# ALL-WAVE RADIO

JANUARY • 1937

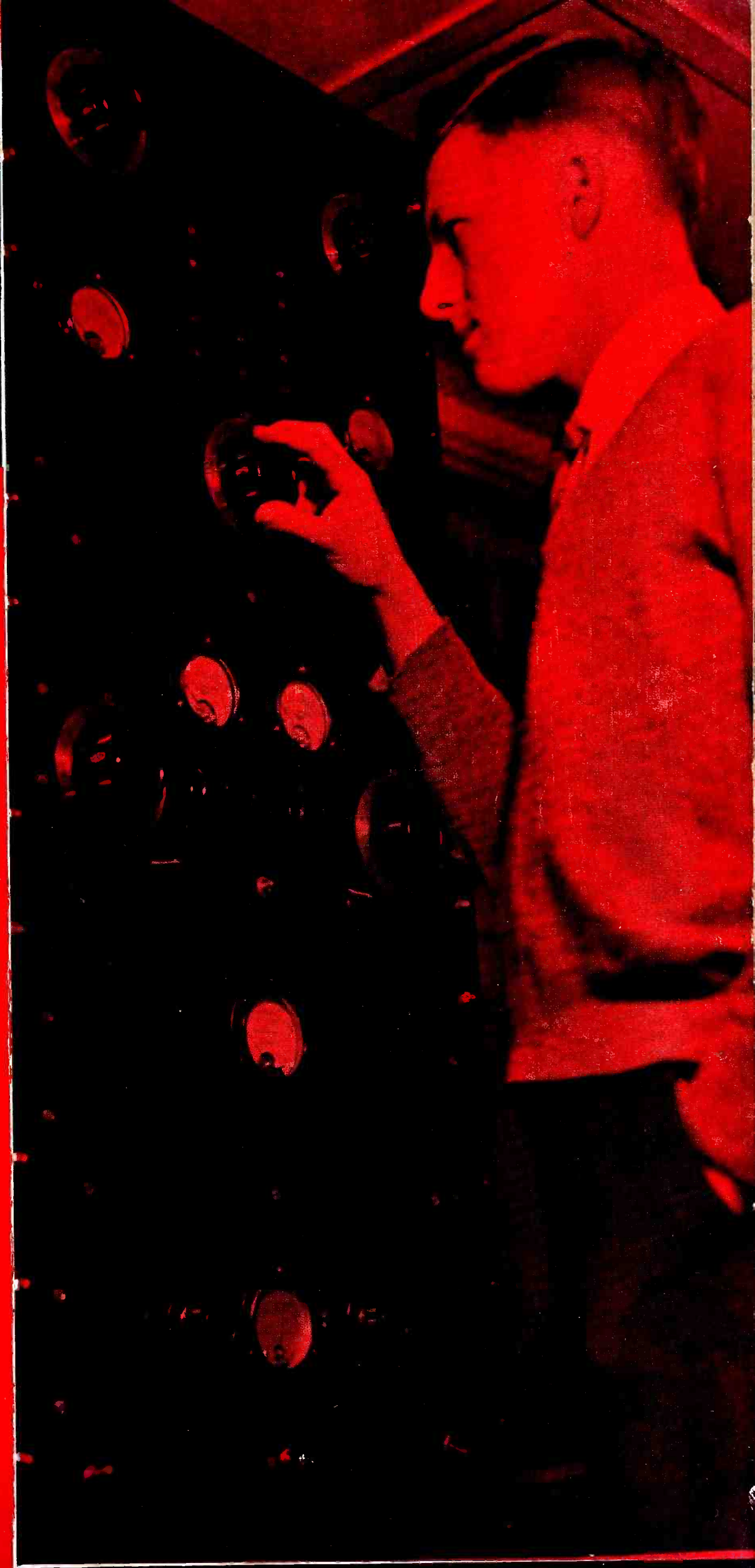
## MIDGET KATYSCOPE

LOW-COST S. W. SET
*top results with 2 tubes*

ALL-BAND TRANSMITTER
*c. w. and fone at low cost*

5-METER TRANSCEPTOR
*for fixed or portable use*

**25c U.S. and CANADA**



THE JOURNAL of WORLD RADIO

# A CHALLENGE!

## TO THE RADIO WORLD

We believe the MASTERPIECE V is the finest receiver that can be built today!

Let any unbiased, competent organization such as "Consumers Research Union" (to whom we have submitted a MASTERPIECE V for test and report) or any competent group of unbiased engineers, test the performance of the custom-built MASTERPIECE V side-by-side with any other receiver being made today!

Our engineers will go to the expense of building a MASTERPIECE V especially for operation in that location — just as they do when one is built individually and specifically for you.

Then we will pay the cost of this same page in RADIO NEWS and tell the world exactly what the results of this test are! Or, better still, YOU make this test in YOUR HOME! We ask only that you then purchase the receiver that you find to be the finest that can be obtained. If that receiver is the MASTERPIECE V— and we have reason to believe it will be — we will gladly arrange your purchase on Easy Monthly Terms.

**Hear a MASTERPIECE V — then you will know what real custom-building means!**

## READ WHAT THE SHORT-WAVE EDITOR OF "RADIO NEWS" SAYS

THE fidelity of reproduction of the "Masterpiece V" receiver is so excellent that it at times seriously interfered with the conduct of the Listening Post tests of this receiver. Time and again the test periods would be devoted to listening to a program of fine music from a local broadcast station, the sheer enjoyment of which was too much to resist. Until the habit was formed of skipping the good locals when running tests, not much was accomplished either in the way of short-wave of DX listening.

### Tone Fidelity

The reasons for this impressiveness was found primarily in the fact that the overall frequency response of the receiver is such that it exceeds the audio-frequency range of most broadcast stations.

In summary, it may be said that this receiver should meet the most exacting requirements of even the most critical radio listener as it combines excellent electrical design with beauty of appearance, ease of operation and all-wave coverage.

**"THE WORLD'S ONLY TRULY CUSTOM BUILT RADIO"**

McMURDO SILVER

# MASTERPIECE

CHICAGO STUDIO—2900 SOUTH MICHIGAN BOULEVARD
NEW YORK DEMONSTRATIONS—63 CORTLAND STREET

**MAIL THIS COUPON**

McMurdo Silver Corporation,
2900-A South Michigan Blvd.,
Chicago, Ill., U.S.A.

Please send me full details on the custom-built MASTERPIECE V.

Name .....

Address .....

# 1937 PROPS FOR THE AMATEUR
## • PRESENT AND FUTURE •

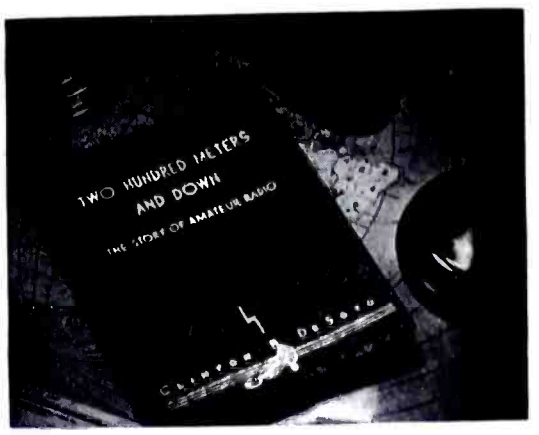
## TWO HUNDRED METERS AND DOWN

***The Story of Amateur Radio by CLINTON B. DeSOTO***

A detailed, concise presentation in full book length of all the elements that have served to develop the most unique institution of its kind in the history of the world. A book of history but not a history-book. TWO HUNDRED METERS AND DOWN: The Story of Amateur Radio tells in spirited, dramatic fashion the entire chain of significant events in the development of the art.

Part I — From the dawn of the art to the time of the World War. Part II — Spark to C.W.; the progress and recognition accorded to amateur radio. Part III — From the first transoceanic communication through development of the short waves. Readjustment and regulation of amateur radio. Its part in expeditions and emergencies. Concluding with an evaluation of the arguments for the future of amateur radio.

Most of today's amateurs have no more than fragmentary knowledge of the beginnings of their art. This book is an invaluable record that every amateur should own, to learn thereby the fascinating tale of earlier days.




*Approximately 200 pages, 90,000 words, with durable imitation leather red paper cover.* **$1.00 Postpaid**

Price **$1.25** Postpaid

## A.R.R.L. Amateur Radio MAP of the World

On a sheet of heavy map paper 30 x 40 inches Rand, McNally, world's premier map-makers, have—to A.R.R.L. specifications—imprinted in six colors and black every single bit of map information useful to the radio amateur.

The special modified equidistant azimuthal projection permits great circle distance measurements in miles or kilometers accurate to better than 2%. Local time in all parts of the world is shown, as well as Greenwich corrections. The official I.A.R.U. WAC continental sub-divisions are given. Principal cities of the world are shown, including, in the U. S., all district inspection offices and examining points.

Perhaps most useful of all is—for the first time—a standard list of countries of the world, arranged on a basis of geographical and political divisions—clearly shown by color breakdown and the detailed reference index. There are 230 countries shown, 180 prefixes (the prefixes in large open red lettering that you can't miss.) More than that, all known national districts and other sub-divisions are shown.

Entirely new in conception and design, large enough to be **useful**, complete in every detail—here is the map radio amateurs have been waiting for these many years. Make a place for it on your wall now—it'll be the most **interesting** object in the shack.

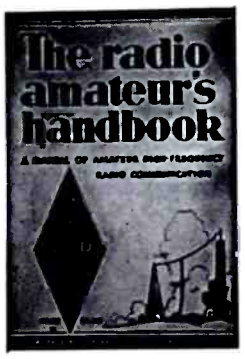

### HOW TO BECOME A RADIO AMATEUR

**LATEST EDITION**
**25 CENTS**
**POSTPAID**

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

## *JUST OUT!*
## NEW 1937 HANDBOOK

**544 PAGES**
**$1.00**
**Postpaid in U.S.A.**

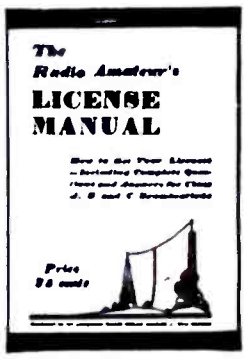



**200 New Illustrations**
**$1.25**
**Elsewhere**

Presents a complete treatment of every phase of modern amateur radio from elementary theory through advanced practical application, emphasizing the proven methods and ideas—new developments in noise silencers for short-wave receivers—transmitter planning, construction and adjustment—antennas, ultra-high frequencies, tables, charts, etc.

### THE RADIO AMATEUR'S LICENSE MANUAL

**LATEST EDITION**
**25 CENTS**
**POSTPAID**




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

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

**ENCLOSE CHECK, MONEY ORDER, OR STAMPS WITH ORDER AND MAIL TO**

**BOOK DEPT., Manson Publications Corp., 16 East 43 St., New York, N. Y.**

ALL-WAVE RADIO

*Reg. U. S. Pat. Off.*

VOLUME 3 • NUMBER 1



**GENERAL**

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*Edited by M. L. Muhleman*

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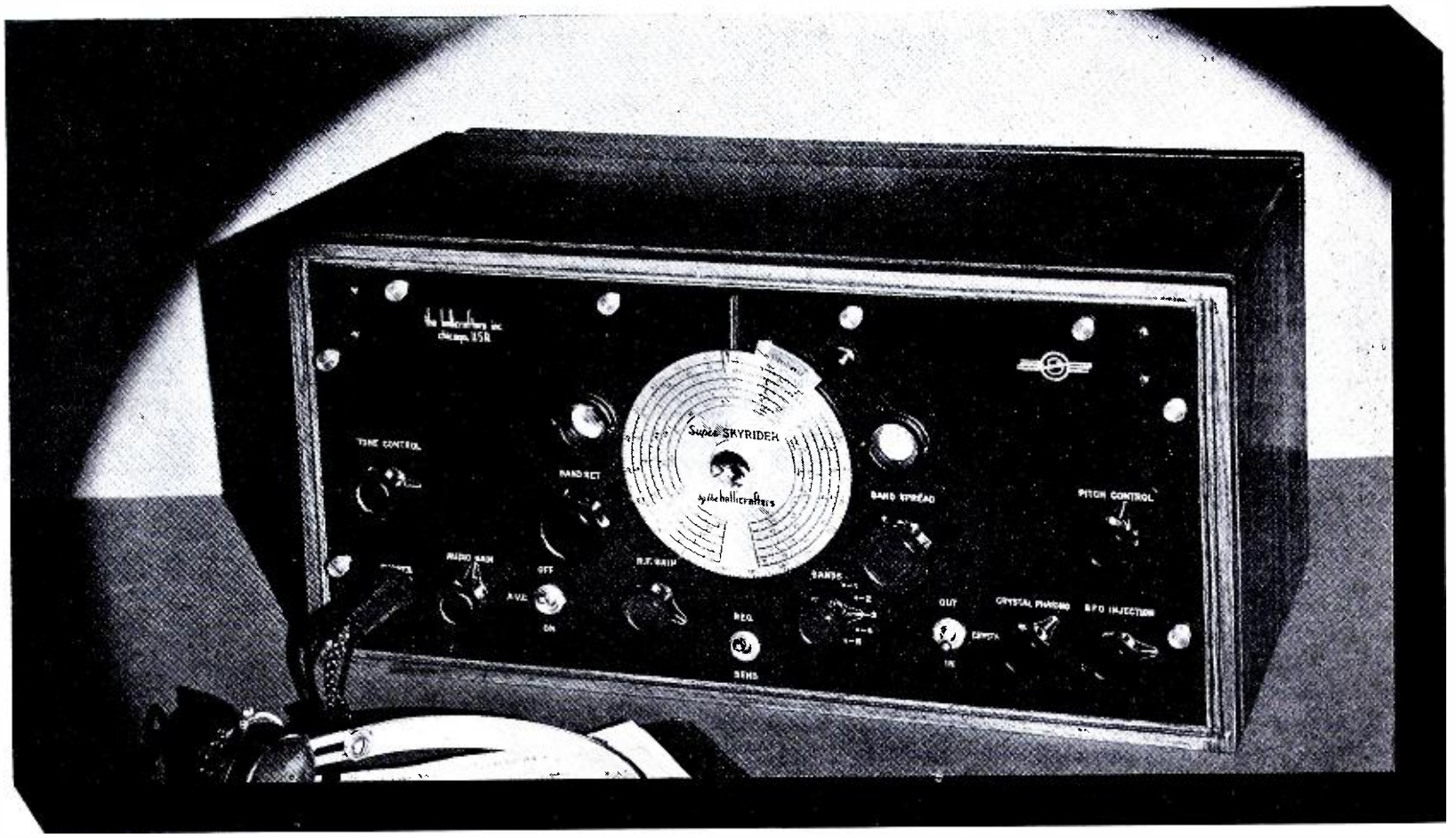
*Adjusting the transmitter at W2CPA, owned and operated by Willard Bohlen.*

## FEATURES



## DEPARTMENTS

# THE SUPER SKYRIDER




## ACCLAIMED BY AMATEURS EVERYWHERE

## OTHER HALLICRAFTERS COMMUNICATION RECEIVERS

### The Ultra Sky Rider

A new and unique approach to high-frequency reception—the finest Hallicrafters receiver built. Experts marvel at its sensitivity and amazing performance. It is the perfect receiver for the Ultra-High-Frequency operator. Tunes 3.76 to 53 Meters in 4 Bands.

### The Sky Rider Commercial

An 11-tube Superheterodyne especially fitted for commercial service, that tunes from 30 to 3000 meters and can be used for practically all long-wave reception, as well as short wave down to the 31-meter short-wave broadcast band. With the Ultra Sky Rider it provides complete reception of the radio spectrum.

