin Is.	(E) Weather reports, 8 A.M.-12 noon; 3-6 P.M.
4295	69.90	WTDX	St. John, Virgin Is.	(E) Weather reports, 8 A.M.-12 noon; 3-6 P.M.
4273	70.21	RV15	● Khabarovsk, USSR	Daily ex. 6, 12, 18, 24, 30th, 3 P.M.-8 A.M. On 6, 12, 18, 24, 30th, 7:10 P.M.-8 A.M. English programs start at 2 A.M.
4272	70.22	WOO	Ocean Gate, N. J.	(P) Phones ships afternoons and eve.
4272	70.22	WOY	Lawrenceville, N. J.	(P) Tests evenings
4107	73.05	HCJB	● Quito, Ecuador	(See 8948 kc.)
4002	75.00	CT2AJ	● Ponta Delgada, Azores	Wed. and Sat., 5-7 P.M.
3750	80.00	HCK	● Quito, Ecuador	Mondays 8:30-10:30 P.M. and occasional specials
3310	90.63	CJA8	Drummondville, Que.	(P) Phones Australia A.M.
4040	98.68	YDA	● Batavia, Java	Sunday 5:30-10:30 A.M., 7:30 P.M.-2 A.M. Weekdays 5:30-10:30 or 11 A.M. (Sat. 11:30 A.M.), 6-7:30 P.M., 10:30 P.M.-2 A.M.

ACT-20

(Continued from page 311)

Included with the test transmitter were all tubes, a type MI-6225-A double-button microphone and three sets of coils for operation on 10, 20 and 40 meters. The transmitter was set up for operation according to the instruction book. It was found that the 807 final stage was perfectly neutralized on all three bands with the original factory adjustment. It is recommended in the instructions that a 25-watt, 110-volt lamp be used as a dummy load for testing in place of the usual dummy idea of doing all testing on the air. The particular bulb we used did not match the antenna winding and provided only a small load. Perhaps a bulb of different characteristics will do the trick.

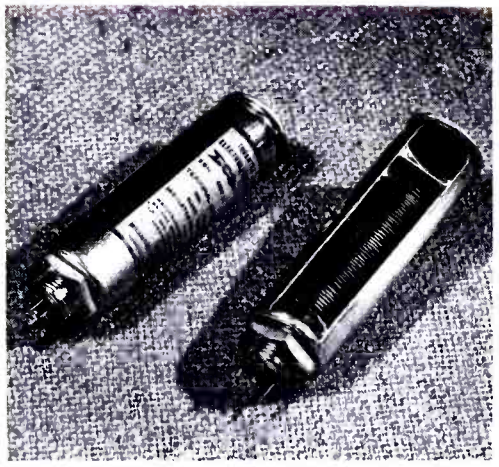
The audio section was checked and found to provide 100 percent modulation of the carrier with the gain three-quarters on, speaking in a normal tone about six inches from the microphone. Much more audio gain was available than could be used. Monitoring

(Continued on page 335)

On the Market

New Wet Electrolytic Condenser

MICAMOLD PRODUCTS CORP. announce a wet electrolytic condenser which incorporates a new design of the anode structure that closely approaches the theoretically perfect unit, in that the current has the shortest average path from the can to all points on the anode surface. This results in a lower power factor than has ever been achieved before . . . rating for rating, it is said.



The elimination of the hard rubber liner not only further reduces the power factor but eliminates a material that often contains sulphides which cause anode corrosion and resultant malfunctioning.

More capacity for a given working voltage can be put into standard size cans (very high capacity electrolytics are demanded by the new circuits).

The condensers are made in cans of standard dimensions and fit the standard holes in radio chassis. Each condenser is equipped with a self locking nut.

It is impossible for this new type anode to touch the can so that a liner is unnecessary. ALL-WAVE RADIO.

✦

New Hammarlund Transmitting Condensers

A NEW POPULAR SERIES of transmitting condensers for high frequency and ultra-high frequency, medium and low powered units, has just been developed in the laboratories of the Hammarlund Manufacturing Company, 424 West 33rd Street, New York City. Though low in price, these condensers include all the constructional features required in quality transmitters of all types.

Known as the MTC series, they are available in both single and split stator styles in 19 different sizes with capacities ranging from 20 to 530 mmfd. and breakdown voltages from 1,000 to 6,000 volts. The end frames are of heavy aluminum sheet, while the rotor and stator plates are of heavy aluminum, firmly anchored in place by wedging into deep slots and then by further staking. An accurately ground stainless steel shaft is carefully fitted to a long bronze front bearing mounted on a Beryllium cushion disc. The free floating action thus afforded provides for a perfect bearing and consequently smooth operation. The rear bearing is of the steel ball and cup type. Thorough Isolantite insulation and a silver plated Beryllium contact wiper assures lowest losses, lowest series resistance and noiseless operation.

The condensers are designed for either panel or base mounting and range in size from 4" long to 6¼" long including a 1" long shaft. Plates are either round edged or standard type varying in thickness from .025" to .040" and from .031" plate spacing to .171" plate spacing, dependent upon voltage breakdown required.

Complete technical bulletins are available free of charge. ALL-WAVE RADIO.

✦

Thordarson "Multi-Match" Modulation Transformers

THORDARSON ELECTRIC MFG. CO., Chicago, have introduced a new series of modulation transformers for amateur transmitters which, by the use of plug-in jacks, as shown in the accompanying illustration, can be adapted to match any tube to any load instantly and without the necessity of altering external circuit connections.

Known as "Multi-Match Modulation Transformers" these units are ideal for experimental purposes as well as for permanent use, since their flexibility insures them against obsolescence.

Features claimed for these units are: plug-in jack terminals for input and output; complete variable matching; new modernistic case design; minimum space factor on chassis; completely compound filled; coils double varnished and baked; moisture proof, and moderate in price.

The Multi-Match Modulation Transformers are available in four sizes, namely, up to 50 watts, 125 watts, 250 watts and 500 watts. ALL-WAVE RADIO.

✦

Taco Line-Noise Filter

INGENIOUS CIRCUIT design is said to be responsible for the new Taco Type 104 Line Filter that does a real noise-suppressing job for a small investment. This device is attractively housed in a round polished-aluminum casing with standard receptacle and ground-connection binding post at top, as well as a long rubber-covered cord and plug. The radio set attachment cord plugs into the filter receptacle, while the filter connection cord plugs into the usual outlet.

Not only line noises within the broadcast band, but also those in the short-wave band, are prevented from reaching the all-wave set, because of the 50-db drop in the filter. ALL-WAVE RADIO.

✦

C-D Color Code Charts Ready

A CONVENIENT CHART, of vest pocket size, illustrating the standard R.M.A. mica capacity color code, has been made available by the Cornell-Dubilier Corporation. The extreme compactness of the modern mica capacitor has necessitated the substitution of a color code for the *usual* numeral capacity identification. This chart, therefore, will be found of exceptional value by the serviceman, engineer and amateur.

Since a quantity sufficient to meet all demands has been prepared, you should have no difficulty in obtaining a C-D mica capacitor color code chart, free of charge, at your local jobber. ALL-WAVE RADIO.

✦

Oxford "Permag" Speakers

A COMPLETE LINE of permanent magnet speakers is announced by Oxford Tartak Radio Corporation. "Permag" has been adopted as the trade name by which these speakers will be known.

This line is outstanding in its completeness, comprising speakers ranging in size from 3" in diameter to 14". The 3" speaker is being featured as the worlds smallest permanent magnet dynamic speaker.

In addition to the three-inch Permag, Oxford has developed a remarkable trumpet type permanent magnet speaker with a six-inch cone housing for use with an exponential horn. It is claimed that this job is superior to a dynamic unit with standard field coil excitation.

For automotive and portable installations, the Permag Trumpet opens an entirely new field, since no external field excitation is required. ALL-WAVE RADIO.

Insuline Knock-Down Cabinets

A LINE OF black crystallized-finished steel cabinets, supplied in knock-down form for easy assembly by amateurs, experimenters and service men, has been brought out by the Insuline Corporation of America, 25 Park Place, New York, N. Y. There are seven sizes, the smallest measuring 9 inches long, 5 inches wide and 6 inches high and the largest 18 by 12 by 9 inches.

The sections of these cabinets are held together by self-tapping screws. The front and back panels, and also the bottom, can be removed without disturbing the rest of the box. This arrangement allows inspection or revision of the circuit or the changing of a part. The top of the cabinet is a hinged lid.

These cabinets are suitable for a wide variety of purposes. They are ideal for receivers, transmitters, power supplies, amplifiers, test oscillators, oscilloscopes using the new 913 cathode-ray tube, etc.

Cadmium plated steel chasses to fit inside the cabinets are also available. ALL-WAVE RADIO.

✦

New "Wholesale" Receivers

AFTER AN EXHAUSTIVE analysis of the radio receiver market, and adapting this analysis to their set line-up, Wholesale Radio Service Company, Inc., of 100 Sixth Avenue, New York City, have announced their new line of Lafayette receivers for Spring and Summer, 1937. Over 25 different types of receivers, including farm, boat, and automobile models, ranging from 4 to 24 tubes and priced for every pocketbook are included. A special set suitable for the "Trailer" is one of the feature items.