### The Sky Chief

This new 7-tube Superheterodyne is designed with all the latest features usually found only on much higher priced sets. Tunes from 17.6 M.C. to 540 K.C. and is equipped with all the features and controls so desirable to critical operators.

### The Sky Buddy

A real 5-tube Hallicrafters engineered communication receiver at an astonishingly low price, with amazing performance characteristics, that compare favorably with those of many higher priced receivers. A splendid receiver for the beginner in amateur radio. Tunes from 16.5 to 544 K.C. in 3 Bands.

● The new Super Sky Rider has created a wave of enthusiasm that's sweeping the entire amateur radio world. Everywhere amateurs who have seen and operated this sensational new communications receiver are voicing their universal approval.

There's a reason. The 1937 Super Sky Rider is revolutionary in its splendid performance. Amazing new sensitivity, selectivity that opens up 50% more clear channels than ordinary communications receivers, plus a dozen other exclusive features, make the Super Sky Rider the outstanding receiver of its type.

Its true selectivity (total band width 12 K.C. at 1000 times down as compared with 20 K.C. in many communications receivers) make this the ideal receiver for the amateur or short-wave listener who wants to get through the crowded radio bands of today.

Tuning is easier with the big 5-Band 338° Direct Calibrated Micro-Vernier Tuning Dial and Electrical Band Spread, no charts or tables are required.

And that isn't all. There are so many exclusive features in this outstanding new receiver that it must be seen and operated to be fully appreciated. Make it your business to stop at your dealers today. See this greatest of short-wave receivers. It's now available on easy time payments at your jobbers!

- 11 Tubes, 10 of them metal.
- 40 M.C. to 535 K.C. in 5 bands.
- Field strength indicator.
- Improved 10 meter performance.
- 338 Degrees main tuning dial.
- Electro - mechanical band spread.
- Measurements made at I.R.E. standard frequency, 1000 K.C.
- 14 Watts undistorted output.
- Single signal crystal action.
- 456 K.C. iron core I.F. for improved selectivity.
- Direct calibration tuning—No charts or tables.
- Ceramic insulation.

# the hallicrafters inc.

2605 INDIANA AVENUE CHICAGO, U.S.A.

CABLE ADDRESS "HALLICRAFT"

# KENYON AMATEUR TRANSMITTER AND PUBLIC ADDRESS COMPONENTS

Kenyon engineers have designed this complete line of audio and power transformers and reactors to make possible a popular priced line particularly suited for amateur transmitter and public address use.

Refinements in design and controlled production result in units which are unapproachable for quality in material of this price range.

Each unit is housed in a metal case finished in a durable black eggshell enamel presenting a pleasing appearance to suit exacting commercial requirements. This case also acts as an electrostatic and electromagnetic shield.

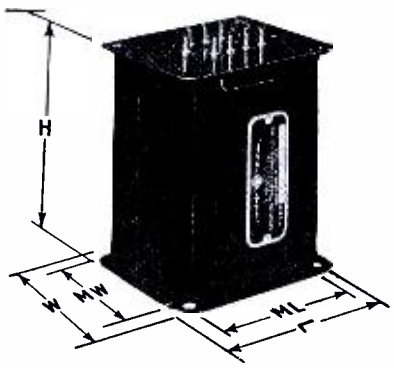
Universal mounting facilities permit all units to be top or bottom mounted to chassis or panels.

With the exception of the high voltage units which are provided with glazed ceramic insulators all units are provided with sturdy solder lug terminals.

**Mounting Dimensions**

| Case | ML | MW. |
|---|---|---|
| 1A | 2 1/32 | 1 9/16 |
| 2A | 2⅛ | 1 13/16 |
| 3A | 2 7/16 | 1 15/16 |
| 4A | 3⅞ | 2 7/16 |
| 5A | 4 5/16 | 3 3/16 |
| 6A | 4½ | 4 5/16 |
| 7A | 5½ | 4 5/16 |
| 8A | 5¾ | 4 13/16 |
| 9A | 6 15/16 | 5¾ |
| 10A | 8⅝ | 7 11/32 |

**T LINE DIMENSIONS**




**Overall Dimensions**

| Length | Width | Height |
|---|---|---|
| 2 7/16 | 2 | 2⅞ |
| 2¾ | 2⅜ | 3 3/16 |
| 3 1/16 | 2 9/16 | 3⅝ |
| 4½ | 3 | 3⅞ |
| 5 | 3⅞ | 5 |
| 5 | 5⅛ | 5 |
| 6 5/16 | 5 3/16 | 6⅜ |
| 6 9/16 | 5 11/16 | 7⅛ |
| 7¾ | 6⅝ | 7 3/16 |
| 9½ | 8¼ | 10⅝ |

## INPUT TRANSFORMERS

| Type No. | | Case | List Price |
|---|---|---|---|
| T-1 | Single or double button microphone to one grid. Input—400-300-200-100-50 ohms. Hum bucking type | 1A | $4.00 |
| T-2 | Multiple line to one grid. Input—500-333-250-200-125-50 ohms. Hum bucking type | 1A | 4.00 |
| T-3 | Multiple line to P. P. grids. Input—500-333-250-200-125-50 ohms. Hum bucking type | 1A | 4.00 |
| T-4 | Detector plate, high impedance pickup; or double button microphone to single grid | 2A | 5.00 |

## LINE TRANSFORMERS

| | | | |
|---|---|---|---|
| T-25 | Line to line matching transformer. Secondary—500-200-50 ohms} Primary—500-200-50 ohms } | 2A | 5.00 |
| T-27 | 500 or 200 ohms to 15-8-4 ohms—Level 15 watts | 3A | 5.00 |
| T-28 | 500 or 200 ohms to 15-8-4 ohms—Level 30 watts | 4A | 6.00 |
| T-29 | 500 or 200 ohms to 15-8-4 ohms—Level 60 watts | 5A | 9.00 |

## CLASS "A" INPUT TRANSFORMERS

| | | | |
|---|---|---|---|
| T-51 | Single Class A Plate 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to single Class A Grid. Ratio 1:4 | 1A | 3.50 |
| T-52 | Single Class A Plate 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to P. P. Class A Grid. Ratio 1:4 | 1A | 3.50 |
| T-53 | Detector plate or single button microphone to single grid. | 1A | 3.50 |

**For portable applications use open type KA114M. List Price $2.25**

| | | | |
|---|---|---|---|
| T-54 | P. P. Class A plates 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to P. P. Class A Grids. Ratio 1:1.8 (total pri. to total sec.) | 2A | 4.50 |
| T-55 | Single Class A Plate 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to single Class A Grid. Ratio 1:3 | 2A | 4.50 |
| T-56 | Single Class A Plate 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to P. P. Class A Grids. Ratio 1:2 (total pri. to total sec). | 2A | 4.00 |
| T-57 | Single Class A Plate 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to single Class A Grid. (Ratio 1:2.) Hum bucking type | 2A | 5.00 |
| T-58 | Single Class A Plate 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to P. P. Class A Grids. Ratio 1:2 (total pri. to total sec.). Hum bucking type | 2A | 5.00 |

## CLASS "AB" AND "B" INPUT TRANSFORMERS

| | | | |
|---|---|---|---|
| T-251 | Single 53, 6A6, 56, 6C5, etc. to P. P. 53, 6A6, etc. (Single 53, 6A6, etc. in P. P.) | 2A | 4.50 |
| T-252 | Single, 30, 49, 89 to P. P. 19, 30, or 49's | 1A | 3.50 |

**For portable applications use open type KR 19. List Price $1.50**

| | | | |
|---|---|---|---|
| T-253 | Single 46 or 59 to P. P. 46's or 59's, 6F6's, etc. | 2A | 4.50 |
| T-254 | Single 45, 6F6, 2A5, 42 etc. to P. P. 6F6's, 45's, 42's, 2A5's, etc. | 2A | 4.50 |
| T-255 | P. P. 56, 76, 6C5, 53, 6A6, 6N7 to P. P. 6L6's | 2A | 4.50 |
| T-256 | P. P. 56, 76, 6C5, to P. P. 45's, 2A3's, 6F6's, etc. | 2A | 4.50 |
| T-257 | P. P. 45's to P. P. Parallel 46's | 2A | 4.50 |
| T-258 | P. P. 45's to P. P. 800's | 3A | 5.00 |
| T-259 | P. P. 2A3's to P. P. 203A's, 838's etc. | 4A | 6.00 |
| T-260 | P. P. parallel 2A3's to P. P. H.D. 203A's, P. P. Parallel 838's etc. | 4A | 8.00 |
| T-271 | P. P. 45's, 2A3's, 6F6's (triode) to P. P. Class $AB_2$ 6L6's | 3A | 5.00 |

## CLASS "A" OUT TRANSFORMERS

| | | | |
|---|---|---|---|
| T-101 | Single Class A Plate 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to 500 or 200 ohms | 1A | 3.50 |
| T-102 | P. P. Class A Plates 56, 76, 6C5, 77 (triode) etc. to 500 or 200 ohms | 1A | 3.50 |
| T-103 | P. P. 45's, or 43's to 500-200 or 15-8-4 ohms | 2A | 5.00 |
| T-104 | Single 2A5, 6F6, 89, 47 etc. to 500-200 or 15-8-4 ohms | 2A | 4.50 |
| T-105 | P. P. 2A5, 6F6, 89, 47 etc. to 500-200 or 15-8-4 ohms | 2A | 5.00 |
| T-106 | P. P. 6B5, 2B6, to 500-200 or 15-8-4 ohms | 3A | 5.50 |

## CLASS "AB" AND "B" OUTPUT TRANSFORMERS

| Type No. | | Case | List Price |
|---|---|---|---|
| T-301 | P. P. 45's, 2A3's (Class AB) 6L6's (Class A) to 500-200 or 15-8-4 ohms. Primary 5000 or 3000 ohms | 4A | 6.00 |
| T-302 | P. P. 6 N7, 53, 49's, 19 to 500-200 or 15-8-4 ohms | 3A | 5.50 |
| T-303 | P. P. 46, 59's, 6F6's (triode or pentode) 2A5's, 42's to 500-200 or 15-8-4 ohms. Primary 6000 or 10,000 ohms | 4A | 6.00 |
| T-304 | P. P. Parallel 45's, 2A3's to 500-200 or 15-8-4 ohms. Primary 1500 or 2500 ohms | 4A | 8.00 |
| T-305 | P. P. Parallel 46's, 59's, 6F6's, (triode or pentode) 2A5's, 42's to 500-200 or 15-8-4 ohms. Primary 3000 or 5000 ohms | 4A | 8.00 |
| T-317 | P. P. 6L6's Class $AB_1$ (6600 or 3800 ohms—34 watts) to 500-200 or 15-8-4 ohms | 4A | 8.00 |
| T-319 | P. P. 6L6's, $AB_2$ (6000 or 3800 ohms—60 watts) to 500-200 or 15-8-4 ohms | 5A | 8.50 |

## MODULATION OUTPUT TRANSFORMERS

| | | | |
|---|---|---|---|
| T-451 | Class B 6N7, 53, 6A6, RK34, to 5000 or 3000 ohms. Max. Sec. D.C. 100 M.A. | 2A | 4.50 |
| T-452 | Class B 19, to 5000 or 3000 ohms. Max. Sec. D.C. 50 M.A. | 1A | 3.50 |
| | **For portable application use open type KR19M. List Price $1.50** | | |
| T-453 | Class AB 2A3's, 45's or Class A, 6L6's to 5000 or 3000 ohms. Max. Sec. D.C. 130 M.A. | 4A | 8.50 |
| T-454 | Class B 46's or 59's, 6F6's (triode or pentode) 2A5's, 42's, etc. to 4000-6000-8000 ohms. Max. Sec. D. C. 140-100-75 M.A. Primary 6000 or 10,000 ohms | 4A | 8.50 |
| T-455 | Class B—210's to 5000-7000-9000 ohms. Max. Sec. D.C. 180-150-130 M.A. | 5A | 10.00 |
| T-456 | P. P. Parallel 45's, or 2A3's Class AB to 5000-7000-9000 ohms. Max. Sec. D.C. 150-100-75 M.A. | 5A | 10.00 |
| T-457 | P. P. Parallel 46's, 59's, 6F6's, (triode or pentode) 2A5's, 42's etc. to 3000-5000-7000 ohms. Max. Sec. D.C. 220-160-120 M.A. Primary 3000 or 5000 ohms | 5A | 10.00 |
| T-465 | P. P. 838's 203A's to 4000-6000-8000 ohms. Max. Sec. D.C. 400-320-270 M.A. | 7A | 25.00 |
| T-470 | P. P. H.D. 203A's to 4000-6000-8000 ohms. Max. Sec. D.C. 500-420-350 M.A. | 8A | 42.00 |
| T-490 | Single 2A5, 42 or 6F6 grid modulation transformer to grid modulate 203A's, 211, etc. | 2A | 4.50 |
| T-491 | Single 45 grid modulation transformer to grid modulate 203A's, 211's, etc. | 2A | 4.50 |
| T-458 | P. P. 801's, to 5000-7000-9000 ohms. Max. Sec. D.C. 150-135-110 M.A. | 6A | 12.50 |
| T-460 | P. P. 800's to 6000-8000-10,000 ohms. Max. Sec. D.C. 200-175-150 M.A. | 6A | 15.00 |
| T-492 | Grid or suppressor modulation transformer—P. P. 45's to 10,000 ohm load | 3A | 5.00 |
| T-459 | P. P. 6L6's Class $AB_2$ to 2500-5000-7000 ohms. Max. Sec. D.C. 300-250-200 M.A. | 5A | 8.50 |

## FILTER REACTORS

| Type No. | Inductance Henries | Max. M.A. | D.C. Resistance | Insulation Test | Case No. | List Price |
|---|---|---|---|---|---|---|
| T-155 | 290 | 10 | 4700 | 1000 V. | 2A | $4.00 |
| T-158 | *350 | 10 | 10000 | 1000 V. | 3A | 4.50 |
| T-156 | 30 | 25 | 800 | 1000 V. | 1A | 3.00 |
| T-157 | 20 | 50 | 200 | 1000 V. | 1A | 3.00 |
| T-153 | 30 | 90 | 350 | 1000 V. | 3A | 3.50 |
| T-154 | 15 | 165 | 210 | 1000 V. | 3A | 4.00 |
| T-152 | 10 | 200 | 100 | 1000 V. | 3A | 4.00 |
| T-164 | 14 | 250 | 135 | 1500 V. | 5A | 9.00 |
| T-166 | 11 | 300 | 125 | 1500 V. | 5A | 9.00 |
| T-159 | 12 | 500 | 77 | 1500 V. | 6A | 12.50 |
| T-165 | 10 | 150 | 275 | 3000 V. | 3A | 4.00 |
| T-168 | 13 | 250 | 125 | 3000 V. | 5A | 10.00 |
| T-160 | 11 | 300 | 120 | 3000 V. | 5A | 10.00 |
| T-167 | 11 | 400 | 80 | 3000 V. | 6A | 12.00 |
| T-175 | 10 | 200 | 140 | 5000 V. | 4A | 7.00 |
| T-176 | 10 | 300 | 110 | 5000 V. | 5A | 11.00 |
| T-178 | 10 | 400 | 90 | 5000 V. | 6A | 15.00 |
| T-177 | 12 | 500 | 95 | 5000 V. | 7A | 18.00 |

*Center tapped.

## SWINGING REACTORS

| Type No. | Inductance Henries | Max. M.A. | D.C.Resistance | Insulation Test | Case No. | List Price |
|---|---|---|---|---|---|---|
| T-517 | 15-45 | 90-20 | 350 | 1000 V. | 3A | $3.50 |
| T-515 | 10-25 | 165-30 | 210 | 1000 V. | 3A | 4.00 |
| T-506 | 5-20 | 200-30 | 100 | 1000 V. | 3A | 4.00 |
| T-507 | 7-25 | 250-50 | 135 | 1500 V. | 5A | 9.00 |
| T-510 | 6-19 | 300-30 | 125 | 1500 V. | 5A | 9.00 |
| T-511 | 5-20 | 170-20 | 275 | 3000 V. | 3A | 4.00 |
| T-508 | 7-26 | 250-50 | 125 | 3000 V. | 5A | 10.00 |
| T-514 | 5-20 | 300-50 | 120 | 3000 V. | 5A | 10.00 |
| T-516 | 5-20 | 400-50 | 80 | 3000 V. | 6A | 12.00 |
| T-509 | 6-19 | 200-30 | 140 | 5000 V. | 4A | 7.00 |
| T-512 | 5-15 | 300-30 | 110 | 5000 V. | 5A | 11.00 |
| T-513 | 5-18 | 400-50 | 90 | 5000 V. | 6A | 15.00 |
| T-521 | 6-21 | 500-60 | 95 | 5000 V. | 7A | 18.00 |

## PLATE TRANSFORMERS

| Type No. | Primary | A.C. Secondary Volts | | D.C. M.A. | Case | List Price |
|---|---|---|---|---|---|---|
| T-664 | | 740-0-740 | | 150 | 5A | $8.00 |
| T-655 | *Tapped | 460-0-460 | | 250 | 5A | 9.00 |
| T-656 | *Tapped | 740-0-740 | | 300 | 6A | 12.00 |
| T-657 | †Tapped | 900-0-900<br>900-0-900 | (2 separate secondaries) | 200<br>200 | 7A | 26.00 |
| T-658 | ‡Tapped | 520-0-520<br>570-0-570<br>570-0-570 | (3 separate secondaries) | 175<br>175<br>175 | 7A | 21.00 |
| T-654 | ‡Tapped | 490-0-490<br>630-0-630<br>630-0-630 | (3 separate secondaries) | 250<br>250<br>250 | 8A | 30.00 |
| T-659 | ‡Tapped | 520-0-520<br>570-0-570<br>570-0-570 | (3 separate secondaries) | 350<br>350<br>350 | 8A | 30.00 |
| T-665 | *Tapped | 1180-0-1180 | | 250 | 7A | 22.00 |
| T-666 | | 1460-0-1460 | | 350 | 8A | 26.00 |
| T-667 | | 1460-0-1460 | | 500 | 9A | 34.00 |
| T-660 | | 1460-0-1460<br>630-0-630 | (2 separate secondaries) | 500<br>200 | 9A | 38.00 |
| T-661 | | 2080-0-2080 | | 200 | 7A | 22.00 |
| T-662 | | 2080-0-2080 | | 300 | 8A | 30.00 |
| T-663 | | 2360-0-2360 | | 600 | 10A | 70.00 |

*Primary tapped to icrease the above secondary voltages approximately 25%.
†Primary tapped to increase the above secondary voltages approximately 30%.
‡Primary tapped to increase the above secondary voltages approximately 12.5% and 25%.

## PLATE AND FILAMENT TRANSFORMERS

| Type No. | Sec. Volts. | D.C. MA. | F1 | F2 | F3 | F4 | Case | List Price |
|---|---|---|---|---|---|---|---|---|
| *T-249 | 235-0-235 | 20 | 6.3V.- .6A.CT. | 6.3V.-.9A. CT. | ..... | ..... | 2A | $4.50 |
| *T-245 | 320-0-320 | 40 | 5 V.-2 A. | 6.3V.-2 A.CT. | ..... | ..... | 3A | 5.00 |
| §T-201 | 0-75 | 70 | 5 V.-2 A. | ..... | ..... | ..... | 2A | 4.50 |
| *T-205 | 350-0-350 | 75 | 5 V.-2 A. | 6.3V.-3 A.CT. | ..... | ..... | 4A | 6.50 |
| *T-206 | 325-0-325 | 100 | 5 V.-3 A. | 6.3V.-3 A.CT. | 6.3V.- 2A.CT. | ..... | 5A | 8.50 |
| T-212 | 420-0-420 | 125 | 5 V.-3 A. | 6.3V.-3 A.CT. | 2.5V.- 4A.CT. | ..... | 5A | 9.50 |
| T-214 | 420-360-125-0-360-420 | 150 | 5 V.-3 A. | 2.5V.-3 A.CT. | 2.5V.- 5A CT. | 6.3V.-3 A.CT. | 5A | 10.00 |
| *T-244 | 425-0-425 | 165 | 5 V.-3 A. | 6.3V.-3 A.CT. | 6.3V.- 3A.CT. | ..... | 6A | 12.00 |
| *T-248 | 425-0-425 | 165 | 5 V.-3 A. | 2.5V.-6 A.CT. | 2.5V.- 6A.CT. | ..... | 6A | 12.00 |
| T-213 | 520-110-0-520 | 180 | 5 V.-3 A. | 2.5V.-3 A. | 6.3V.- 3A. | 6.3V.-3 A.CT. | 5A | 11.50 |
| T-215 | 360-125-0-360 | 200 | 5 V.-3 A. | 2.5V.-3 A.CT. | 2.5V.-10A.CT. | 6.3V.-2.1A.CT | 5A | 11.50 |
| T-247 | 590-0-590 | 200 | 5 V.-3 A. | 6.3V.-3 A.CT. | 6.3V.- 3A.CT. | ..... | 5A | 12.00 |
| T-216 | 520-85-0-520 | 250 | 5 V.-3 A. | 2.5V.-3 A. | 6.3V.- 3A.CT. | 6.3V.-3 A.CT. | 6A | 13.00 |
| †T-207 | 0-275-375 | 10 | 6.3V.- .6A. | 6.3V.-1 A. | 2.5V.-1.4A. | ..... .. | 3A | 4.00 |
| | 0-180 | 6 | | | | | | |
| ‡T-202 | 0-150 | 20 | 6.3V.- .6A. | ..... | ..... | ..... | 1A | 4.00 |
| §T-220 | 125-0-125 | 200 | 5 V.-3 A. | ..... | ..... | ..... | 4A | 6.00 |
| T-246 | 625-0-625 | 250 | 5 V.-3 A. | 6.3V.-3 A.CT. | 6.3V.- 3A.CT. | ..... | 6A | 13.00 |

*Indicates unit designed for condenser input to filter. All other units should be used with choke input.
†For RCA 913 Midget Cathode Ray Tube.
‡For oscillators, wave meters, etc.
§For bias supplies.

## FILAMENT TRANSFORMERS

### Single Winding

| Type No. | F1 | F2 | F3 | F4 | Case No. | List Price |
|---|---|---|---|---|---|---|
| T-352 | 2.5 V.-10 A. CT. 2000 V. Test | ..... | ..... | ..... | 2A | $4.00 |
| T-354 | 5 V.-3 A. CT. 2000 V. Test | ..... | ..... | ..... | 2A | 4.00 |
| T-351 | 6.3 V.-3 A. CT. 2000 V. Test | ..... | ..... | ..... | 2A | 4.00 |
| T-353 | 7.5 V.-4 A. C. 2000 V. Test | ..... | ..... | ..... | 2A | 4.00 |
| T-357 | 5.25 V.-12 A. CT. 2000 V. Test | ..... | ..... | ..... | 4A | 6.00 |
| T-358 | 5.25 V.-20 A. CT. 2000 V. Test | ..... | ..... | ..... | 5A | 8.00 |
| T-360 | 2.5 V.-10 A. CT. 5000 V. Test | ..... | ..... | ..... | 3A | 6.00 |
| T-365 | 10 V.-4 A. CT. 5000 V. Test | ..... | ..... | ..... | 3A | 6.50 |
| T-361 | 10 V.-8 A. CT. 5000 V. Test | ..... | ..... | ..... | 4A | 8.00 |

### Two Windings

| | | | | | | |
|---|---|---|---|---|---|---|
| T-366 | 2.5 V.10 A. CT. 5000 V. Test | 2.5 V.10 A. CT. 5000 V. Test | ..... | ..... | 4A | 8.00 |
| T-363 | 10 V.-6.5 A. CT. 5000 V. Test | 10 V.-3.25 A. 5000 V. Test | ..... | ..... | 5A | 9.00 |
| T-362 | 11-12 V.-8 A. CT. 5000 V. Test | 10-11 V.-3.5 A..CT 5000 V. Test | ..... | ..... | 5A | 11.00 |

### Three Windings

| | | | | | | |
|---|---|---|---|---|---|---|
| T-364 | 2.5 V.-8 A. CT. 750 V. Test | 2.5 V.-8 A. CT. 750 V. Test | 5 V.-6 A. 750 V. Test | ..... | 4A | 7.00 |
| T-356 | 6.3 V.-3 A. CT. 750 V. Test | 5 V.-4 A. CT. 3000 V. Test | 5 V.-8 A. CT. 3000 V. Test | ..... | 4A | 9.00 |
| T-355 | 5V.-3 A. CT. 4000 V. Test | 5 V.-3 A. CT. 4000 V. Test | 5 V.-6 A. CT. 4000 V. Test | ..... | 4A | 7.50 |
| T-375 | 2.5 V.-5 A. CT. 6000 V. Test | 2.5 V.-5 A. CT. 6000 V. Test | 2.5 V.-10 A. CT. 6000 V. Test | ..... | 4A | 9.00 |

### Four Windings

| | | | | | | |
|---|---|---|---|---|---|---|
| T-373 | 2.5 V.-5 A. CT. 750 V. Test | 5 V.-3 A. 750 V. Test | 7.5 V.-3.25 A. CT. 3000 V. Test | 7.5 V.-8 A. CT. 3000 V. Test | 5A | 9.00 |
| T-374 | 2.5 V.-5 A. CT. 750 V. Test | 5 V.3 A. 750 V. Test | 6.3 V.-3 A. CT. 3000 V. Test | 7.5 V.-8 A. CT. 3000 V. Test | 5A | 9.00 |
| T-370 | 6.3 V.-3 A. CT. 750 V. Test | 6.3 V.-3 A. CT. 750 V. Test | 2.5 V.-4 A. CT. 750 V. Test | 5 V.-3 A. 750 V. Test | 4A | 7.50 |
| T-371 | 5 V.-3 A. 750 V. Test | 6.3 V.-3 A. CT. 750 V. Test | 6.3 V.-3 A. CT. 750 V. Test | 7.5 V. 8 A. CT. 2500 V. Test | 5A | 8.50 |
| T-372 | 5 V.-3 A. 750 V. Test | 5 V.-3 A. CT. 750 V. Test | 6.3 V.-3 A. CT. 750 V. Test | 7.5 V.-4 A. CT. 2000 V. Test | 5A | 8.50 |
| T-367 | 6.3 V.5 A. CT. 2000 V. Test | 6.3 V.-5 A. CT. 2000 V. Test | 5 V.-6 A. CT. 2000 V. Test | 5.V.-3 A. CT. 2000 V. Test | 5A | 9.00 |

### Five Windings

| | F1 | F2 | F3 | F4 | F5 | | |
|---|---|---|---|---|---|---|---|
| T-377 | 5 V.-3 A. 2000 V. Test | 5 V.-6 A. 2000 V. Test | 6.3 V.-1 A. CT. 2000 V. Test | 6.3 V.-5 A. CT. 2000 V. Test | 6.3 V.-5 A. CT. 2000 V. Test | 5A | 9.50 |

# SINCE 1927 . . .

## By B. L. AHMAN, JR.

Snapped at Newark meeting . . . back row, left to right: Poppele (Chief Engineer, WOR), Kramer, Barchary, Varrelman, Smith, Beidleman. Front row, left to right: Hahn, Wittenburg, Potts, Reichart, McKenna, Fleischman, Schneider, Sweitzel.

ON December 8, 1927, a group of 55 enthusiastic DX fans met in the editorial rooms of The Newark *Evening News,* of Newark, New Jersey, and organized the now well-known Newark News Radio Club. Many of these fans were set builders, some were simply dyed-in-the-wool listeners, but all had embraced radio as a hobby.

The club was formed for the purpose of aiding experimenters and listeners, and as a means of establishing good fellowship. These ideals have been eminently successful.

### The Old and the New

Nine years have since passed, and as the club is about to enter its tenth radio season, it is apparent that many changes have taken place in the make-up of the average listener and experimenter. In the early days of radio there was no ALL-WAVE RADIO magazine to assist the listener in his attempts to receive distant stations. In fact, Pittsburgh was considered DX reception to Newark listeners. The going was tough but the final catches, as short in distance as they were, were sufficient compensation for the many hours of trial.

The DXer of yesterday fished for his catches, and when we say fished, we *mean* fished. He literally had to glue his ears to the headphones, and amidst bursts of static try to decipher the weak voice of the announcer saying, "this is KDKA, Pittsburgh!" And should the frequency of the transmitter drift slightly there were not one, but three or four dials to twirl before the elusive signal was again captured. But they were happy days nevertheless.

Baltimore Chapter . . . back row, left to right: Weyrich, Ahman, Kelly, McVey, Russell. Front row, left to right: Howard, Bruns, L. Hahn, Bauer, P. Hahn.

Most of the club's organizers were DXers who wrote of their experiences in the newspaper columns under such *nom-de-plumes* as "Switch Reel," "Hifrequency," "Dial Twister," "Air Raider," and "Roamer." Their interests were altruistic, as evidenced by their use of pen-names, and it is a credit to them that they wrote for the sake of assisting the many other less-experienced fans taken up with the then new hobby.

Aside from this, the officers and members of this club were probably the only DX representatives who constantly traveled from one city to another visiting old friends and making new ones. As a result there are today active chapters in Baltimore, Indianapolis, Chicago, Newark, Brooklyn, and Toronto that have regular meetings during the DX seasons. Reunions of inter-chapter members give many DXers the opportunity to tell tall tales with convincing veracity.

### From All Walks

DXers come from all walks of life. There are radio critics, radio artists, station owners, station engineers, rich men, poor men, short-wave fans, licensed amateurs and broadcast listeners who follow the art as a hobby. And they continue to come from all walks of life. With the advent of short-wave broadcasting, countless recruits were added to the ranks, and are still being added. The influx will continue, and only the nature of the recruit will change as the face of broadcasting itself changes with the passing of time.

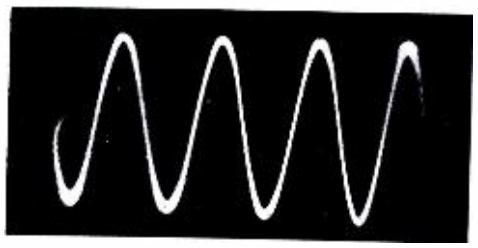
Indeed, there are many charter members of the Newark News Radio Club who have realized that there is a new order of things, related to but still somewhat detached from the DXing hobby as it was some years ago. Today one twists a dial and, presto, hears Europe, Asia, South America, and even Africa, during daylight hours. In the past "distance" was released only with the arrival of night and it could not be taken without considerable patience and effort. The short-wave "white-hope" had not appeared on the scene, nor had receivers with knife-edge selectivity, calibrated dials and single control. The DXer stuck to the standard band, worked with temperamental receivers, and burned the midnight oil. If he hooked one DX station, it was a good night's work. The world of DX was not his completely, as it almost is today; there were continents yet to be heard and low power stations yet to be caught.