Special stress has been placed on phonograph combinations; these are available for single recordings and with Capehart automatic record changers. Prices for this category are brought within the low brackets so that this type of instrument is now available to every class of buyer. All of the latest technical developments are found in many of these new sets; these include tone expander circuits, magic "ear," beam spot dial, and many others.

Complete details and prices of the entire line is found in the Spring and Summer catalog, No. 68, just released for free distribution by Wholesale Radio Service Company, Inc. A copy may be obtained from their New York office or any one of their branches, in Chicago, Atlanta, Newark, the Bronx and Jamaica. ALL-WAVE RADIO.

✦

Waterproof "B" Batteries

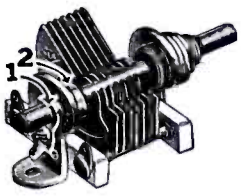
BURGESS "B" BATTERIES are now effectively protected from cell leakage and outside moisture. Each cell is individually wrapped in three layers of moisture-resistant paraffined paper, and is in turn separated from other cells by a paraffined inner liner—in egg-crate fashion. This construction gives maximum insulation between cells and prevents stray current losses which cause noisy reception. Furthermore, the individually sealed cells are totally covered with pitch to retain the electrolyte moisture. As a final protection against the passage of moisture, the heavy outside cartons are paraffined on both sides.

A double wax seal on the top—reinforced by a gauze strip between the wax layers—assures double strength and resistance to chipping or breaking. ALL-WAVE RADIO.

✦

Bud Midget Transmitting Condensers

THE MOST RECENT additions to the Bud line of midget condensers are the Bud Midget Transmitting Condensers. In tank circuits used in conjunction with such tubes as type 10, 801, T-20, 800, RK-39, etc., these condensers will find a welcome spot. The advantage in this type condenser over the larger sizes lies in the fact that, due to the smaller size, parts may be placed closer together and more correctly facilitating shorter leads and an overall gain in efficiency.



As in all Bud Condensers, these have close fitting brass bearings on both ends which insure smooth running at all times. These condensers utilize the improved Bud Rear Spring Contact. Mounting may be accomplished in either the single-hole panel mount style or on stand-off insulators utilizing the mounting angles on the front and end plates. Four sizes of these condensers are available:—35, 50, and 75 mmfd. size at 2,000 volts peak and a 100 mmfd. size at 1250 volt peak.

Further information on these condensers is available by writing Bud Radio Inc., Cleveland, Ohio. ALL-WAVE RADIO.

✦

Sylvania Revised Characteristic Sheet

HYGRADE SYLVANIA Corporation, Emporium, Pa., offers free to radio servicemen a revised edition of the Sylvania Characteristic Sheet, containing complete operating characteristics, condensed technical information, and base diagrams for all Sylvania tubes announced up to April 1, 1937. The chart is arranged for use in a standard three-ring binder, or may be opened flat for wall use at the service bench. ALL-WAVE RADIO.

✦

Du Mont Two-Inch Cathode Ray Tube

A TWO-INCH Cathode-Ray Tube type 24-XH has recently been developed by Allen B. Du Mont Laboratories, Inc.

This tube is of the high vacuum type with four electrostatic deflection plates, two common, mounted in a glass envelope having a full two-inch fluorescent screen. It is 7⅝ inches overall in length and a large octal base is used. The heater voltage a.c. or d.c. is 6.3 volts. Up to 600 volts may be used on the second anode. The 24-XH is a practical tube for all routine operations where economy and compactness are essential without sacrificing screen area. ALL-WAVE RADIO.

✦

Condenser Kit for Thordarson Oscilloscope

A CONVENIENT, money-saving kit of condensers called for in the construction of the new Thordarson Cathode-Ray Oscilloscope, is now offered by Aerovox Corporation, Brooklyn, N. Y., through its jobbers. The kit comprises 18 condensers of various types, capacities and voltage ratings. Some of the units have to meet very close capacity tolerances because of the critical nature of the oscilloscope circuits. The low cost makes this kit-assembled oscilloscope unusually attractive to servicemen, "hams" and other workers. ALL-WAVE RADIO.

✦

IRC Volume Control Guide

COINCIDING WITH completion of intensive national distribution of the new IRC Metalized Type Volume Controls through leading parts jobbers from coast to coast, comes announcement of an IRC Volume Control Guide, by International Resistance Co., 401 North Broad St., Philadelphia, Pa. It is available free to servicemen and amateurs who request it from IRC jobbers.

This Guide is attractively printed in handy pocket size with durable covers and is punched for convenience in hanging near the user's service bench. It lists in detail the IRC Standard Controls recommended for leading radio receivers, thus greatly simplifying the job of making quick, accurate replacements. ALL-WAVE RADIO.

✦

Interference Data in New Tobe Catalog

SPECIFIC RECOMMENDATIONS for quelling all types of man-made static are given in the current issue of the Tobe Deutschmann Corporation Filterette catalog in which are presented the results of ten years' laboratory and field research by this organization in the radio interference eliminating field.

Forty-two stock models from which may be chosen the correct unit for any application are fully described and their installation illustrated in this hand-book for radio servicemen. The Filterettes listed in the catalog are endorsed by all leading radio and electrical manufacturers, it is said, and incorporate the latest improvements so that they may be depended upon to eliminate interference in the short-wave bands as well as in the broadcast band.

The catalog also tells how radio servicemen may have placed at their disposal the services of the only engineering staff devoted exclusively to the study of radio interference problems.—ALL-WAVE RADIO.

(Continued on page 330)

Backwash

Commercial Code Station List

Editor, ALL-WAVE RADIO:

Three cheers for Ed. W. Barrett of Topeka for his letter in your last month's issue.

A list of commercial short-wave c.w. stations showing their frequency and hours of operation is something we've been hunting for unsuccessfully for a long time. You would certainly be doing all short-wave fans who can read code a big favor by publishing such a list.

Here's hoping you do real soon.

W. SCHNORR AND W. GOEDKE,
CHICAGO, ILL.

(List appears in this issue.—Editor)

◆

Variety

Editor, ALL-WAVE RADIO:

As a reader of ALL-WAVE RADIO since the first issue, I wish to express my appreciation of the fine work that you are doing in publishing this fb magazine.

I like ALL-WAVE RADIO because it has something of interest for everyone whether he be an engineer or just a listener. Not too technical nor is it too simple to bore the old timer. It's tops here on my work bench. Can hardly wait for next issues.

Now that you have started up the Radio Signal Survey League I believe that it would be a good idea to give the working and constructional details of a really sensitive receiver with some sort of a metering device to show the actual incoming signal strength. I am sure that the numerous readers of your magazine would appreciate one. I know I would. Keep the cost of this receiver under $50 and I believe it would go over with a bang. I have constructed several of your receivers and so far they have worked fb. That has given me a lot of confidence in your choice of circuits.

That fb Queries Dept. is the berries. One can really get some fine pointers from it. Keep up the good work.

Here's wishing you all the luck in the world in forming the R.S.S.L.

JOE HESTER,
TULSA, OKLAHOMA

(Thanks. A receiver similar to the one you suggest is on the way. Sensitivity and accuracy are its main features.—Editor)

◆

Likes

Editor, ALL-WAVE RADIO:

I bought my first copy of ALL-WAVE RADIO last September and since that time I haven't missed an issue. I have read lots of radio magazines but in my opinion AWR beats them all. It gives us the news for both the short-wave listener and those who wish to listen on the broadcast band.

Mr. La Rocque's department is very helpful and I think that "Night-Owl Hoots" is one of the best departments in your magazine. I have enjoyed the contest which he has been conducting very much and hope that he has another one next year. It helps to keep our interest up and gives us something to work for.

As I am especially interested in short waves, Mr. Hinds' "Globe Girdling" is very helpful. He gives the news in detail so that it makes it easier for us to find the stations we want. His station list is fine as it is more complete than most of them.

I would like to second Mr. Van Voorhees' motion that you have a list of the Police and Commercial stations between 1650 and 4000 kilocycles. If you couldn't print one every month, once every three months would be O.K.

KENDALL WALKER,
YAMHILL, OREGON

(Lists on way, but we have a few others to get off our chest before tackling the police and commercial stations.—Editor)

◆

A Boost From a Zedder

Editor, ALL-WAVE-RADIO:

I hope I am not putting you to any inconvenience, but we do not have a publication in the same class as ALL-WAVE RADIO here in New Zealand, which is rather a pity because of the numerous hams and radio men who are interested in radio.

FREDERICK DITEBFIELD, ZL3RS,
GISBORNE, NEW ZEALAND.

(Thanks. Hope we can fill the bill forever and anon.—Editor.)