And now, as these older members view the scene, they observe that radio progress has rubbed out at least some part of the old zest and laid before them in its stead the entire radio world tied up in a neat, convenient package, to be opened as desired with possibly too small an amount of effort to leave room for a sensing of the old thrill. They realize, with some sadness, that the old days are gone forever.

### Wider Horizons

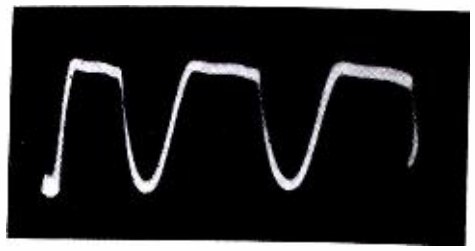
But all men look back to "the old days" as cherished memories, no matter what the past may have held for them. And though KDKA is no longer the DX it was to the old timer, he has as a fitting compensation a far wider horizon, with the number of possible catches increased many fold. His new wings carry him farther afield and yet he has not reached the ultimate. And above all, though the old timer may cherish memories of yesterday, he has kept pace with the times and continues to serve newcomers as did "Switch Reel," "Air Raider" and the rest of them in their time.

The Newark News Radio Club has continued to reflect these ideas and the accumulated experience of its members. It has remained democratic in its activities and, like its older members, has kept pace with the world of radio. To this extent it has instituted a short-wave chapter and so, aside from being known as the world's pioneer DX club, it is now also the world's all-wave radio club.



Oscillogram of wave envelope indicating good waveform.

# THE AWR MIDGET CATHODE-RAY OSCILLOGRAPH



Oscillogram of wave envelope indicating poor waveform.

**By Chester E. Watzel . W2AIF**

MOST every amateur and experimenter has an idea of what a cathode-ray oscillograph is and of what benefit it is in making the proper adjustments on a transmitter. This is especially true of the phone amateur. While a c.w. transmitter will turn out a proper sounding and legally correct signal without a full complement of either proper equipment or adjustments, a phone transmitter will not take kindly to this type of treatment. Every component of a phone transmitter must be of correct value and adequate size, and every adjustment must be "on the nose," if the resulting phone signal is to be a natural reproduction of the operator's voice. Not only that, but an incorrectly adjusted or operated phone transmitter can splash over everything from the neighbor's BCL receiver to the Grand Rapids monitoring station, with the well-known disastrous kickbacks.

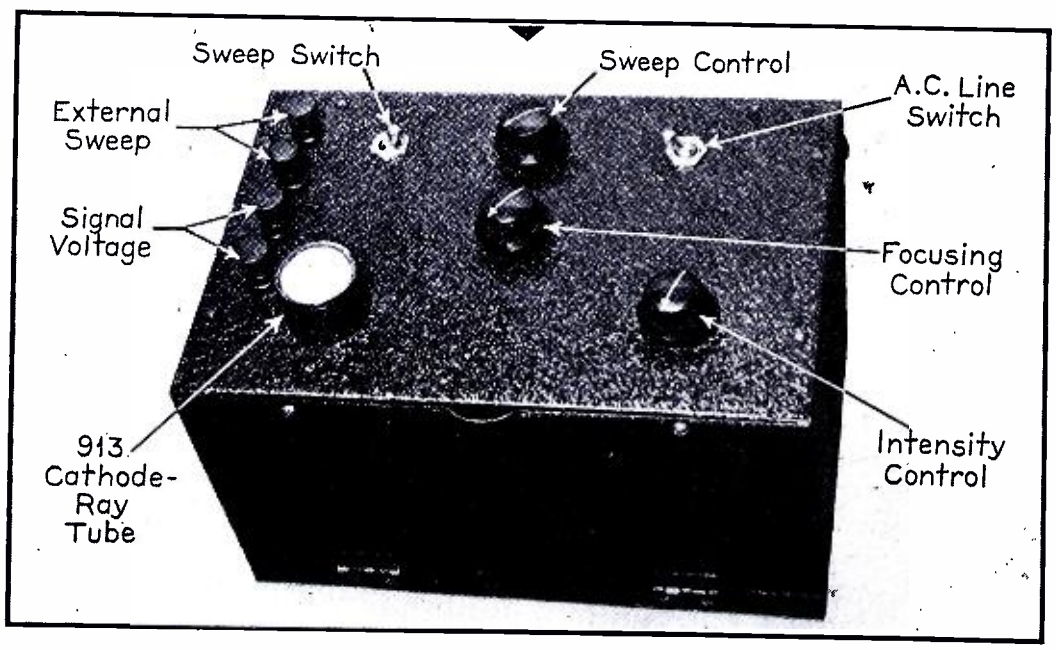
Every phone operator realizes this, and would add an oscillograph to his station equipment if he could afford one. But the high prices of existing oscillographs, ranging from about fifty dollars and up—mostly up—have been an effective deterrent to the majority of the phone amateurs.

### *Midget, Low-Cost Tube*

A new midget cathode-ray tube which has just been released, the RCA type 913, now permits of the construction of an oscillograph for fifteen dollars or less, this price including the cost of the cathode-ray tube. This should immediately permit a great many amateurs to include an oscillograph in their equipment. We predict that the release of the new type 913 tube will go further toward cleaning up the amateur phone bands (and some of the commercial bands as well) than any recent transmitter development has. The small size of the type 913 should also permit its inclusion in installations where compactness and low cost are the determining factors.

The type 913 cathode-ray tube, for all its odd and unfamiliar appearance, and its small size, will do anything that the larger cathode-ray tubes will do. The tube closely resembles the new metal 6L6 beam power tube, except that the end of the metal shell is fitted with a one-inch glass screen. The only disadvantage of the 913 is the small screen as compared to the larger screens of the other cathode-ray tubes. Otherwise it is identical in functioning and operation to the more familiar type 906, which has a three-inch screen.

An advantage of the 913 tube is the excellent shielding of the elements from external interfering fields afforded by the metal shell which encloses the entire tube except for the glass screen. In one compactly built commercial oscillograph it was actually necessary to mount the power transformer outside the case to avoid distortion of the oscillograms. The small size of the oscillograph described in this article has no effect on the screen patterns of the 913, due to the complete shielding of this tube, even though the power transformer is less than four inches from the tube.




Panel view of the completed Midget Cathode-Ray Oscillograph. The photo has been switched around for ease in designation of controls, the hinged top being toward the reader.

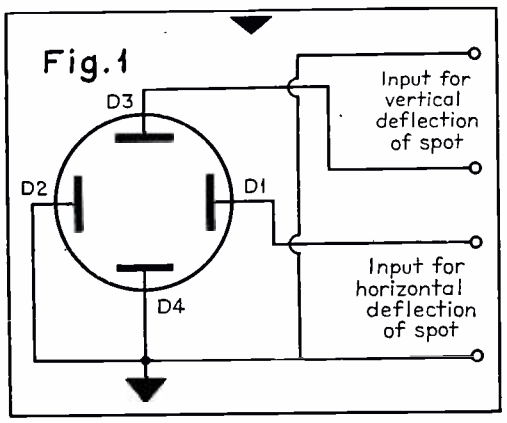
### *Functioning of Tube*

It would be well before going into the design of this oscillograph to give a brief review of the functioning of a cathode-ray tube. The tube may, for the purpose of illustration, be considered as having three sections: the cathode, the control grid and the several anodes constituting an electron gun which projects a beam of electrons at the center of the glass screen. Variation of the control grid voltage with the "intensity" potentiometer controls the intensity of this beam, while variation of the anode voltages by means of the "focusing" potentiometer controls the focusing of the beam upon the screen.

This glass screen is coated with a fluorescent material which glows green over the portion of the screen at which the electron beam is directed. This flourescent screen constitutes the second section in our analysis of the type 913 cathode-ray tube.

With a green spot appearing on the center of the screen as a result of the action of the first section of the cathode-

ray tube, the third section of the tube now comes into play. This section consists of four plates, arranged in a square around the inside of the tube. The action of this section of the tube is illustrated in Fig. 1. The circle represents the screen, the dot in the center being the luminous spot before the plates go to work on it. There are four plates, arranged in opposite pairs. D1 and D2 form one pair, D3 and D4 the other. Each pair produces an electrostatic field which moves the electron beam, and the spot it produces on the screen, in a line between the corresponding plates of each pair, the direction and speed of this movement depending on the voltages applied externally to the plates. Thus an alternating voltage applied to plates D1 and D2 will move the spot back and forth between D1 and D2. The frequency of the alternating voltage determines the number of times a second that the spot



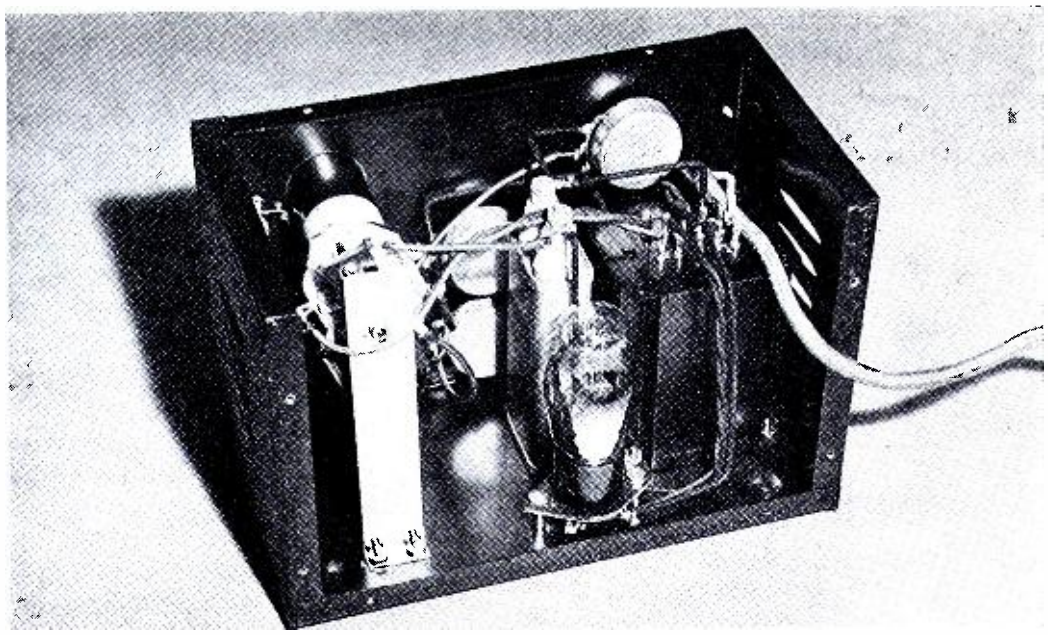

**Connections of cathode-ray tube plates to terminal posts.**

will reverse its direction of travel, the potential of the voltage determining how far across the screen the spot will swing. The same can be said also of the pair of plates D3 and D4. If the usual 60-cycle a.c. line voltage is applied to either pair of plates the spot traveling between this pair of plates will sweep back and forth across the screen 60 times a second. This spot will travel so fast, however, as to appear as a solid line.

## *Horizontal and Vertical Deflection*

With the tube oriented as it is in this particular oscillograph, plates D1 and D2 will cause the spot to move in a horizontal direction, and plates D3 and D4 will move the spot in a vertical direction. The same applies to the line produced by the fast-moving spot. An alternating voltage applied to D1 and D2 will produce a horizontal line on the screen, while plates D3 and D4 will produce a vertical line.

When alternating voltages are applied to both pairs of plates the spot on the screen ceases to appear as a straight vertical or hoizontal line, but instead traces an almost unlimited variety of patterns on the screen, depending on the amplitude, frequency, phase difference, etc., of the two voltages applied to the two pairs of plates. Applying two or more different voltages to one or both pairs of plates produces an even more bewildering array of patterns on the screen. These patterns result because the voltages on the two pairs of plates, being applied t the same time, exert a simultaneous force on the electron beam which causes the spot to deflect out of the straight horizontal or vertical line which is traced on the screen when a single alternating voltage is applied to only one pair of plates. A glance at the oscillograms in this article will show some of the many patterns which can be traced on the screen. By proper interpretation of these patterns it is possible to actually visualize on the cathode-ray tube screen the electrical actions which are going on in the particular piece of equipment to which the oscillograph is connected.

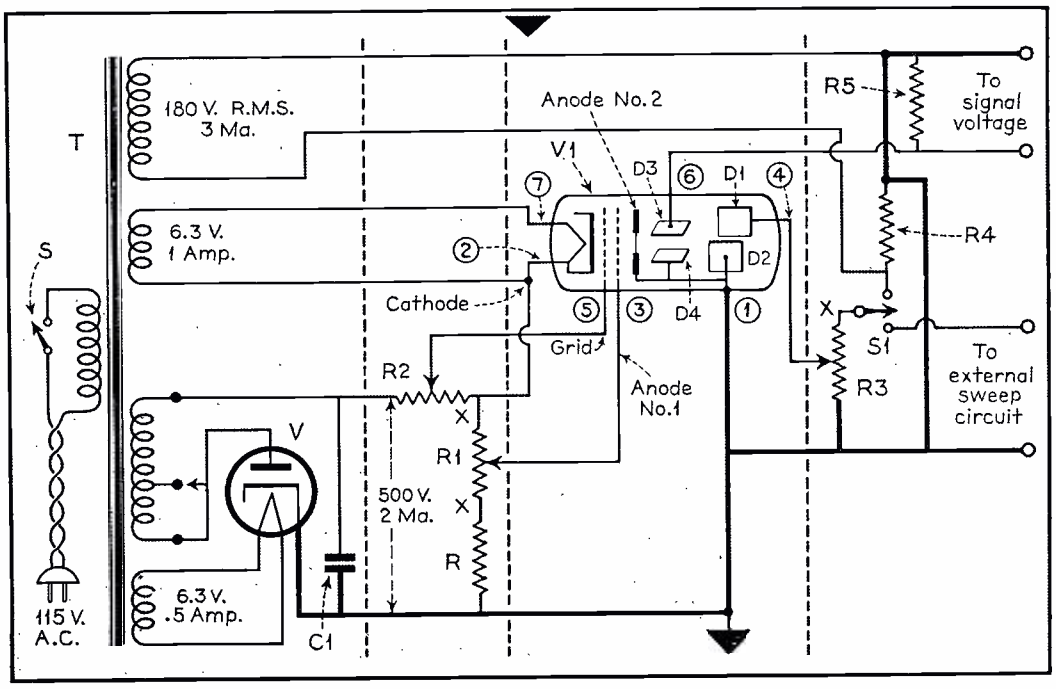


**Inside view of the completed cathode-ray oscillograph. Note the swivel mounting which permits the type 913 tube to be oriented.**

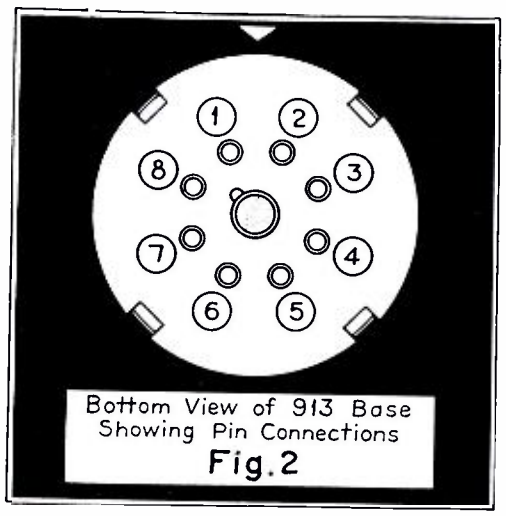
## *The Oscillograph*

The construction and wiring of this little oscillograph is extremely simple, as may be seen by a glance at the photos and diagram. There are many possible additions to this simple unit that may be made, such as a voltage amplifier for each set of deflecting plates, a saw-tooth oscillator for synchronizing the frequencies of the voltages on the two pair of plates, etc. The simplest possible design, however, was chosen for this unit to keep the cost as low as possible. The latter part of this article will show the many tests it is possible to make on a transmitter with this job. For those amateurs who desire the addition of some of the above features, another small unit incorporating these additions may be constructed at a later date and used with the present unit with no changes.