◆

Roses For Bouck

Editor, ALL-WAVE-RADIO:

I have been receiving your very fine magazine since its very first issue and right here I want to put in the very kindest word I know for Zeh Bouck. His very delightful column is certainly a great source of enjoyment, and that is not detracting in the least from your many other fine contributors. The real object of this letter is to tell you that somehow I have lost my November 1936 issue of ALL-WAVE RADIO and I am enclosing thirty-five cents in stamps which I hope will be enough to cover the cost and postage on another Nov. 1936 issue which I wish you to send to me as soon as possible.

LEE EDWARDS,
OMAHA, NEB.

(We get first crack at Bouck's stuff, and we enjoy it as much as you do. He manages to get under some skins, but his copy wouldn't be worth much if it didn't rile a few people.—Editor)

Shut-In Outing

Editor, ALL-WAVE RADIO:

The Radio Amateurs of Cleveland and their friends, Broadcast Station Engineers, Police Radio Operators, Radio Servicemen and all others who are interested, have formed a "Shut-In Day Committee" for the sole purpose of showing our more unfortunate shut-in friends a good time in the form of an outing.

This outing will be held at Puritas Springs Park, Cleveland, Ohio, Sunday, August 1, 1937 (full day). We have cooperation of invalid coach operators here to help transport the shut-ins, also doctors and nurses to assist the invalids.

Everyone is invited to come; amateurs, their friends, shut-ins and their friends, SWL's and the public.

For further information, shut-ins and others may write to John E. Garvey, "Pop" (Chairman and one of the Shut-Ins), 2141 W. 67th Street, Cleveland, Ohio.

GEORGE FAGERHOLM, W8LVX
(Publicity Committee)
LAKEWOOD, OHIO

◆

Our Apologies

Editor, ALL-WAVE RADIO:

Regarding Mr. Geller's letter on page 149 of the March issue of ALL-WAVE RADIO, in which he states that I am no longer connected with the GCDXC, I should like to point out that my original letter, published in the January issue, was sent you while I was still connected with the organization.

Under the circumstances, I feel that I have been placed in a bad light when, as a matter of fact, I acted in good faith. If anything, I feel that Mr. Geller should have advised you of the change, in which case the incident would never have occurred.

RAYMOND S. SWENSON,
ROCKFORD, ILL.

(Mr. Swenson is right—his original letter did not appear in print until some months had passed, through no fault of his. We regret there has been a misunderstanding. —Editor)

◆

Thinks Bouck Crack-Pot

Editor, ALL-WAVE RADIO:

I would like to state that I am highly in favor of a list of Police and Commercial Stations in ALL-WAVE RADIO as suggested by F. L. Van Voorhees, in the March issue.

May I also suggest that this list of Police and Commercial Stations be printed instead of "Channel Echoes." If this were done it would be the best DX mag-

(Continued on page 335)

BOOK REVIEW

MALLORY-YAXLEY RADIO SERVICE ENCYCLOPEDIA (Limited Edition). Compiled and published by P. R. Mallory & Co., Inc., Indianapolis, Indiana. Stiff cloth cover, 8¾ by 11¼ inches, 216 pages, profusely illustrated. Sectionalized and indexed. Price $2.50.

It has been assumed from the outset that, by virtue of the differences in the mechanical and electrical design of radio receivers, no system of references could be established that would rationalize the complex and circuitous methods by which radio service men tackle the problems of receiver diagnosis and repair, unless the system itself consisted of the multitudinous collection of individual circuits, charts, tables and alignment data.

This assumption has been at least partly false because it has been based on another assumption, equally as false, that there are few basic similarities in receiver design. The truth of the matter is that for years receivers have been cut much to the same fundamental pattern, the differences being principally points of engineering individuality rather than new methods of accomplishing the same old thing. Thus, filter circuits are basically the same as they were in the beginning; the superheterodyne circuit is the same except for the i.f. frequencies; and though the volume control has been forced by fad and the introduction of the diode detector from the antenna circuit into the demodulator load position, it is basicly the same sort of gadget. In short, circuit differences are subject to specific classifications with the result that, with few exceptions, "key circuits" may be made applicable to numerous receivers and the process of servicing greatly simplified.

If it occurred to others that there were practical short-cuts for the service man through a system of specific key references, certainly no one has heretofore shown a willingness to undertake the immense task of compiling and tabulating the voluminous data on some twelve thousand distinct receiver models. Yet this is exactly what has been necessary in producing the Mallory-Yaxley Radio Service Encyclopedia. It is a work that must have taken years to develop.

The volume consists of eleven sections. The first section explains how to use the Encyclopedia, and once the system is thoroughly understood it is a simple matter to determine parts values, circuit connections, the i.f. peak, tube types, original part numbers, transformer characteristics, and other necessary data on any of 12,000 receiver models. Where a circuit departs from the usual, or changes were made during production, special notes are provided.

The second, third and fourth sections, consisting of 100 pages of tabulations, are the receiver listings, by manufacturer and model and in alphabetical order. These listings include the data on controls, such as volume, tone, etc., condensers, vibrators, tube complements, i.f. peaks and transformer circuits, together with notations which refer the reader to specific data on "Controls" in Section 5, and to one of the 128 "key circuits" which show the connections, taper, etc., of the control in the receiver in question. And notations which refer to Section 6, on Condensers, wherein specific data, special notes and 62 "key circuits" are also included. Such receivers as use vibrators are listed with references to Section 7 which includes notes and 50 connection sketches, as well as specifications on 68 different types of vibrator units.

Sections 8, 9 and 10 cover tubes, transformers and resistors. Section 11 deals with antenna design. Additional pages deal with measurements of radio components and notes on auto-radio interference. Numerous charts and tables are also included which provide short-cuts for the calculation of electrical values.

✦

TWO HUNDRED METERS AND DOWN—The Story of Amateur Radio, by Clinton B. De Soto. Published by American Radio Relay League, West Hartford, Conn. Imitation red leather paper cover, 7 x 9 3/4 inches, 184 pages, no illustrations. Price $1.00 postpaid; de luxe edition bound in blue cloth, $2.00 postpaid.

"Two Hundred Meters and Down" is the story of amateur radio from the time of its inception up to the present. Mr. De Soto spent over seven years collecting the data for this book the authenticity of which marks it as a valuable reference work.

The book is divided into three parts—Pioneers, Development and Recognition, and International High-Frequency Communications. The first part deals with the dawn of the radio art, the advent of amateur communication, the institution of communication laws, amateur progress, the formation of the American Radio Relay League, and the part the amateur played in the world war. The second part gives an account of the return of the amateur to the air, the battle of the spark and c.w. men, the broadcast boom and its effects on amateur radio, and a review of amateur records and accomplishments. The third part covers the first amateur transoceanic contacts, the development of the short waves, the formation of the International Amateur Radio Union, the stabilization and readjustment periods, the regulation of amateur radio, the part the amateurs have played in expeditions and cases of emergency, and finally a treatment of the problems confronting the amateur at the present time and a frank statement of the facts.

An excellent book for newcomers and oldtimers alike who are interested in a detailed history of amateur radio.

✦

NEW CATALOGUES

Aladdin Technical Bulletin 536

OF VALUE TO amateurs, experimenters and set builders is the latest bulletin, with supplement, covering the complete line of Aladdin Polyiron Inductors. Illustra-

tions, dimensions, selectivity curves, electrical specifications and list prices are provided for each unit type, together with suggested circuit diagrams.

Among the units covered are the mica- and air-tuned i.f. transformers, adjustable-coupling i.f. transformers, hi-fidelity band expansion i.f. transformers, wave traps, r.f. chokes, and the new inductance-tuned units. Specifications are also provided for the high-frequency i.f. transformers for ultra-high-frequency and television receivers.

Copies of Bulletin 536 are available upon request to Aladdin Radio Industries, Inc., 466 West Superior St., Chicago, Ill. ALL-WAVE RADIO.

✦

New ICA Catalogue

THE 1937 CATALOGUE of the Insuline Corporation of America, 25 Park Place, New York, N. Y., is now available to amateurs, servicemen and experimenters. It contains 40 pages measuring 8 1/2 by 11 inches and describes the extensive ICA line of receiving and transmitting parts and accessories, service tools and attachments, racks, panels and chassis and hundreds of other items.

Copies of this new catalogue, which bears the number 190, are being distributed by parts jobbers and dealers everywhere, or are obtainable, free of charge, directly from the home Insuline office. ALL-WAVE RADIO.

✦

New ARHCO Catalogue

FRESH FROM THE press comes the new ARHCO Catalog, replete with illustrations and descriptions of more than 2,000 items necessary to Radio, Sound and Television.

This organization stresses the fact that ARHCO hardware and accessories are not merely assembled or jobbed, but are actually created and manufactured under one roof.

Experimenters in transmission and short-wave will find much of interest in this elaborate new catalogue, and all engineers, hams and servicemen are invited to write for a copy.

It may be news to some in the trade that this outfit works prolifically in Mycalex and Ameroid compositions, as well as in steel, brass, copper and bakelite . . . performing stamping, die-cutting and various other operations with micrometric accuracy. ALL-WAVE RADIO.

✦

New Mallory-Yaxley Radio Catalogue

P. R. MALLORY & CO., INC., Indianapolis, Ind., have issued a new illustrated catalogue listing the mechanical and electrical specifications of their complete line of Mallory-Yaxley Precision Radio Products, including variable resistance controls, fixed resistors, special single and multiple switches, dial plates, jacks, plugs, radio convenience outlets, fixed condensers of the electrolytic and paper type, vibrator units, etc.

This 44-page catalogue will be of particular value to the licensed amateur, service man, experimenter and set designer, as complete information is provided on each unit. Numerous photographic illustrations and mechanical drawings complement the tabulated data so that the catalogue is, in a sense, a design brochure. No one should have any difficulty in determining the exact unit required for a specific job. ALL-WAVE RADIO.

✦

New RCA Parts Catalogue

A COMPREHENSIVE AND profusely illustrated parts catalogue, crammed with a wealth of valuable information for the licensed amateur radio serviceman and dealer has just been issued by the RCA Manufacturing Company for selective distribution through RCA radio, parts and amateur equipment distributors.

In it are pictured and described all of the numerous radio replacement parts, test and measuring equipment, amateur appa-

ratus, tubes, radio accessories and specialty apparatus.

The cross-indexed guide of all the important replacement parts for the RCA Victor radio receivers and the corresponding models of the General Electric, Graybar and Westinghouse Companies, which was an extraordinarily popular feature of the previous catalogue, has been brought completely up-to-date and included in the new volume.

Among the products featured in the new RCA catalogue are the various types of cathode-ray oscillographs, test oscillator, calibrating and modulator devices, service engineering tools, phonograph modernization and hard-of-hearing equipment, the various types of transformers, and new auto antennas and short and all-wave antenna kits, a full line of amateur receiving and transmitting apparatus, including amateur tubes, and many other pieces of equipment important to the service engineer and amateur radio enthusiast. ALL-WAVE RADIO.

✦

New Cornell-Dubilier Catalog

CORNELL-DUBILIER has just released an illustrated booklet listing the complete line of replacement electrolytic and paper condensers. The numerous shapes and sizes available, including the latest compact types, makes this catalog invaluable to the serviceman and set builder in choosing the proper replacement capacitors. Send for catalog 137A, Cornell-Dubilier Corporation, South Plainfield, New Jersey. ALL-WAVE RADIO.

✦

Wholesale Radio Spring & Summer Catalog

THE WHOLESALE RADIO Service Co., Inc., of 100 Sixth Avenue, New York, announces the release of the new Spring and Summer 1937 catalog No. 68. This catalog, likes its predecessors, is distributed free of charge.

This catalog has 116 pages and contains over 2,000 illustrations. All-wave and short-wave receivers, transmitters, and transmitter parts, experimenter parts, service replacement parts, a complete line of service test equipment and the latest 1937 Lafayette Radios are listed in the most comprehensive collection of radio items.

Featured are the Lafayette Co-ordinated Sound Systems, said to be a new and revolutionary idea in Public-Address Equipment.

Copies may be obtained by writing to or calling at any of the six branches of Wholesale Radio Service Co., Inc., located at 100 Sixth Avenue, New York; 430 West Peachtree Street, N.W., Atlanta, Ga.; 901 West Jackson Boulevard, Chicago, Illinois; 219 Central Avenue, Newark, N. J.; 542 East Fordham Road, Bronx, New York; 90-08 166th Street, Jamaica, Long Island. ALL-WAVE RADIO.

✦

New C-D Brochure

SPECIFICATIONS on the new type TL capacitors are now available in Cornell-Dubilier's catalog 135A. The type TL's are high-voltage paper condensers, impregnated and filled with Dykanol. These capacitors, conceived and recently developed in the laboratories of the Cornell-Dubilier Corporation, are extremely compact, yet retain the excellent characteristics of the bulkier types. Especially suited for power supplies and high-fidelity amplifiers. Address requests for Catalog 135A to the Cornell-Dubilier Corporation, South Plainfield, N. J. ALL-WAVE RADIO.

✦

N.U. Seeks New Products

NATIONAL UNION Radio Corporation of N. Y. have announced the appointment of Mr. J. H. Robinson as Director of New Products Research. Mr. Robinson assumes the new title and duties, in addition to his regular work as Export Manager.

It is said that Mr. Robinson has been assigned the task of seeking out and analyzing the marketability of new products, patents and ideas having to do with radio, electronics, television and electrical industries.

Inventors are invited to correspond in strict confidence with Mr. Robinson, care of National Union Radio Corporation, 570 Lexington Avenue, New York, N. Y. It is the belief of the National Union organization that an era of great development and advancement is at hand and they are prepared to encourage the promotion of new practicable ideas. ALL-WAVE RADIO.

✦

New Wholesale Radio Link

WHOLESALE RADIO Service Company, Inc., of 100 Sixth Avenue, New York City, added another link to their growing chain of modern establishments with the opening of their beautifully fitted display and salesroom at 90-08 166th Street (Merrick Road), Jamaica, Long Island.

The new store will serve as headquarters for radio servicemen, amateurs, and experimenters living in Queens and Long Island who will now save the trouble to heretofore necessary travel to New York. It is directly back of the Long Island Bus Terminal on 165th Street, near the 168th Street Station of the B.M.T., is accessible from the 8th Avenue Subway Station by a short bus run, and three blocks from Union Hall Station of the Long Island R.R., and around the corner of the Valencia Theatre. ALL-WAVE RADIO.

C. W. STATION LIST

(Continued from page 285)

11410	HBO	M	Geneva, Switzerland
11010	PDQ	M	Kootwik, Netherlands
11000	ROI	C	Koustanai, U.S.S.R.
10920	DFS	M	Nauen, Germany
10690	PLQ	M	Malabar, Java
10590	FXK	C	Beyrouth, Lebanon, Asia
10410	CMR	C	Havana, Cuba
10400	WCG	C	?, U.S.A.
10190	WIU	M	Sayville, L. I., N. Y.
10160	DLE	M	Nauen, Germany
10160	DLC	M	Nauen, Germany
10060	PVG4	C	Pera, Brazil
10040	OER	C	Deutsch Altenburg, Austria
9910	XDY	C	Chapuetepec, Mexico
9830	FYC2	C	Pontoise, France
9800	LSI	M	Monte Grande, Argentina
9750	LSZ	C	Monte Grande, Argentina
9610	FZL	C	Dakar, Senegal, W. Afr.
9605	RAL	C	Alma-Ata, U.S.S.R.
9600	PZB	M	Paramaribo, Surinam, S.A.
9450	WQES	C	Washington, D. C.
9425	NAA	C	Arlington, Va.
9425	NSS	C	Washington, D. C.
9420	EAX	M	Barcelona, Spain
9400	TMB2	C	Pontoise, France
9300	WMEQ	M	Wheeling, Ill.
9290	WMEC	C	St. John, Indiana
9200	PDX	M	Kootwik, Netherlands
9150	YVR	C	Maracay, Venezuela
9110	LST	M	Buenos Aires, Argentina
9090	FXI	M	Beyrouth, Lebanon, Asia
8910	KJJ	C	Palo Alto, Calif.
8860	FYQ2	C	Lyon, France
8800	WJP	C	Hicksville, L. I., N. Y.
8760	WAR	C	Washington, D. C.
8700	KNB	C	Palo Alto, Calif.
8650	GBR	M	Rugby, England
8500	PCH	C	Scheveningen, Netherlands
8490	WBF	M	Hingham, Mass.
8470	CWF	M	Cerrito, Uruguay
8460	WCC	M	Chatham, Mass.
8430	WSC	M	Tuckerton, N. J.
8390	KFS	C	Palo Alto, Calif.
8380	IAC	M	Coltano, Italy
7920	DFP	M	Nauen, Germany
7850	WJS	M	Hicksville, L. I., N. Y.
7840	PGA	M	Kootwik, Netherlands
7760	WIF	M	Sayville, L. I., N. Y.
7380	RWG	M	?, U.S.S.R.
6970	WKP	M	Rocky Point, N. Y.
6860	HAT2	M	Szekesfehervar, Hungary
6820	FYM2	C	Lyon, France
6810	FXA	C	Beyrouth, Lebanon, Asia
6800	WFC	C	?, U.S.A.
6790	WAU	C	Hialeah, Fla.
6720	OLF	M	? ? ?
6720	OLH	M	? ? ?
6720	OLP	M	? ? ?
6300	HPN6	C	Panama City, Panama
6210	SFY	M	?, Sweden
6000	WREK	C	Brentwood, L. I., N. Y.
5810	HKY	C	Bogota, Colombia
5740	WNEJ	C	Muirkirk, Md.
5510	CKA	M	Dartmouth, N. S., Canada
5310	HKZ	M	Bogota, Colombia
5230	WNEJ	C	Muirkirk, Md.
5210	CMR	C	Havana, Cuba
4390	NAA	C	Arlington, Va.
4390	NSS	C	Washington, D. C.