As the diagram will show, the oscillo-




**Complete schematic diagram of the oscillograph. Tube V is the half-wave rectifier and V1 the type 913 cathode-ray tube.**




**Showing pin connections and also correct position of 913 socket, as viewed from the rear.**

graph is composed of only four sections, which are divided by dotted lines. The first section, at the left of the diagram, is the power unit. This merely consists of a power transformer, rectifier tube, and filter condenser. The current drawn from the high-voltage winding is so extremely small that a half-wave rectifier and single 4-mfd filter condenser provide ample filtering. Due to the light drain from the power supply the voltage will reach the peak voltage generated, so that the 375 r.m.s. volts from the transformer will produce an output voltage of approximately 500 volts. A tap is provided on the high-voltage winding so that a lower voltage than 500 may be used if desired.

The second section of the oscillograph is a combined bleeder and variable voltage control for the intensity and focusing electrodes of the cathode-ray tube. R2 varies the control-grid voltage and is the "intensity" control. R1 varies the anode No. 1 voltage and is the "focusing" control. R completes the bleeder. It is very important that the total resistance of these three resistors be of the order of several megohms. Any smaller combined resistance will place too great a load on the high-voltage winding of the power transformer and may result in burning out this winding.

The third section of the oscillograph is the type 913 cathode-ray tube itself. This has been explained.

The fourth section comprises the 60-cycle sweep circuit and the external sweep connections. There are two sets of binding posts, located at the right of both the diagram and the oscillograph itself. The upper pair connect to deflection plates D3 and D4 in the tube, this pair of plates comprising the vertical deflection plates in this particular oscillograph. Plate D4 is grounded, while a 10-megohm resistor is connected to D3 to bring it to the same potential as D4. The signal voltages under test are usually connected to the vertical deflection plates, so that we call this upper pair of binding posts the "signal voltage" connections.

### *Sweep Sources*

The horizontal deflection plates, D1 and D2, connect to the lower pair of binding posts. The circuit connected to this horizontal pair of plates is commonly called the "sweep circuit." The SPDT toggle switch, S1, provides a choice of two different sweep circuits. The 180-volt winding on the power transformer provides a 60-cycle sweep voltage. This sweeps the green dot back and forth across the screen of the tube 60 times a second, which is the a.c. line frequency, forming a horizontal line on the screen. Adjustment of potentiometer R3 varies the a.c. voltage applied to the horizontal deflection plates, which in turn varies the width of the horizontal line on the screen. This control is therefore called the "sweep" control.

With the toggle switch thrown to the other position the horizontal plates are connected to the lower pair of binding posts, which are then called the "external sweep" connections. The potentiometer R3 again varies the width of any pattern on the screen, while at the same time bringing plate D1 back to the same potential as D2.

### *Construction Details*

The construction of the oscillograph is also quite simple, there being but few parts. The cabinet is a standard type, being the same as was used for the 5-meter super-regenerative receiver described in the August issue of ALL-WAVE RADIO. The base is mounted in the cabinet with the edges turned up, as shown in the rear-view photo. No explanation of the location of the parts need be given, the photos showing this phase of the construction clearly.

The only piece of "special construction" is the mounting bracket for the 913 cathode-ray tube. It was desirable to be able to rotate the tube to any position so that the lines and patterns on the screen would be in the proper plane. A swivel mounting was necessary to accomplish this. Fortunately this was easy to construct. An odd piece of aluminum was mounted on the base with a bracket, and a hole drilled in the upper end at the position the center of the tube and tube socket would take, according to the hole drilled in the panel for the tube to project through. Two, long 6/32 bolts were put through the mounting holes in the tube socket, using the fiber washers to protect the socket from breakage, and the pair of metal spacers provided with the socket slid on these bolts. A scrap of hard rubber was drilled with three holes, one in the center, and two corresponding to the spacing of the socket-mounting holes. This piece was next slid on the bolts and fastened with nuts. A 6/32 bolt through the center hole of the hard rubber strip and the corresponding hole in the upright bracket formed the "swivel joint."

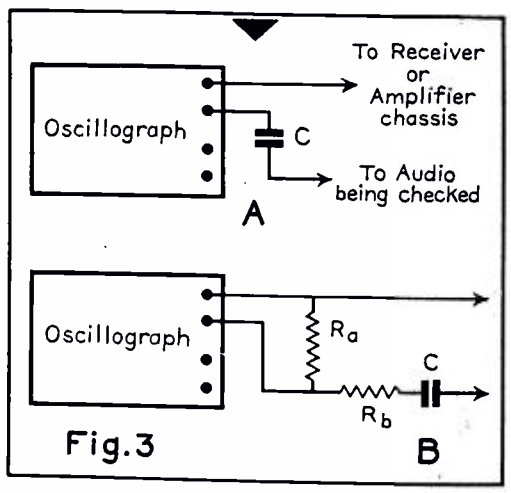
No sketch or dimensions are given for this swivel mounting, as it may be made up of any odds and ends around the shack. The piece of hard rubber could just as well be of metal. The only thing to remember in making this mounting is that the hole in the top of the upright bracket must be in exactly the right position so that the tube will project straight through the hole in the panel. This hole was drilled for a close fit. A magnifying glass may be mounted in front of the tube to provide a larger screen image.

Fig. 2 shows the correct position of the 913 tube socket, as well as the pin designations, as viewed from the rear. The leads to this socket should be flexible, as well as extra-long, so that the tube may be turned one way or the other.

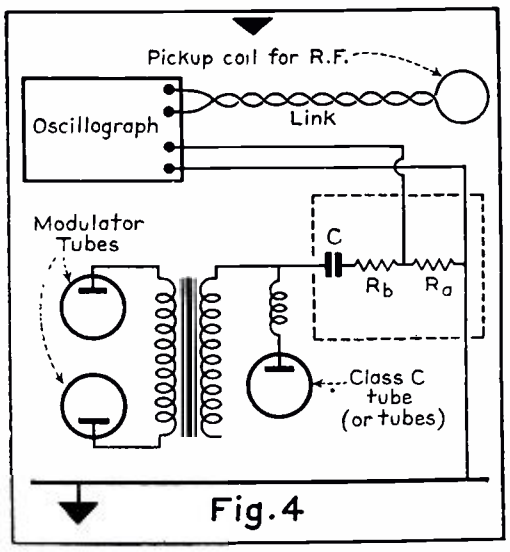
### *Operating Precautions*

After completion, the oscillograph should be checked for proper operation. If it has been constructed exactly in accordance with the information in this article, it should work immediately, with no changes to be made anywhere. Before turning on the unit, the booklet accompanying the 913 tube should be carefully read, especially the four paragraphs on page 5. A maximum input power to the fluorescent screen of 5 milliwatts per square centimeter should not be exceeded. Either a temporary loss of sensitivity, or a permanent destruction of the active screen material, will result if this figure is exceeded. In other words, the intensity control should be adjusted for minimum brightness, consistent with clarity, of whatever green image appears on the screen.

One thing that should be especially avoided is to permit the beam to appear as a spot at any point on the screen for more than a second or two. Otherwise the concentrated beam will injure the screen at this particular spot. The spot should be *kept in motion at all times* so as to spread the pattern into lines.




**Means of connecting oscillograph to receiver or amplifier (A) or to modulator (B).**




**How oscillograph is connected to transmitter to obtain a trapezoidal pattern.**

This avoids overloading of any particular portion of the screen. Throwing the "sweep" switch to the 60-cycle sweep position will keep a line on the screen and take care of this, or the "intensity" or "focusing" controls may be turned down to leave the screen blank.

It will be found that when the a.c. line switch is thrown off that a spot will persist in the center of the screen for a good portion of a minute. The "intensity" or "focusing" control should be *turned off* when the line switch is thrown, to avoid this. These various precautions will assure long life of the 913 tube.

When the oscillograph is first turned on the "sweep" switch should be thrown to the 60-cycle sweep position. The "sweep" control should be well advanced, while the "intensity" and the "focusing" controls should be set at their minimum positions. In the diagram each of the three control potentiometers has an "X" marked at one end. These controls should be wired in the circuit so that when the control knobs are advanced to the furthest "clockwise" positions the arms of the controls will be at the ends marked with the "X's". This will assure uniformity in control.

### *Adjustments*

When the tubes have been given a minute or so to warm up, advance the "focusing" control to near maximum position and then turn the "intensity" control up slowly until a green line appears across the screen. By proper adjustment of both the focusing and intensity controls this line should be made thin, sharp, and just bright enough to be seen as a clear line. Snapping the sweep switch over for a second will show a small green dot instead of a line. With the sweep switch thrown back again the sweep control should be adjusted so that the green line extends, nearly, but not quite, the width of the screen.

As a final adjustment the tube should be turned a bit one way or the other until the green line across the screen is exactly horizontal. The nut on the swivel bolt should then be tightened and the oscillograph is ready to put into service as a piece of valuable test equipment. The two screws provided for that purpose should be used to bolt the cover down tightly to keep inquisitive fingers out. There is 500 volts running around inside, and the size of the total bleeder system is too great to absorb the charge of the filter condenser for quite some time. After the oscillograph is turned off the terminals of the filter condenser should be shorted with a screw driver to dissipate the charge on the condenser before working on the interior.

### *Practical Applications*

Making practical use of the oscillograph cannot, of course, be covered in a short article. The subject is an extensive one, and requires a book of several hundred pages to cover. We recommend that the reader refer to "The Cathode-Ray Tube At Work," by John F. Rider, to whom we are indebted for the excellent oscillograms contained in the latter part of this article. With the aid of these oscillograms we hope to make clear some of the more common uses of the oscillograph in testing an amateur transmitter. These unretouched oscillograms were taken on a larger screen, but since the functioning of the 913 is identical with that of the larger tubes, except for screen size, they are representative of the oscillograms that will be obtained for the various transmitter ills they illustrate.

The oscillograms at the heading of this article are typical of those obtained when the oscillograph is connected to the output of either a receiver or an audio amplifier. Fig. 3 shows the proper connections to either. The wire connected through condenser C goes to the point in the receiver or amplifier which is being checked. This may be the plate of the output amplifier tube. It may also be the plate of one of the tubes in an amplifier ahead of the output stage. Connection to the various plates will tell which stage in the amplifier is causing distortion.

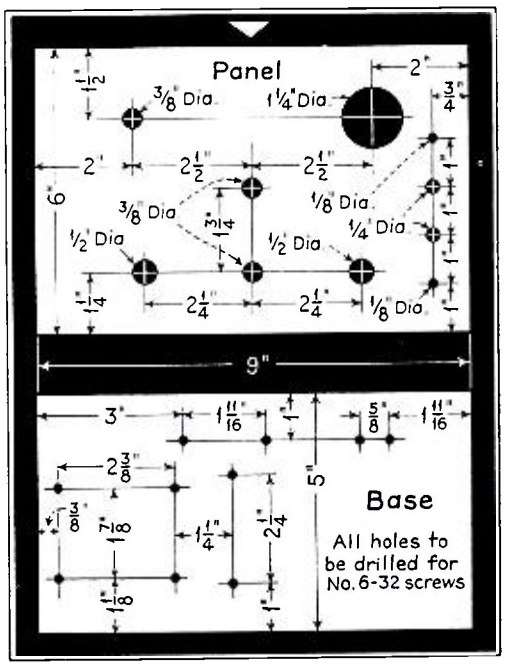
When using this connection the "sweep" switch must be thrown to the 60-cycle internal sweep position. The shape of the pattern obtained on the screen will depend on how may different audio frequencies are coming through. The pattern will only be made to stand still on the screen when the audio frequency being tested is synchronized with the sweep-circuit frequency. This would necessitate the use of an external sweep circuit of variable frequency. It is not necessary, however, that stationary patterns be produced in order to study the waveform of a receiver amplifier. The moving patterns obtained when the internal 60-cycle sweep circuit is used may be easily examined.

Not much will be said about this phase of testing at this time, except that a smoothly curved, evenly illuminated pattern indicates good waveform and therefore low distortion. This is illustrated in a simple pattern by the photo at the left of the heading of the article. Poor waveform, and consequent distortion, is indicated by an irregular, unevenly lit pattern as illustrated in the photo at the right of the article heading. The flat tops of the trace in this photo indicate overloading of some portion of the amplifier. Experiment with the oscillagraph on an amplifier or receiver will teach the user the correct interpretation more quickly than by the printed word.

### *Checking Phone Rigs*

The real utility and value of this oscillograph to the amateur is in checking a complete phone transmitter, so that more space will be devoted to this phase of the subject: Fig. 4 illustrates the proper connections to a phone transmitter. The upper pair of connection posts—those connected to the vertical deflection plates—connect through a twisted pair to a loop of one or two turns. This loop should be placed near either the final tank coil or the antenna coil. The degree of coupling regulates the height of the pattern on the screen.

The lower pair of binding posts for the sweep circuit require a bit more apparatus than the simple link coil used for the vertical plates. The audio output of the transmitter must be used to provide the sweep voltage (sweep switch

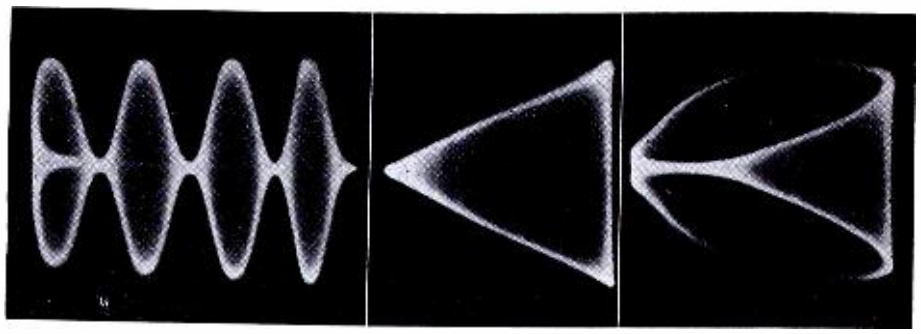



**Detail drawings of panel and chassis for the oscillograph.**

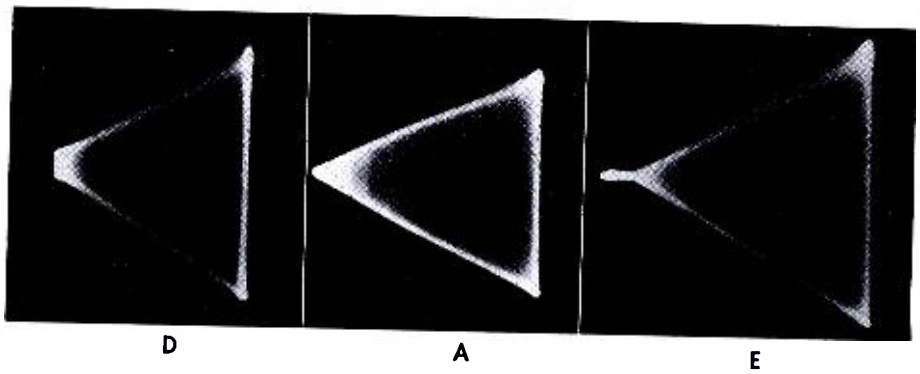
thrown to "external sweep" position.) The grounded post of this pair should go to ground on the transmitter. The other post of this pair must go to the "hot" audio output. The output power of the modulator will dictate the proper connection for this lead.