ON THE MARKET

(Continued from page 325)

Low-Loss Parts Bulletin

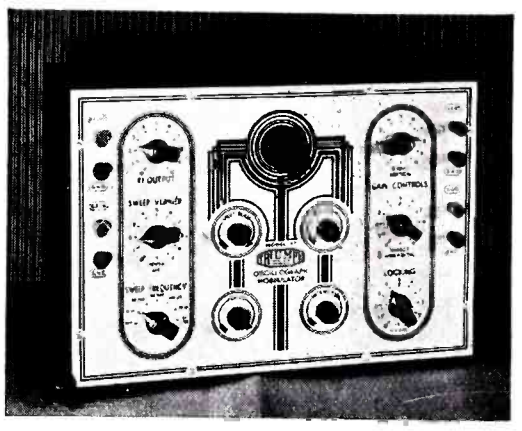
A LINE OF Hi-Q parts for critical radio circuits and assemblies, is illustrated and described in a new bulletin just issued by Boonton Radio Corporation, Boonton, N. J. The line include threaded and grooved Isolantite forms for coils and high-frequency transformers, complete inductors and aluminum shields, flat sockets, mica insulated binding posts, jacks and terminals, and other handy parts. A copy of the bulletin may be had by addressing the company. ALL-WAVE RADIO.

✦

Oscillograph-Wobbulator

A COMPLETE oscillograph using the 913 cathode-ray tube and thyratron linear sweep with horizontal and vertical amplifiers combined with an adjustable electronic wobbulator is the description of the new Model 77 Oscillograph-Wobbulator announced by the Triumph Mfg. Co., 4017 West Lake Street, Chicago, Illinois.

Substantial economies are made possible through the combination of the wobbulator with the oscillograph. A single full-wave power pack employing an 80 rectifier tube supplies all d.c. operating voltages. An 885 thyratron performs the dual function of supplying the linear sweep circuit and the single trace wobbulator. A 6A6 dual high-gain amplifier provides the vertical and horizontal beam amplification. In the wobbulator section a 6A7 mixer and a 76 frequency modulator are used. The linear horizontal sweep circuit may be continuously varied from 15 to 35,000 cycles. The electronic wobbulator may be varied to sweep and band width from 0 to 55 k.c., although normally used with a band width of 30 k.c. for i.f. and r.f. alignment. A synchronous locking control permits stabili-



zation of any pattern for timed photographic exposures. Beam adjustment, focusing and intensity controls are conveniently located on the front of the panel. A telescoping light shield excludes reflections from the cathode-ray tube screen.

Model 77 is supplied in a portable steel case, 13¾" x 9½" x 8" deep and weighs only 13 lbs. The control panel is finished in ivory and black, the case in black wrinkle baked enamel. Red pointer knobs and universal combination binding posts in red and black achieve a colorful and impressive appearance.

Any make of all-wave signal generator with optional audio modulation may be employed in conjunction with the Oscillograph-Wobbulator for making accurate r.f. i.f. or a.f. measurements. Complete operating instructions and circuit diagrams are offered free to those who request same and mention the name of this publication. ALL-WAVE RADIO.

✦

New ICA Car Antennas

TWO NEW CAR antennas designed to meet all automotive-radio requirements are announced by Insuline Corp. of America, 25 Park Place, New York, N. Y. The first is the ICA "Poletenna", which is of the telescopic type, opening to a maximum height of 8 ft. It is intended to clamp to the rear bumper, and fits any make or model of car. It is also suitable for transmitting purposes and can be tuned for 5- and 10-meter amateur operation.

The second new antenna is the ICA "Airflow", especially designed for new cars of the streamline and all-steel body types. It consists of a length of rust-proof metal-tubing supported on the top of the car by means of rubber suction cups, and is installed quickly and easily without requiring drilling of the top. It provides maximum signal pick-up with minimum ignition noise and wheel static, and is not affected by rain, snow, dirt or mud, it is said. ALL-WAVE RADIO.

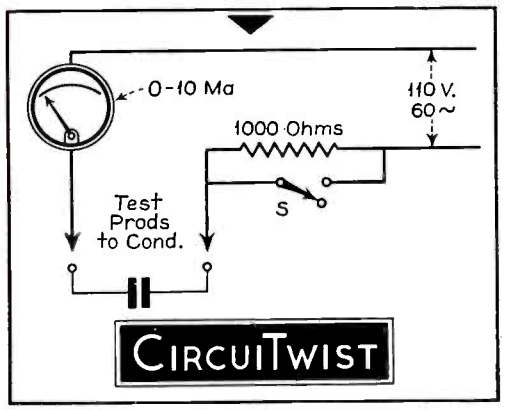
✦

CIRCUITWIST

THE EXPERIMENTER who designed this wanted a simple circuit for measuring the capacity of condensers up to one microfarad. He applied the well-known principle that an alternating current will pass through a condenser, the amount of current increasing proportionately with the capacity. By properly calibrating the milliammeter, capacity can be read directly with fair accuracy. Check your findings with the answer below.

ANSWER TO CIRCUITWIST

THE CURRENT PASSING through a condenser in a purely capacitative circuit (such as this approximates) equals E/X, where E is the a-c voltage (115) and X the reactance of the condenser. The reactance, which corresponds to resistance in the usual expression of Ohm's Law, equals $\frac{1}{2\pi fC}$, where π is, of



course, 3.1416, f the frequency (60 cycles) and C the capacity in farads (micro-farads times 10^{-6} or 1/1,000,000). The reactance of a 1.0-mfd condenser at 60 cycles is only 2654 ohms, which, at 115 volts would pass over 40 milliamperes. Therefore a 0-to-50 m.a. meter should be used.

The resistor shown in the circuit is for current limiting—in the case of a shorted condenser. It should be chosen for full-scale deflection with the test prods shorted. Its value should therefore be 2300 ohms. (A 1000-ohm resistor would pass 115 milliamperes through the meter with a shorted condenser or accidental touching of the prods.)

The first test, of course, is made with the switch, S, open. If the deflection is half scale or less, the switch may be closed and the capacity measured. A deflection between half and full scale means that the condenser is too large—full scale shows a shorted capacitor. Test only paper or mica condensers with this circuit—never electrolytics.

QRP TRANSMITTER

(Continued from page 291)

condenser (VC4) turn the inductance switch SW2 back one notch and repeat the process. Several adjacent taps of SW2 will be found which will permit the antenna to be tuned to resonance; choose the one which will give the maximum output. Vary the loading by varying the position of the loading coil L3.

Resonance Indicator

For indicating antenna resonance a thermo-ammeter could be used; but being Scotch by instinct we decided to use a simpler and less expensive method. On the antenna tuning panel we mounted a pilot light bracket, and a midget jack switch. The socket terminals of the pilot light were connected in shunt with the switch, as shown in Fig. 2. In the dial light bracket we placed a common 15-volt tungsten Christmas tree bulb which we found by experiment to be just right for this application. If a common dial light bulb is used, the socket terminals will have to be bridged with a length of resistance wire to prevent the bulb from burning out. The midget jack switch is opened when tuning and closed when transmitting to eliminate the power loss of the bulb.

For testing modulation, etc., a dummy antenna can be had by simply shorting the antenna and ground binding posts.

And now our story is ended. We achieved just what we desired—a QRP 160-meter phone rig, inexpensive and without "bugs."

PARTS FOR R. F. CHASSIS

Resistors

R1—25,000 ohms, 1 watt carbon
R2—50,000 ohms, 1 watt carbon
R3—1,500 ohms, 10 watt vitreous wire wound
R4—25,000 ohms, 50 watt vitreous wire wound

Condensers

CT1-2—15-ohm center tapped resistors, Yaxley 815C
C1—0.1 mfd., 600-volt paper, Mallory TP418
C2—0.1 mfd., 600-volt paper, Mallory TP418
C3—8 mfd., 250-volt Mallory CS123
C4—0.1 mfd., 600-volt paper, Mallory TP418
C5—0.1 mfd., 600-volt paper, Mallory TP418
C6—.001 mfd., mica, receiver type

C7-8—4 mfd., 600-volt Mallory HS691
VC1-2-3—140 mmfd. midget variable condensers
VC4—500 mmfd. broadcast receiver type variable condenser
NC—25 mmfd. midget variable condenser
X—160-meter crystal

Switches

SW1—4 pole, 3 position switch, Yaxley 3143J
SW2—1 pole, 11 position switch, Yaxley 1311J
SW3—Midget jack switch, Yaxley No. 10

Output Indicator

Yaxley 310R Pilot Light Bracket
15-volt tungsten Christmas Tree bulb

Dial Plates

1—Yaxley 472, off 1 to 2
1—Yaxley 381, 1 to 11

Jacks

3—Circuit closing jacks, junior types Yaxley 702 (J1, 2, 3)
1—Jack plug for milliammeter, Yaxley 75
1—Three-circuit microphone jack, Yaxley 702A
1—Microphone plug, Yaxley 76 or 76A
Set of extruded fibre washers for above (Yaxley 202 and 212)

Knobs

3—1¼" bar knobs, Yaxley No. 366

Transformers

T1—Power transformer with 550-0-550-volt high-voltage winding, 5-volts 2 amp. winding, 2½-volts 3 amp. winding, 2½ volts 3 amp. winding.
T2—Dynamic speaker output transformer for push-pull, 45 tubes to 4-ohm voice coil
CH1—12-18 henry 110 m.a. choke
CH2—Heavy-duty receiver type

Tubes

1—type 47 tube
1—type 45 tube
1—type 80 tube
Necessary hardware, blank chassis, etc.

PARTS FOR MODULATOR CHASSIS

Transformers

T1—Double-button shielded microphone transformer
T2—Push-pull input transformer 1:3 ratio
T3—Push-pull output transformer 45 tubes to 4-ohm voice coil
T4—325-0-325-volts 100 m.a. power transformer with 5-volts, 2 amp., 2½-volts, 3 amp., 2½-volts, 5 amp., filament secondaries
CH1—5 to 15 henry choke 100 m.a.

Condensers

C1-3—5-5 mfd., 25-volt Mallory TN110
C2—.05 mfd., 400-volt paper, Mallory TP426
C4-5—8 mfd., 450-volt, Mallory CS133
C6—12 mfd., 450-volt, Mallory CS135
C7—16 mfd., 450-volt, Mallory CS136
C8—0.1 mfd., 400-volt paper, Mallory TP428
C9—8 mfd., 100-volt, Mallory CS123

Resistors

R1—250,000 ohm, No. 1 taper Yaxley "M"
R2—2,500 ohm, ½ watt
R3—25,000 ohm, 1 watt
R4—500,000 ohm, ½ watt
R5—25,000 ohm, 1 watt
R6—2,500 ohm, ½ watt
R7—15,000 ohm, 1 watt
R8—1,000 ohm, 10 watt wire wound

Tubes

1—type 56 tube
1—type 56 or 27 tube
2—type 45 tubes
1—type 80 tube

OPTIONAL HIGH-GAIN INPUT

R9—250,000 ohms
GBC—Mallory Grid Bias Cell
1—type 2A6 tube

NIGHT-OWL HOOTS

(Continued from page 303)

of Parahyba (on the eastern tip of Brazil) inaugurated its first broadcast station in the city of Joao Pessoa, its capital. Call letters are PRI-4 and the power is 10 kw. The frequency is 1080 kc. and the sked. 6-11:30 P.M. local time . . . The new "Radio Nacional" in Lima, Peru, is now operating and has been heard in the U.S.A. on 854 kc. Call is the same as the old station—OAX4A. It's interesting to note that the transmitting plant is located at an elevation of 300 feet above sea level and covers an area of 74,000 square yards. One of the advantages of the site is that the lay of the land permitted masts to be lined up so as to give the signal the correct take-off for jumping the Andes before coming into action . . . A special vote of thanks is due to C. Vassallo Gomez for dedicating a program to this department last month and for providing the DXers of America with an opportunity to log his station . . . A little long-wave data: Kiev No. 1 (248 kc.), Leningrad No. 1 (232 kc.), and other Russians relay Moscow No. 1 (172 kc.) after 4 P.M. E.S.T. . . . This information is from the Universal News of the UDXC, which, Harry Hawkins reminds us, is issued bi-monthly during the DX season. Any further information regarding the club may be had by writing the Universal DX Club, 345 Maple Ave., Oradell, N. J. . . . PRF3's veri card is a real beauty! A picture of the xmitter and tower in full color on a card bearing the station name in large letters . . . By the way, the "mystery Mexican" on 780 is not XEYZ. There is no such station as XEYZ according

to Mexican Postal authorities!

Cheers and Jeers

We're just aching to hand out the jeers this month, but first we have to dispense a bunch of cheers. Three of them to the staff of XEMO, "The Foreign Club Station" at Tiajuana, Mexico. Arrangements have been made for a program dedicated especially to the Standard Broadcast Division of the RSSL from this station on Sunday morning May 30 from 3-4 A.M. E.S.T. John Griggs, Continuity Editor, and Jack Babcock, Announcer are the boys responsible for the arrangements. It is hoped that all members will echo and re-echo our three cheers with a bunch of reports . . . Cheers to you KGKO, may many more stations adopt your system of repeating the call in Morse code after each announcement on the FCC monitoring test program . . . cheers also to the Newark News Radio Club and WOR for arranging a very novel DX program which was broadcast over a chain of 20 stations of the Mutual, Don Lee, and Yankee hook-ups. Bob Emery conducted a spelling bee—the participants being NNRC members. An original skit about club members, written by Harry Varrelman, was presented as one of the many features of this informal four-star DX program. Programs of COCO and HJ1ABP were picked up via short waves and rebroadcast.

Here they come—we can't hold them any longer. Lend a hand, neighbor and help heave these juicy jeers across the Rio Grande. It's not only up to DXers, but up to the entire Radio listening public to get together and formally protest to the powers that control Mexican broadcasting against such programs as the 1 A.M. session recently conducted at Brinkley's Boisterous Border Blacksheep Broadcaster, XERA! When a station has nothing better to offer in the way of entertainment than a studio full of belching drunks and their gal pals swearing and carrying on obscene conversation over the air—then it's time someone did something about silencing it. Surely there must be something that can be done when 350 kilowatts of such swilly filth is being flung directly at American listeners from just across our border. We're endeavoring to locate the right authority to whom such protests should be sent and in the meantime we not only ask but beg that DXers forward their letters of protest to us to be sent en masse to the proper authority.

JEERS to you, XERA, may your antenna towers melt under the heat of the protests from an American audience which is resentful of the "tripe" which you throw at them under the label "entertainment" ! ! !

All correspondence intended for this department should be addressed to Ray La Rocque, 135 Highland St., Worcester, Mass.

SIGNAL PEDIGREE

(Continued from page 294)

peaks, and amount of filter noise present on the carrier. These may all be incorporated on a QSL card, such as the one shown here, to be read completely at a glance. For convenience and so as not to stray too far at one time from the time honored R1——9, the cards are so numbered as to carrier level.

A thin piece of celluloid ruled off in quadrants and with the upper left quadrant marked out in nine divisions makes an excellent device for use with this system when placed over the screen of the oscilloscope, so that accurate readings and comparison can be made.

CHANNEL ECHOES

(Continued from page 301)

cargo vessels or freight cars, precise details concerning the schools, churches, jails, county houses and hospitals, restaurants, garages and orphan asylums, street cleaners and haberdasheries, the quantity of coffee consumed—beg pardon, the number of Chrysler-made cars sold in one week, the number of American flags in the last Fourth of July parade, pertinent facts of the first settlement, number of witches hanged, metropolitan area to the square centimeter, the number of lamp-posts and water hydrants, the square feet of parks, and other minutiae, laid out end to end, associated with every one of his "honor cities."

It seems incredible that the Major should have forgotten that on Monday afternoon, December 30th, 1831, the Baltimore and Ohio Company offered a prize of $4000 for an American engine weighing three and a half tons that could pull fifteen tons at *fifteen* miles an hour on the level. This prize was won September 15th, 1832, by the "York," constructed by Messrs. Davis and Gartner.

This was the Major's cue to join the

rest of the Chrysler employees—to sit down and strike—the gong.

◆

AS USUAL, Easter Services were held under the gun turrets of the naval flagship, the U. S. S. Pennsylvania—and broadcast to the world in general via long- and short-wave radio. Very touching indeed. Perhaps next Christmas time, it might be a good idea to broadcast a "peace on earth good will to men" program from an armament factory.

◆

ANOTHER EASTER Sunday broadcast was "The World is Yours Program," sponsored by the Department of Interior, Bureau of Education. This was the story of the famous microbe hunters—from the Dutchman Leeuwenhoek up, through Spallanzani to Pasteur and Koch and Lister. The achievements of these scientists and medicos was described in detail, and the triumphs of science against tuberculosis and other infectious and contagious diseases were lauded—as they should be. All the famous names were there—except one—and all the world's scourges were mentioned, except one. This despite several very important facts. 1—Probably more people suffer from syphilis in this country than from any other disease. 2—Over 500,000 new cases were uncovered in 1935. 3—Paul Ehrlich, the German physiologist was probably the greatest of all microbe hunters, for his research into syphilis and the inception of a cure for it. 4—President Roosevelt has asked that all possible publicity be given to this disease, and the world at large be told what can be done for it. Newspapers and magazines, throughout the country, have carried this intelligent plea of the administration. And yet the administration's own Department of Interior is apparently afraid to mention the subject, even in a whisper!

About the only person with guts enough to mention syphilis on the air is Doc Brinkley. We haven't tossed many bouquets toward the Brinkley Hospital at Del Rio, Texas. But here's one—and orchids at that!

MULTIMETERS

(Continued from page 306)

lustrates why this is so. Capacitive reactance and resistance add "vectorally" which means in this case, that they can be represented by the sides of a right triangle, the impedance becoming the hypothenuse. If this triangle is drawn to scale, it is easy to see that a relatively large change in the length of side R results in but little change in the length of Z. This will be the more so when R is small compared to X.