One form of suitable connection is shown in Fig. 4. The isolating condenser C should be 1/10 mfd. and of a high voltage rating to avoid breakdown. The size of resistors Ra and Rb depends on the output power of the modulator. These two resistors act as a bleeder to feed only a portion of the audio voltage of a high-power modulator to the sweep circuit. Suitable values would be 1 megohm for Ra and 10 megohms for Rb. On a low-power modulator it is possible to leave these resistors out entirely. Experiment will be necessary to pick the right amount of audio voltage for the sweep circuit. Several resistors having values in the megohms would be useful.

With these connections made the oscillograph is ready for checking the phone transmitter. It is very important that the connections to the vertical plates be made to the final r.f. output of the transmitter, while the connections to the sweep circuit be made only to the output of the modulator. If the audio voltage for the sweep circuit is taken from one of the speech amplifier stages an out-of-phase pattern will be obtained on the screen, which is useful for checking. This will be illustrated later with a photo.



B A C



D A E

### *Trapezoidal Patterns*

With connections made as in Fig. 4 a trapezoidal type of pattern will appear on the screen, as shown in the photos of the oscillograms. Photo A should be studied first. This represents a perfect phone signal which is 100% modulated. Under conditions of 100% modulation the trapezoid forms a perfect triangle.

Fig. 5 illustrates how this triangular pattern is formed. The dotted line in the middle of the figure represents the unmodulated carrier of the transmitter—in other words, the r.f. output alone. As this is modulated the positive peaks of the signal will extend the pattern to the right of the figure, while the negative peaks will extend it to the left. The positive peaks are produced when the r.f. output of the transmitter is increased on one side of the audio cycle, while the negative peaks are produced by the reduction on the transmitter r.f. output on the opposite side of the audio cycle.

As the signal is modulated more heavily the pattern will extend further to the right and left of the center line. When the pattern is extended as far as the two outside dotted lines a pattern is produced as illustrated in photo N. With 100% modulation the full triangular pattern will be produced, as illustrated by photo A. With overmodulation the points of the triangle become extended as in photos H, I, and J.

The upper and lower lines of the pattern show the linearity, or lack of linearity, of the transmitter output. In a perfectly adjusted transmitter the r.f. output of the final amplifier stage is proportional to the d.c. and audio input. If the input is doubled the r.f. output should double, and vice-versa. This condition is shown when upper and lower lines of the trapezoid are perfectly straight. A curving of the lines one way or the other shows that the final stage is not linear.

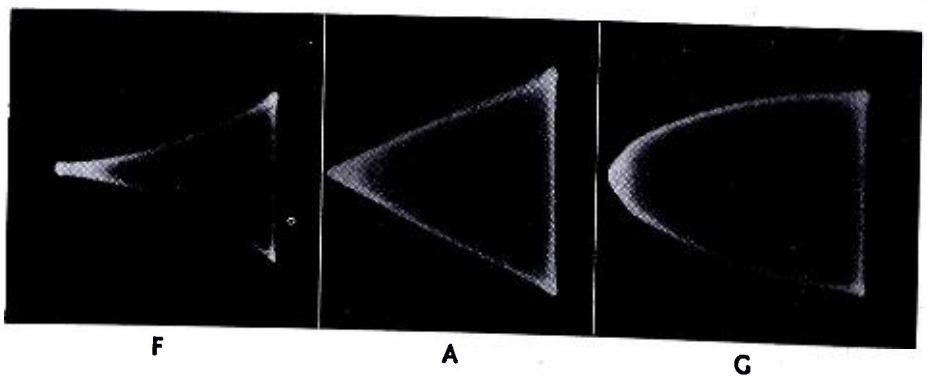
As a final study we will go right through the group of oscillographic photos, A to Q, in order. A, B and C each represent a perfect signal 100% modulated. B represents a modulated-envelope type of pattern. This is developed when an external sweep circuit of variable frequency is used instead of the audio output of the modulator for the sweep voltage. The trapezoid type of pattern is to be preferred as it is easier to interpret. Photo B is given only as an example and does not enter our study of the transmitter output.

Photo A is, of course, the perfect trapezoidal pattern we are endeavoring to produce by proper adjustment of the transmitter. The pattern C is obtained when the audio sweep voltage is taken from the speech amplifier instead of the modulator output, as mentioned before.

The group of photos D, A and E represents the patterns with different r.f. impedence loads on the modulator. In each case the r.f. end of the transmitter is correctly adjusted, the audio output distortionless, and the signal 100% modulated. Photo A is again the perfect signal with correct impedence matching between the modulator and class C r.f. stage. Photo D shows what happens when the load from the r.f. stage across the modulator is too low. In photo E the load impedence across the modulator is too high.

Photos F, A and G represent various conditions of linearity. Photo A is again the perfectly linear signal. F illustrates a condition of non-linearity caused by excessive bias on the class C modulated stage. Photo G was caused by insufficient excitation of the class C stage.

Photos H, I and J: Photo I, in the center, represents an otherwise perfect signal which is overmodulated. The extended points of the triangle indicate this condition. Photo H indicates three wrong conditions in the transmitter, these



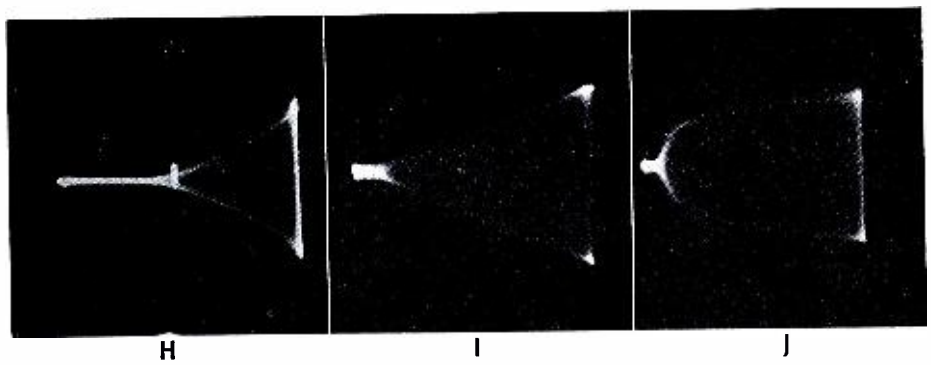
F A G

being insufficient excitation, overmodulation and excessive bias. The pattern in photo J was caused by insufficient excitation and overmodulation.

### *Regeneration and Oscillation*

The previous photos were all taken with the tank condenser of the class C stage tuned to resonance and with perfect neutralization of this stage. Photos K, L, and M show what happens when this stage is incorrectly neutralized. The weird type of patterns shown for this condition always indicate that the stage is not properly neutralized. Photo K shows excessive regeneration, while L and M actually show an uncontrolled oscillation of the class C stage itself.

N and O illustrate the effect on the screen of incorrect plate tank tuning of the class C stage. Photo N represents the tank condenser as being tuned to exact resonance, while O was caused by this condenser being tuned off resonance. Note the difference in linearity indicated by the upper and lower lines



H I J

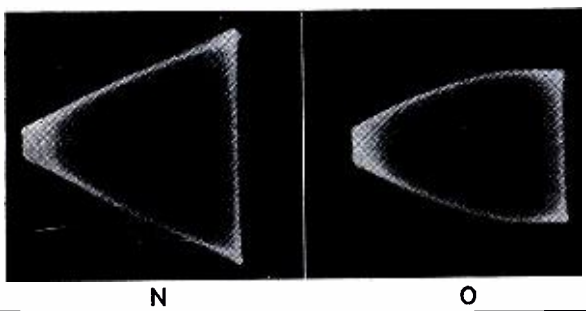
by reducing the r.f. carrier so that it may be 100% modulated with whatever measure of distortionless audio output is available from the modulator. Reduction of the excitation to the class C stage to reduce the r.f. carrier might be helpful in this case.

It is not necessary to fully understand the complexities of oscillograph operation in order to get a near perfect signal from the phone transmitter if the trapezoid type of patterns shown in the photos are used for checking the transmitter. The main points to remember

the manner in which it is obtained.

One great advantage of using the trapezoid type of pattern is that overmodulation may be noticed more easily than with the envelope type of pattern given in photo B. Once the transmitter is adjusted properly and is on the air, just watch those negative peaks on the pattern. They will shoot out in a long "tail" with the least bit of overmodulation. Merely talk less loudly into the microphone when these "tails" are seen, or else turn down the gain control.

And remember that when the trans-



N O

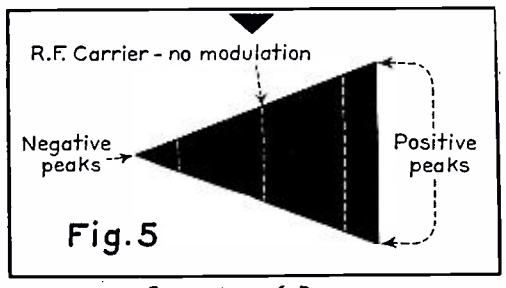
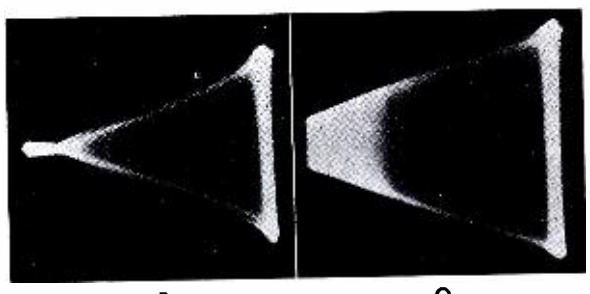



Fig. 5 Formation of Pattern



P Q

of the pattern. These two photos were taken with less than 100% modulation.

These previous photos were taken with an undistorted audio output from the modulator. The last pair of photos, P and Q, show the effect of distortion or other wrong conditions in the audio section of the transmitter. Photo P illustrates both overmodulation and audio distortion. The existence of audio distortion is always indicated by light and dark portions in the pattern. The moving spot on the screen is slowed down at each end of the pattern by the distortion, causing the positive and negative peak positions to be brighter than the center portion of the pattern.

### *Overloading*

When a figure such as that shown in photo Q is obtained, indications are that there is both distortion present and that the modulator is incapable of modulating the r.f. carrier a full 100%. The speech amplifier and modulator stages were overloaded in an effort to fully modulate the r.f. carrier in the test transmitter used to obtain these photos. The lack of sufficient audio made it impossible to produce the triangle indicative of 100% modulation. This condition can be corrected either by increasing the audio output capabilities of the entire audio system, or else

are that a perfect triangle with straight sides and even brilliancy indicate 100% modulation of the proper r.f. carrier with low audio distortion. It is best to check the audio amplifier separately for distortion by the first method given. An audio oscillator of steady note and output should be used for all checking so that fixed patterns may be obtained on the screen. Mere whistling into the microphone will not do at all.

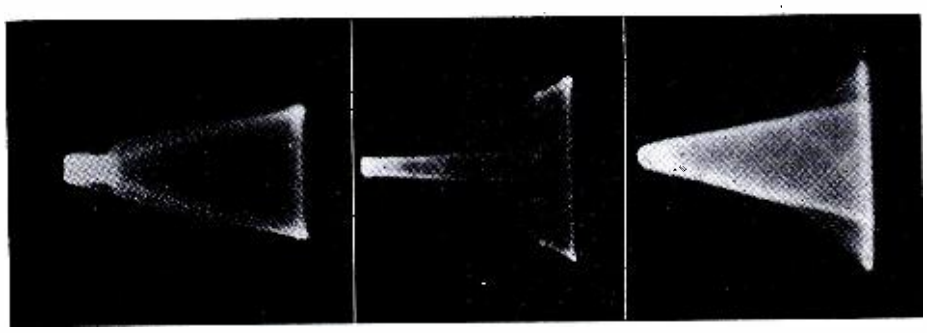
### *The "Perfect Triangle"*

If some of the interpretations given are forgotten, "fiddling" with the transmitter controls to produce the "perfect triangle" will sometimes bring the proper set of adjustments as quickly as a scientific analysis of the transmitter would do. As long as the "perfect triangle" is obtained don't worry too much as to

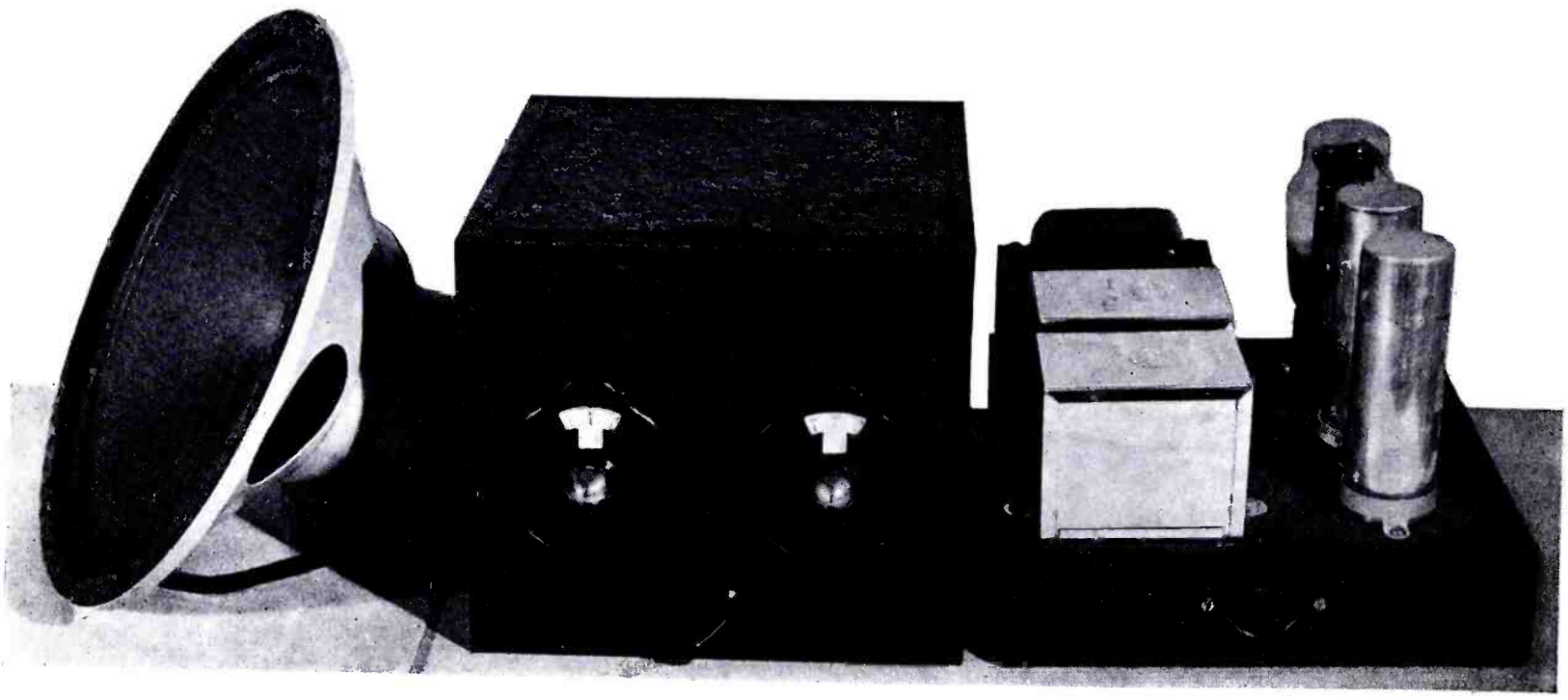
mitter is turned off during listening periods the pattern will resolve itself into a single dot, which will harm the screen if left on. It will be necessary to throw over to the 60-cycle sweep position during receiving periods unless other arrangements are made to break some circuit in the oscillograph automatically when the transmitter is turned off. This may be easily done.

We wish to acknowledge our indebtedness to James Millen and his excellent National oscillograph. One of these units was used by us in production-line testing of transmitters and found to be invaluable. The basic design of the National oscillograph was used as a basis for the design of this particular midget job.

[*Continued on page 52*]



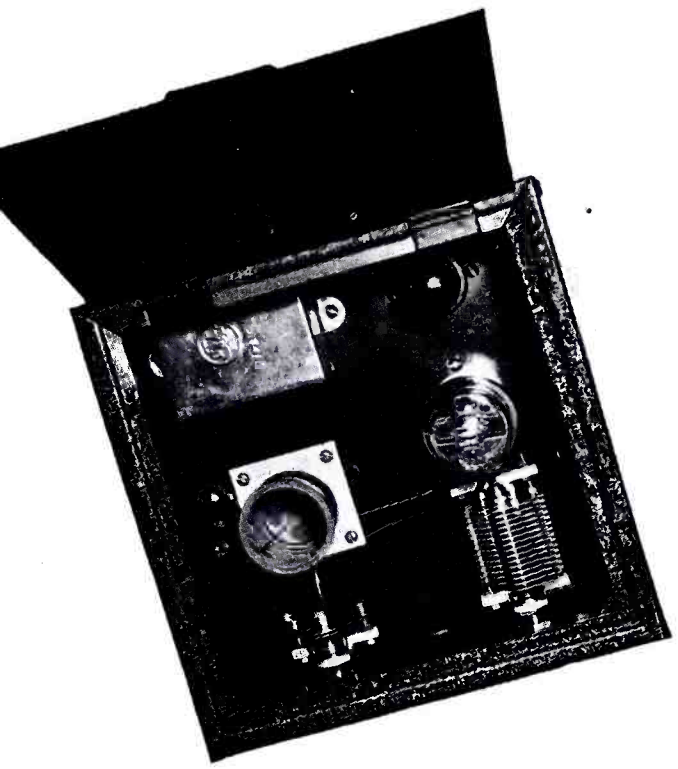
K L M



# Low-Cost Two-Tube Receiver

**By Willard Bohlen, W2CPA**

THIS little receiver is the result of experimentation with several different layouts in order to get the most output from two tubes. Although there are only two tubes in this receiver, there are actually three separate stages. The type 6A6 glass tube comprises two separate triode-type tubes in one enve-



lope. The grid and plate of each tube section are isolated from the grid and plate of the corresponding tube section, but the cathodes are connected together and brought out to a common cathode pin.

### *Tube Functions*

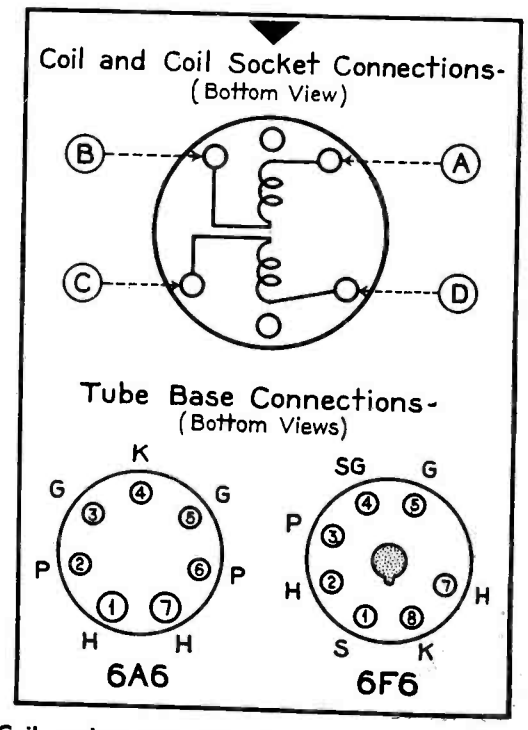
One section of the 6A6, that shown on the left in the circuit diagram, is used as a regenerative detector. The plate of this section is coupled through condenser C-5 to the grid of the second section, which is used as the first audio stage. The plate of this audio section is again coupled through condenser C-8 to the grid of the 6F6. The 6F6 is the metal tube shown in the right rear corner of the top-view photo. This tube is a high-gain pentode and is used as the second audio and power output stage. The power output of the 6F6 is three watts, which is sufficient to give good quality at room volume from the speaker.

The universal output coupling transformer, T, is located at the left rear corner of the receiver, and will match the 6F6 power tube to the voice coil of any dynamic speaker having an output impedance of 2, 4, 8 or 15 ohms. The 2-ohm connection from the output transformer is used to match to the speaker shown.

It is just as important to use a good speaker with a small receiver as with a large one if good quality is to be expected, so a permanent-magnet dynamic speaker is used, this being a ten-inch Cinaudagraph Type CZ 10-10. An eight-inch speaker (model AZ 8-7) will do as well and be less expensive, but the ten-inch speaker was on hand and so was used for testing this receiver. The speaker is shown as minus a baffle in the large photo, but one should be used, as no dynamic speaker will give good quality without one. A piece of Celotex two feet square or larger, with the speaker mounted at the center, will be satisfactory. If an enclosed box is preferred instead of an open baffle, one may be easily constructed by following the instructions on the data sheet enclosed with the speaker.

### *The Plug-In Coils*

Only one coil at a time need be used in the detector circuit, thus simplifying the




**Coil socket and tube base connections. Instructions for winding the coils are given in text.**

tuning section of the receiver. Three plug-in coils cover the complete range from 19 meters up to 150 meters. Each coil has only two windings, with *no taps necessary*. Winding A-B is used for the tuned grid circuit, while winding C-D is used as a combination antenna and tickler circuit.

It is important to get these coils wound as shown in the coil-connection sketch. A is located at the top of the coil form, B and C are adjacent, while D is located at the bottom. Changing this order will prevent the detector from regenerating properly.

Band spread is obtained by the simplest possible scheme—that of using two separate tuning condensers, one of small capacity and the other of large capacity. The large capacity condenser, or "band setter," which is operated by the right hand dial, will give complete band coverage as shown in the coil table. When any desired band, such as the 19 meter, 20 meter, 25 meter band, etc., is tuned in with this right hand dial it should be set at the center of the desired band and tuning done with the small condenser, or "band spreader," operated by the left hand dial. This will give very good separation between stations.

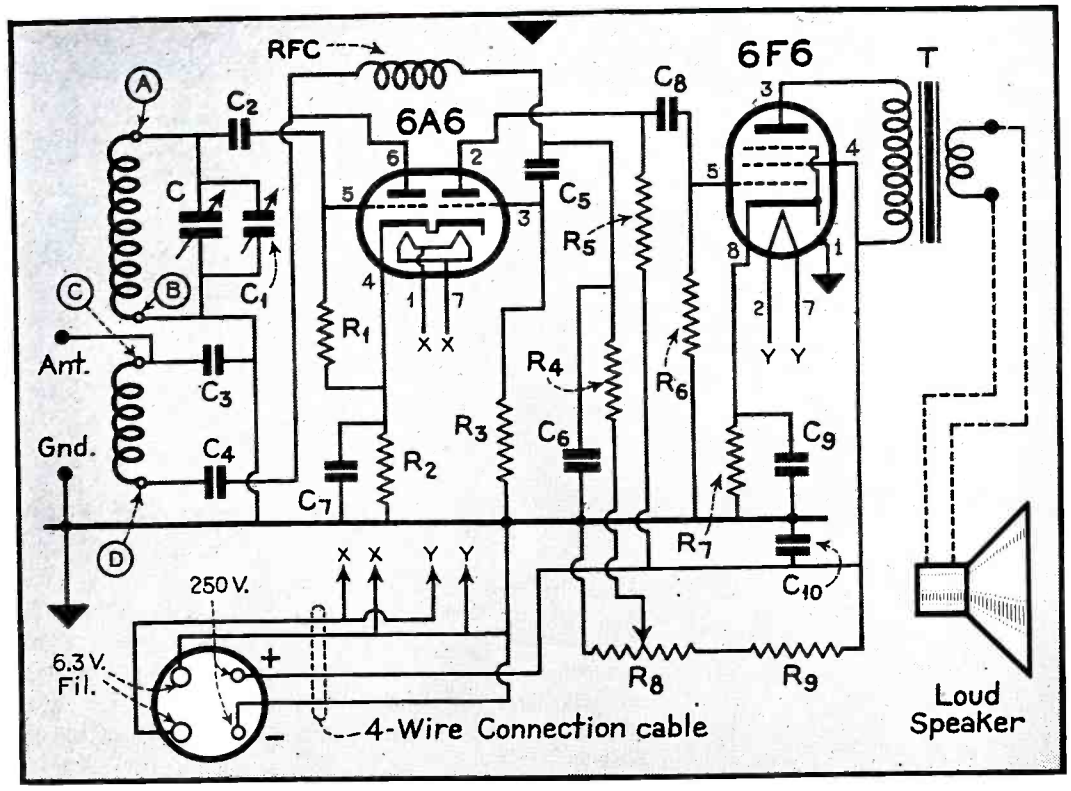



Diagram of the two-tube receiver. Note that the antenna coil also functions as the tickler.

The two binding posts mounted on a small bakelite strip at the left of the coil are for antenna and ground, the rear post being for antenna.

## Coil Winding Data

| Range in Meters | 19 to 40 | 40 to 85 | 85 to 150 |
|---|---|---|---|
| Grid Winding Number of Turns | 6¾ T. | 15¾ T. | 39¾ T. |
| Length of Winding | ½" | Close wound | Close wound |
| Wire Size | No. 24 DSC | No. 24 DSC | No. 24 DSC |
| Tickler Winding | 5½ T. | 8½ T. | 20½ T. |
| Length of Winding | Close wound | Close wound | Close wound |
| Wire Size | No. 24 DSC | No. 24 DSC | No. 30 DSC |
| Note: - All grid and plate windings spaced ⅛" | | | |

The regeneration control, operated by the knob at the bottom of the panel, serves as a volume control.

### Construction

The construction and wiring of this receiver is simple and should present no difficulty to the constructor. After drilling is completed according to the layouts, the parts should be mounted on the base and as much wiring completed as possible before the base is bolted into the cabinet. The location of small parts beneath the base, and their interwiring, should be done according to the bottom view photo.

Four binding posts are provided for connection to the antenna, ground and speaker. The two binding posts shown alongside the 6F6 power tube are for connection to the speaker. They should be insulated from the base with washers and connected directly to the 2-ohm output connection of the output transformer.

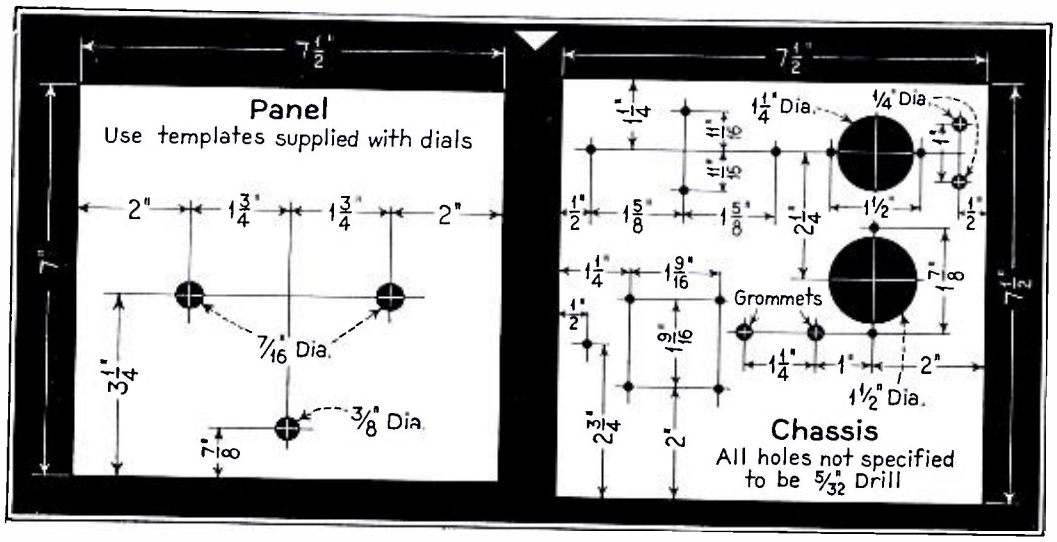
It will be found that the dials will not fit flush on the panel because of the nuts used to fasten the tuning condensers. This can be taken care of by placing a small washer of appropriate thickness on each mounting bolt of the dials, between dial and panel.

A four-wire cable is used for connection to the power supply unit. The two filament wires of this cable should be heavy enough so that full voltage is had on the heaters of the tubes. A four-prong connection plug, connected as shown in the diagram, is used to plug into the power supply. The power supply is the same as described in the article on the AWR-6 Receiver in the July 1936 issue of ALL-WAVE RADIO. This power supply, when used with the regenerative receiver, causes no tunable hum or other trouble. Most any power supply of sufficient voltage and current can be used satisfactorily on a superheterodyne type of receiver, but only a properly designed and well filtered supply can be used on a regenerative receiver if smooth operation on all frequencies is to be had.

### Regeneration Control

If the receiver is built according to specifications and used with a good power supply it should work "right off the bat" with no trouble of any kind. As the size of the antenna has an effect on the regeneration control setting, it may be necessary to adjust the antenna load in order to get smooth regeneration. If the antenna is too small the receiver will oscillate too easily, with the

regeneration control set near the minimum position. As this control varies the plate voltage of the detector there will then be too little detector plate voltage for good signal strength. On the other hand, too large an antenna might




**Detail drawings of panel and chassis for the two-tube receiver.**

prevent the detector from even reaching the oscillation point. For best operation the oscillation point on the regeneration control should be reached with the control set at from half to three-quarters of full voltage.

With the type of circuit used the antenna size is not as critical as with many other regenerative receiver circuits. A variable condenser of any size at all can be placed in series with the antenna lead to adjust coupling for proper setting of the regeneration control. Another way of adjusting for smoothest regeneration is to change the number of turns on the antenna-tickler winding of each of the three coils for best operation with the antenna being used. If the two holes through which this winding goes on each coil form are drilled a little wider apart than necessary to accommodate this winding, it may then be slid up and down on the form for finest adjustment of regeneration.

### *Results*

The results obtained with this receiver are surprising in view of the small number of tubes used. But as was mentioned previously, three separate and distinct stages are had with only the two tubes, and the receiver is actually a detector and two stage audio layout.

On test many foreign stations, both amateur and broadcast, were heard. European amateurs on 20-meter fone came through on the speaker nicely while many of the foreign broadcasters were loud enough for enjoyable reception of their programs.

The actual results obtained by the constructor will of course depend on how good his location and antenna are, but satisfactory reception should be had if the location is reasonably good.

If earfone reception is desired the fones may be connected to the speaker binding posts in place of the speaker. This will not hurt the fones as there is no d.c. flowing in the output winding. The impedance mismatch when the fones are connected will give a desirable reduction in volume to earfone level without affecting the quality of the signals.