Calculations

As a numerical illustration, taking the meter mentioned above, the reactance required for the five-volt scale is

$$X = \sqrt{4400^2 - 1000^2} = 4285 \text{ ohms}$$

When the resistance of the rectifier becomes 400 instead of 1000 ohms, the impedance becomes less than 4400 ohms but cannot become less than 4285 ohms which would be about 2 per cent in error.

After having found the correct reactance, the size of the condenser follows from the equation

$$C = \frac{1{,}000{,}000}{2\pi f X} \text{ mfds.}$$

or, simplifying:

$$C = \frac{2650}{X} \text{ mfd. (for 60 cycles)}$$

$$C = \frac{6360}{X} \text{ mfd. (for 25 cycles)}$$

On the higher a.c. ranges the varying resistance of the rectifier is of minor importance but here the a.c. impedance of the resistor multipliers has to be reduced to .88 of their resistance by placing a condenser in parallel with each of them. The condensers can be left permanently in the circuit since they do not affect the operation on d.c. The proper size of the condenser can be found from the simplified equation.

$C = b/R$ microfarads (for 60 cycles)
$C = a/R$ microfarads (for 25 cycles)

where R is the resistance of the multiplier in thousands of ohms and a and b are given below for different ratios of ohms-per-volt on a.c. and d.c.

(o-p-v on a.c.) / (o-p-v on d.c.)	*a*	*b*
.89	3.26	1.36
.88	3.44	1.43
.87	3.58	1.5
.85	3.76	1.57
.86	3.95	1.65
.84	4.1	1.71
.83	4.26	1.78

As an example, the condenser across a 50,000-ohm multiplier should be 1.43/50=0.0286 mfd (for 60 cycles)

Multimeter Circuit

Fig. 2 shows the complete circuit for a multimeter employing condensers, and showing the switch needed. It should be remarked here that the size of C2 can be found by the rules for parallel combinations, but only when the second voltage range is much higher than the first; for instance, if it is 50 volts. When the second range is only 10 volts, the proper size is much harder to find and requires more mathematics. One cannot simply add the impedance of the series combination to that of the parallel combination because the two have different phase angles.

BACKWASH

(Continued from page 326)

azine on the market, in my own opinion. I have no time for a scatter-wit like Zeh Bouck. He condemns an owner of a certain radio station, and in the same issue another writer praises this man. Something's wrong!

Besides, why don't Bouck write about something he knows? He don't know Doc Brinkley or else he would not write such matter about him. Neither does he know anything about "The American Medical Association." I wouldn't give a tinker's damn for what he knows about Radio. The Radio Fraternity would be a lot better off without him. From the first picture I ever saw published of him, I gathered he was a crackpot. I still think so. His writings substantiate my opinion. Nobody with average intelligence writes about something or condemns anything on which they have no proof or know nothing about.

CLARENCE M. KEMRER,
LANCASTER, PA.

(Pleased to have your views. We can't all think alike. But we would no more think of censoring Bouck's copy than we would of censoring your letter. Ed.)

THE ACT-20

(Continued from page 323)

the signal showed very excellent quality with an absence of hum on the carrier.

The first station called on 10 meters (from W2CPA, near New York City) was W5DOK, in Louisiana. Information on the power being used was withheld and a candid opinion asked. He informed us that the quality was perfect, no hum could be heard and the signal was R8. When told that the output was only 12 watts he said that the signal sounded like a 500-watt job and was the only signal on the band that was not fading.

An English phone station, G2AK, was next called. We did not work him, but he came back on the air saying, "will the DX station that just called G2AK please call again. W2CPA is putting a perfect signal in here and drowning you out." Believe it or not.

W9RDW, in Kansas, reported the signal QSA5 and R7 through a heavy dust storm that was shooting sparks off his receiving antenna lead-in. On switching over to c.w. a CQ was called and W6MSM came back with a report of QSA5 and R6.

During these spot air tests the 10-meter band was in a very poor condition, with not many signals coming in, and these not very loud. To make it more interesting, two local hams dropped in to see the rig perk. After having just previously worked four stations in a row, not a single station could be raised while they were present. *But it ever happens thus.*

One feature of the ACT-20 that showed up to advantage was the total lack of any tendency toward feedback when operating on 10-meter phone. All too many 10-meter phone rigs are forced to operate on the verge of feedback, with resulting detriment to the quality of the phone signal emitted. On the ACT-20 the audio gain control could be opened wide and the microphone placed in any position with still no trace of feedback.

As a result of these various tests we would say that the ACT-20 is an excellent transmitter. It presents a pleasing appearance and performs as per specifications, with a beautiful crystal note on telegraph operation and a phone signal that can be truly said to have "broadcast quality."

THE "FLEXIBLE 400"

(Continued from page 293)

Of course, the four-prong plug and socket arrangement for connecting Panel No. 2 to Panel No. 3 can be eliminated, but it does simplify matters materially because the equipment mounted on the sub-base is really rather heavy and if the additional weight of the transformers and chokes mounted on Panel No. 2 were added to it it would become rather unwieldy. Then, too, some method of attaching Panels Nos. 2 and 3 to each other would be required and we believe that our arrangement simplifies matters materially.

Layout and Wiring

All of the work on the chassis for the R.F. Power Supply and the Modulator unit can be done without giving any consideration to the external cabinet. In our case, it was but necessary, after the units were completed, to drop them into the enclosed cabinet after the front panels had been attached. The only wiring connections between the units on Panels Nos. 2 and 3 and the Modulator chassis are the two connections which go to the chokes; the connections that go to the four-prong socket and the connections that go to the milliammeter on Panel No. 3. A twin connector mounted on the meter and banana plugs mounted on a pair of flexible leads, as indicated by the X's in the circuit diagram, provides for instant withdrawal of the Modulator chassis except for the removal of the two wires which run from the chassis to the left-hand terminal on CH1 and the right-hand terminal on CH2. These terminals are provided with rather large nuts which are easily removed, but if

extreme convenience is desired, push connectors of the heavy-duty type may be used.

Because of its flexibility as well as its ability to withstand very high voltages without breaking down, we have found it desirable to use Giant-Killer Cable in most of the high-voltage circuits in the R.F. Power Supply and in this comparatively high powered modulator. It will be observed that the leads from the Modulator chassis to the chokes were made by paralleling the two conductors in the Giant-Killer Cable and using them together.

Reference to the circuit diagram and the various pictures will give practically all the information that is necessary for the duplication of a unit of this nature.

Performance

It may be well to say a word regarding the actual performance of the completed Speech Amplifier and Modulator.

Though the manufacturer rates the RK-31 tubes at 120 watts when used in push-pull Class B, we have found that the output of these tubes is ample to provide 140% modulation when the final R.F. stage is running at 500 watts input. The check on this modulation was made with a Triplett Modulation Meter, a General Radio Percentage Modulation Meter and a National Midget Cathode-Ray Oscilloscope. Within the normal limits of error which units of this nature may be expected to show, all three checks showed essentially the same result.

Reports on our transmission, on the 10-meter band, from practically all parts of the world, indicate speech quality which is considerably above average.

The Modulator tubes are operated with the plate voltage recommended by their manufacturer. When the final stage is operating at its normal 400 watts input the gain control on the Speech Amplifier is run less than halfway up to provide full modulation, as indicated by peaks of approximately 200 mils on the Class B meter.

Many other types of tubes suggest themselves for use in a Modulator of this nature, but those that we are using were chosen for the reason that they eliminate the need for a separate grid bias power supply or grid bias batteries. For the four months that the transmitter has been in operation, up to the time that this article is being prepared, they have functioned in a perfectly normal fashion and they show every indication of continuing to do so. As a matter of fact, that statement may be considered true of the entire assembly.

Summary

To summarize, may we say that each of the units which go to make up our "Flexible 400" may be considered a distinct entity. Each, up to the limit of its capacity, may well be employed with other combinations of units. For instance, the Speech Amplifier and Modulator, considered as a single unit, will deliver enough high-quality audio to feed enough speakers to fill the largest auditorium in the country, at a cost which is exceedingly low, to say nothing of the many radio applications, which will suggest themselves to the experienced ham.

The R.F. unit may be used with any suitable power supply with or without modulation. And that is provided by the R.F. unit and R.F. Power Supply, and forgetting about the speech equipment entirely.

For c.w. operation only, the input may be safely run to 600 watts, keying being accomplished by breaking the center tap of the RK-38 filament. The small condensers and chokes for the keying circuit may be attached to the upper front panel which puts a lot of power into a very small space.

As we said, in the introduction, no transmitter is any one person's baby and we desire to express our thanks to Bill Filler, W2AOQ; Frank Lester, W2AMJ; Dick Purinton, W2ICU; and Harry Lawson, W2IER, who did the actual building and put the transmitter in operation on the air.

List of Parts

AEROVOX

1—100,000-ohm, 100-watt wire-wound resistor (R1)

CORNELL-DUBILIER

2—type TJ-15020 Dykanol 2 mfd., 1500-volt condensers (C1, C2)

NATIONAL

5—four-prong isolantite sockets
2—type XS-1 Steatite bushings
1—four-prong connecting plug
2—type 24 grid grips
2—type 12 grid grips

PAR-METAL PRODUCTS

2—No. 3604 panels, 8¾" x 19" for panels Nos. 2 and 3
1—No. 15213 heavy-duty sub-base 13" x 17" x 3" for modulator

RAYTHEON

2—type RK-31 tubes
2—type 866 tubes

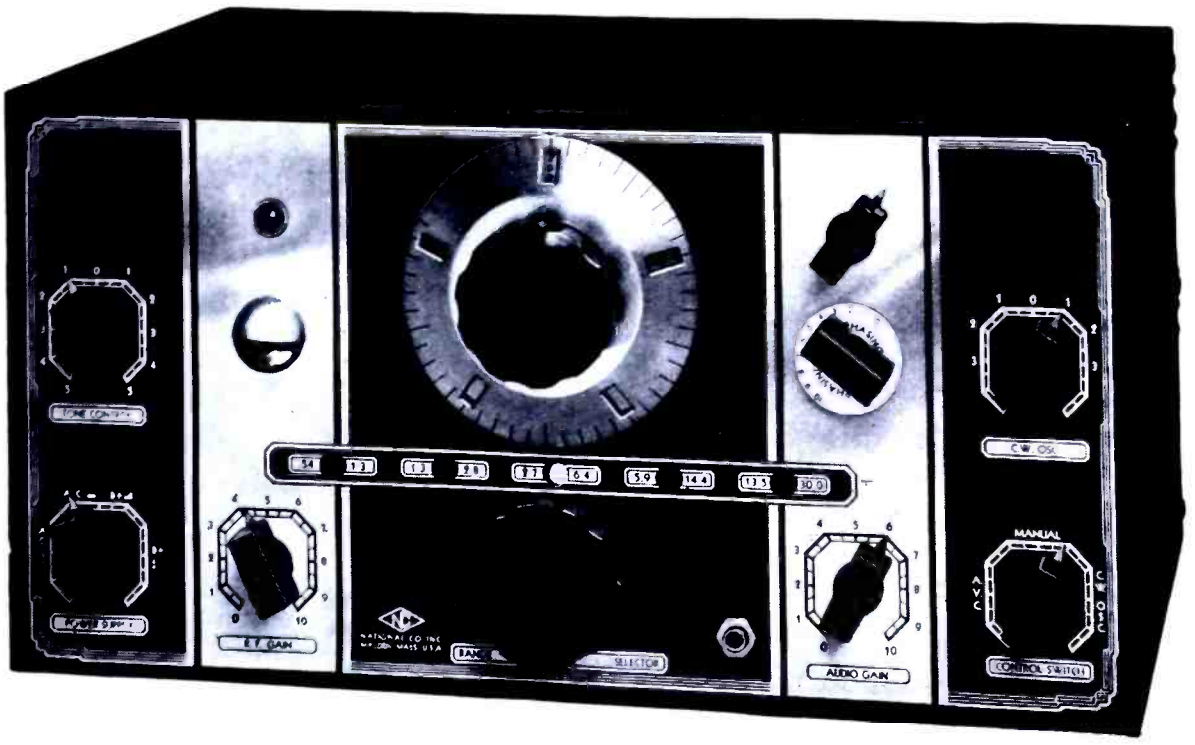
THORDARSON

1—type T6408 filter choke (CH1)
1—type T6315 filter choke (CH2)
1—type T8975 or T7510 input transformer (see text) (T1)
1—type T6435 filament transformer (T2)
1—type T7511 output transformer (T3)
1—type T6411 power transformer (T4)
1—type T6433 filament transformer (T5)

TRIPLETT

1—milliammeter 0-300 mils, 3" square type (Ma.)

PERFORMANCE PLUS:

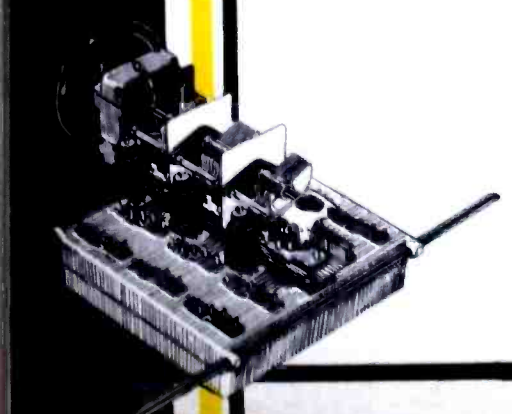


Built for *extra* performance, the twelve tube NC-100 Receiver includes every refinement for difficult short wave work. Among its many unusual features is the unique movable Coil Tuning Unit which combines the high electrical efficiency of plug-in coils with the convenience of the coil switch. Tuning from 540 KC to 30 MC is covered in five ranges, so that stations are well spread out. Each of the fifteen high frequency coils is shielded in its own compartment of cast aluminum. The turn of a knob on the front panel brings the desired range into position and plugs it in. Idle coils are isolated, leads are short, and calibration is exact. There are no dead spots in the NC-100 Receiver.

Fully worthy of the advanced performance of the Tuning Unit are other details of the superheterodyne circuit. Thorough use of low loss insulation and of air-dielectric condensers, together with carefully designed high-Q coils, results in exceptionally high signal-to-noise ratio and high usable sensitivity. The advanced design of the (optional) Crystal Filter provides unusual effectiveness when QRM is severe.

Panel controls are complete, and include separate switches for B-supply, Filaments, CW Oscillator, and AVC; as well as dials for Audio Gain, RF Gain, Tone Control, and CW Oscillator Tuning. Crystal Filter controls include Phasing and Selectivity. The precision Micrometer Dial, direct reading to one part in five hundred, provides exceptional ease of tuning together with great accuracy in logging.

These are but a few of the features that combine to make the NC-100's performance so outstanding, and its low price so remarkable. An illustrated folder will be mailed on request.



NATIONAL COMPANY, INC., MALDEN, MASS.

Announcing

the New 1938

SUPER SKY RIDER

THE HALLICRAFTERS' GREATEST ACHIEVEMENT

Imagine a receiver that gives you complete coverage from 5 to 550 meters, taking in everything from the 5 meter band to the top of the broadcast band—with wide range variable selectivity (single signal razor-sharpness to true high fidelity*)—with an ingenious, new, electrical band-spreading device** that provides 1000° of band spread—an "S" meter that works on weak signals—with improved image and signal-to-noise ratio, and a dozen other outstanding features. Now you can listen to two-way police communications on 7½ meters—to the interesting and active new 5 meter band—in fact to everything on short waves and the broadcast band as well.

Imagine all this on one receiver—there's not another feature the amateur or short wave listener could possibly desire. It's absolutely revolutionary in performance and scope. It's the New 1938 Super Sky Rider, now on display at your dealer's, at an amazingly low price for so much value. Available on Hallicrafters' liberal Time Payment Plan. See it today!

*R. M. A. has defined High Fidelity as 7000 cycles at 20 D. B. down.
**Patent applied for.

FEATURES

- **5 to 550 Meters Coverage.**
- **6 Bands.**
- **11 Tubes.**
- **Wide Range Variable Selectivity.**
- **Better than One Microvolt Average Sensitivity on all bands.**
- **1000° Electrical Band Spread.**
- **"S" Meter.**
- **13 Watt Undistorted Output.**
- **Air-Trimmed R. F. Circuit.**
- **Improved Expanding I. F. Transformers.**
- **Improved Crystal Filter Control.**

See the New 1938 Super Sky Rider at your dealer's or write for complete information.

the hallicrafters inc.

2605 Indiana Avenue, Chicago, Ill. • Cable Address "Hallicraft" Chicago

America's Leading Manufacturer of Communications Receivers

Leading Radio Columnist HANDS AN ORCHID to the Super Sky Rider†

Visited by Diplomats

On Wednesday evening I was honored to entertain B. P. Stoyanovitch, Consul General of Yugoslavia, and his staff while we listened to a special broadcast up among the megacycles from Belgrade.

With a battery of five communications receivers which had been warming up for hours, I sat down full of confidence and started spinning dials. Well, maybe not confidence, exactly, but hope, anyway. But imagine my embarrassment when minutes passed and we logged practically everything in the world except Belgrade.

However, at the end of about fifteen minutes we dragged in a speech in an unfamiliar language, and immediately Mr. Stoyanovitch burst forth in happy smiles. It was the voice of the Prime Minister of Yugoslavia and the receiver that did the trick was the old reliable SX11 superskyrider. After trying for a few minutes to fog the program on the other receivers, just by way of something to fall back on in case of emergency, but having no luck, we turned off the others and sat back to listen. And if you don't think a terrible weight was lifted from my brow when the skyrider did its stuff, then you never had eleven officials of a foreign nation standing skeptically by while you try to produce results in short wave radio reception.

†Reproduced from Ted Rogers' Radio Column, New York World-Telegram, April 17, 1937