[*Continued on page 56*]

## SUPPLEMENTARY WX BROADCAST LIST

*THE following auxiliary list of corrections and additions relate to the Department of Commerce Airway Radio Weather Broadcast schedules appearing on pages 434 and 345 of the October 1936 issue of* ALL-WAVE RADIO. *The names of cities and states in italics indicate new stations at these locations not included in the previous list. The following list is correct as of September 22, 1936. It is suggested that the changes and additions here noted be transferred to the original list.*

| | |
|---|---|
| Atlanta, Ga. | Code Signal now 'AG'.<br>:50 broadcasts adds -to Charleston. |
| *Billings, Mont.*<br>KCDK 242 kc. 'BI' | :5 Miles City to Helena.<br>:15 Billings to Cheyenne.<br>:30 local. |
| *Bismark, N. D.*<br>KCDV 230 kc. 'RK' | :5 Fargo to Miles City.<br>:30 local. |
| Bellefonte, Pa. | :5 broadcast adds -Columbus to Camden. |
| Boise, Ida. | :55 broadcast Pendleton to Salt Lake. |
| Buffalo, N. Y. | :10 bc. changed to :15, :30 changed to :33. |
| Butte, Mont. | :0 bc. omitted. (see new stations added). |
| Charleston, S. C. | Frequency is 329 kc. Code Signal now 'CS'. :55 broadcast adds -to Atlanta. |
| Chattanooga, Tenn. | Frequency is 341 kc. |
| Chicago, Ill. | Lafayette, Indianapolis, Milroy and Cincinnati reports now at :50 instead of :10. |
| Cincinnati, Ohio. | Frequency 236 kc. :0 broadcast now made at :5 and made St. Louis to Pittsburg. :10 bc. changed to :15. :15 bc. to 55. :30 to :33. |
| Cleveland, Ohio. | Frequency 236 kc. :5 broadcast moved up to :0. :15 bc. omitted. :50 now includes old :55 bc. |
| Davenport, Iowa. | Signal now 'MO'. |
| Detroit, Mich. | Signal now 'DT'. :5 broadcast omitted. |
| Elizabeth, N. J. | Frequency now 236 kc. :0 bc. now at :5.<br>:10 bc. included in :15 bc.<br>:50 bc. sequence now included in :55. |
| Elmira, N. Y. | Frequency 381 kc. |
| El Paso, Tex. | :10 bc. sequence now made at :15. |
| Fargo, N. D. | :0 bc. now Bismark to Twin Cities. Add :50 Fargo to Winnipeg. |
| Fresno, Calif.<br>KCU 344 kc. 'FT' | :30 local.<br>:55 Los Angeles to Oakland. |
| Greensboro, N. C. | Signal now 'GW'. |
| Harrisburg, Penna. | :50 Newark to Richmond broadcast added. |
| *Helena, Mont.*<br>KCDH 371 kc. 'HL' | :0 Billings to Missoula.<br>:30 local. |
| Houston, Texas. | San Antonio to New Orleans-Shreveport broadcast now at :10. |
| Jacksonville, Fla. | Call letters WWAB. Signal now 'JX'. |
| La Crosse, Wis. | Signal now 'LE'. |
| Los Angeles, Calif. | :0 Winslow report omitted.<br>:10 Salt Lake report omitted.<br>:50 oakland report omitted. |
| Medford, Ore. | Frequency 263 kc. |
| Memphis, Tenn. | :15 bc. sequence omits -to St. Louis. |
| *Miles City, Mont.*<br>KCAZ 320 kc. 'MY' | :0 Bismark to Billings.<br>:30 local. |
| *Missoula, Mont.*<br>KCAY 308 kc. 'MX' | :5 Helena-Butte to Spokane.<br>:30 local. |
| Mobile, Ala. | Signal now 'MS'. |
| New Orleans, La. | Signal now 'NO'. |
| Portland, Ore. | :50 Spokane report omitted. |
| Raleigh, N. C. | Signal now 'RA'. |
| Roanoke, Va.<br>WWIJ 206 kc. 'RO' | :15 Nashville to Washington<br>:30 local. |
| Seattle, Wash. | add :5 to Spokane instead of at :0. |
| Spartanburg, S. C. | Signal now 'SU'. |
| Spokane, Wash. | :0 now Seattle to Missoula.<br>:50 Portland report omitted. |
| St. Louis, Mo. | add to :5 broadcast - to Richmond. |
| Titusville, Fla. | add to :50 broadcast St. Petersburg report. |
| Tulsa, Okla. | add to :5 broadcast Muskogee report. |
| Washington, D. C. | Frequency now 236 kc.<br>:5 schedule now broadcast at :0.<br>:15 schedule now broadcast at :10. |

# Channel Echoes

## By Zeh Bouck

***contests . . . televisionary . . . fraudcasting . . . wanted—a.a.c. . . . constructive logging***

THE Musterole's "Voice of Experience" program announces a contest to determine who can write the best opus on "Why I Am Glad That I Live in the United States of America." A tip to anyone who'd like to win: Dash off about five hundred words on how good Musterole is—just as if you believed every word of their advertising. Conclude your comments with the line—"It's so easy to buy Musterole in the United States of America." Just to be on the safe side, send in a half dozen box tops, labels, cartons and facsimiles.

✦

SPEAKING OF contests, a free subscription goes to Robert Hertzberg, 2512 84th Street, Jackson Heights, New York City, who correctly identified the photograph in our November column as the control room of old WJZ and WJY in Aeolian Hall—long since demolished. The time was in 1925 or thereabouts—just after WJZ moved from Newark, N. J. The curtain covers a window looking into the WJZ studio. The idea behind the two stations was fundamentally sound, and we wish some broadcasting company had the guts to adopt it today. WJZ was to broadcast a consistently high grade of fare—from the semi-classics up, while WJY was to confine its radiations pretty much to jazz. With the advent of sponsored programs, this ideal went into discard—and WJY was dropped altogether when WJZ moved to 711 Fifth Avenue (and ultimately to Radio City).

There are people who like popular music—and there are folks who don't. Probably most of us go in for both types of music at one time or another. We feel that there is merit in an arrangement whereby the listener is practically certain of the type program he will receive when he tunes in a given station—just as one chooses his restaurant for a steak or shore dinner. Probably W2XR most closely approaches this ideal and one can dial 1550 kilocycles almost any time in the afternoon or evening with the probability of hearing classical music exquisitely rendered.

✦

THERE IS NO contest this month. However, we publish a photograph that will be of interest to both old and new timers, principally to prove to the euthusiastic latter that 1936 isn't the first time television has been just around the corner. The photo is of one of the many previous corners—better than a handful of years back—when television was taken so seriously that actor Lionel Atwell (in the high hat) was persuaded by Mortimer Stewart of W2XCR and WGBS (Director of Television, no less!!) to enact a scene from "The Silent Witness" as a television drama!

✦

After a few rounds, television never even came out of the corner.

As in several past occasions, it is quite possible that for some years to come television's most important corner will be on the stock market.

✦

DOC BRINKLEY, mentioned last month, has a serious rival in the person of one Mr. Norman Baker who advises that one's appendix should never be removed, that most doctors can't tell hemorrhoids from cancer, that piles should never be operated upon, that he will cure 'em at a flat rate, that neither x-ray nor radium ever helped cancer, but that he can cure the disease in his hospital in Muscatine, Iowa. Needless to say, Mr. Baker also does his stuff on the air from the other side of the Rio Grande—from XENT (910 kc), starting at around four o'clock in the morning Eastern Standard Time. The FCC does not permit fraudcasting.

✦

DEFINITELY, it would seem that this is a matter seriously to be considered by the Cairo Conference. At least to some reasonable extent, a nation should have control over etheric contraband, just as it may exclude undesirable aliens or opium. Of course it makes no difference to Mexico. As a matter of

[*Continued on page 55*]

**A handful of years ago, when television was "just around the corner" . . . the stage star, Lionel Atwill greeting Mortimer Stewart, director of television, prior to former's enactment of a scene from "The Silent Witness," on television from W2XCR and WGBS.**

# Globe Girdling

## By J. B. L. Hinds

***experimental stations . . . madrid frequencies . . . "log of the month" . . . argentine program . . . nippon overseas programs***

THERE is no cause for complaint on reception conditions in general and the signals are coming in strong and clearly from all parts of the world. With the added high-powered transmitters of Japan and Norway, and the improvement in transmitting plants in many countries the DXer may look forward to an enjoyable period in the weeks to come.

Great care is being taken to see that the station lists, address and identification sections, prepared by this department, are kept up to date. All information possible that will enable the listener to be in possession of the facts and conditions of reception are presented in "Globe Girdling."

It is a source of much gratification to know by your letters and comments that we are moving forward in the right direction, but we are particularly pleased in knowing that we have your interest and support, which is so essential to gain the goal we have set. Your criticisms, as well as your comments, will therefore be most welcome.

### Station Changes

Many changes again appear this month as will be noted from the accompanying tables:

### NEW STATIONS

| *KC* | *Meters* | *Call* | *Location* |
|---|---|---|---|
| 21520 | 13.94 | JZM | Nazaki, Japan |
| 17785 | 16.87 | JZL | Nazaki, Japan |
| 15785 | 19.01 | XOJ | Shanghai, China |
| 15320 | 19.58 | OLR | Prague, Czechoslovakia |
| 15160 | 19.79 | JZK | Nazaki, Japan |
| 15150 | 19.80 | YDC | Bandoeng, Java |
| 11870 | 25.26 | OLR | Prague, Czechoslovakia |
| 11800 | 25.42 | JZJ | Nazaki, Japan |
| 11710 | 25.62 | VK9MI | Sydney, Australia |
| 10960 | 27.37 | JZB | Nazaki, Japan |
| 9560 | 31.38 | HJ1ABB | Barranquilla, Colombia |
| 9535 | 31.46 | JZI | Nazaki, Japan |
| 9525 | 31.49 | ZBW | Hong Kong, China |
| 9520 | 31.51 | HJ4ABH | Armenia, Colombia |
| 8960 | 33.48 | "Radio Algiers" | Alger, Algeria, Africa |
| 7100 | 42.25 | FO8AA | Papeete, Tahiti |
| 6767 | 44.33 | PMH | Bandoeng, Java |
| 6350 | 47.24 | YV1RV | Valera, Venezuela |
| 6095 | 49.22 | JZH | Nazaki, Japan |
| 6050 | 49.59 | VPB | Colombo, Ceylon |
| 6010 | 49.92 | VK9MI | Sydney, Australia |
| 6000 | 50.00 | FIQA | Tananarive, Madagascar |

### STATION CHANGES

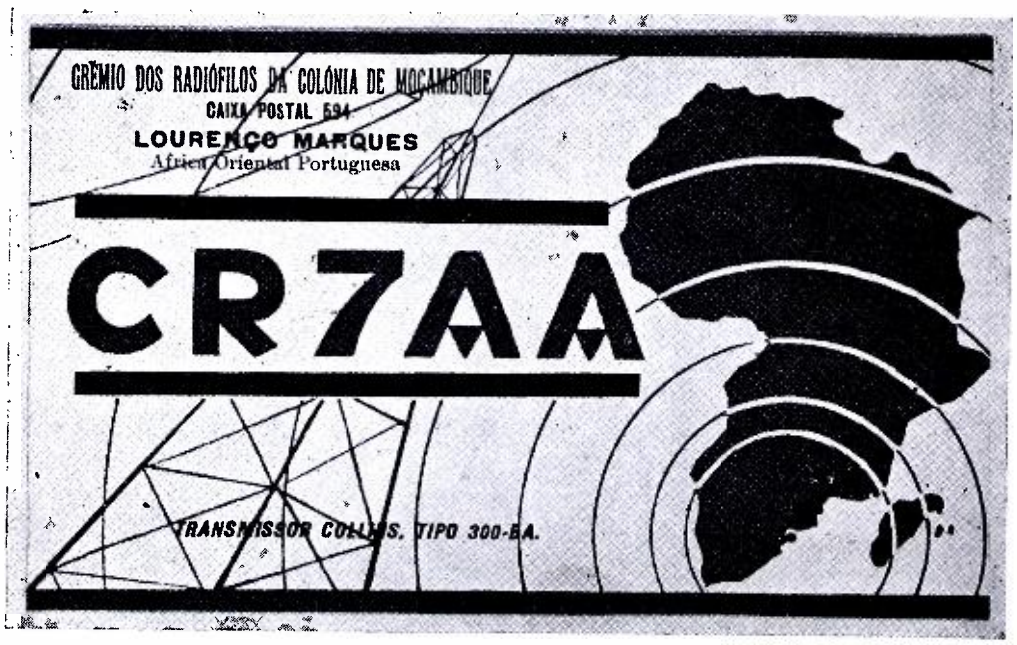
| *New Frequeny* | *Call* | *Old Frequency* |
|---|---|---|
| 11875 | YDB | 11860 |
| 11435 | COCX | 11450 |
| 9930 | CSW | 9870 |
| 9665 | CT1AA | 9650 |
| 9650 | YDB | 9610 |
| 9600 | CQN | 9553 |
| 6820 | XGOX | 6850 |
| 6360 | YV1RH | 6350 |
| 6200 | COKG | 6150 |
| 6156 | YV3RC | 6150 |
| 6080 | VE9CS | 6070 |
| 5710 | YV1ORSC | 5720 |

### STATIONS DELETED

| *KC* | *Meters* | *Call* | *Reason* |
|---|---|---|---|
| 14236 | 21.07 | HB9B | Not reported |
| 9870 | 30.40 | JYS | Not broadcasting |
| 7118 | 42.13 | HB9B | Not reported |
| 6150 | 48.78 | HJ5ABC | On long wave only |
| 6130 | 48.94 | TGX | Not in service |
| 6130 | 48.94 | LKC1 | Not in service |
| 5400 | 55.56 | HJA7 | Not in service |
| 3770 | 79.60 | HB9B | Not reported |

### NON-AUTHENTICATED STATIONS

| *Frequency* | *Call* | *Location* |
|---|---|---|
| 15740 | TFM | Reykjavik, Iceland (Dec.) |
| 15000 | SV1KS | Athens, Greece (Nov.) |
| 14000 | PZ1AA | Paramaribo, Dutch Guiana (Dec.) |
| 11895 | HP5I | Aguadulce, Panama (Dec.) |
| 11740 | HP5L | David, Panama (Nov.) |
| 10520 | GOA | Shanghai, China (Jan.) |
| 9590 | VK6ME | Perth, West Australia (Dec.) |
| 9540 | CB954 | Santiago, Chile (Dec.) |
| 8820 | COCE | Havana, Cuba (Jan.) |
| 7580 | HI9J | Ciudad Trujillo, R. D. (Dec.) |
| 6580 | YN1GG | Managua, Nicaragua (Dec.) |
| 6330 | YV13RV | Valencia, Venezuela (Mar.) |
| 6270 | YV14RC | Caracas, Venezuela (Aug.) |
| 6132 | VP3BG | Georgetown, B. G. (Nov.) |
| 6120 | XEOK | Tia Juana, Mexico (Dec.) |
| 6120 | HP5Z | Panama City, Panama (July) |
| 6075 | HI3E | Puerto Plata, R. D. (Nov.) |
| 6005 | XEW | Mexico City, Mexico (Jan.) |
| 5910 | YV15RV | Valencia, Venezuela (Aug.) |
| 5750 | YNOP | Managua, Nicaragua (Jan.) |
| 5700 | RV15 | Khabarovsk, U.S.S.R. (Jan.) |
| 5000 | ZUD | Roberts Heights, So. Africa (Dec.) |
| Various | 6 stations | Peru, So. America (Dec.) |
| Various | ..... | 8 Costa Rica Stations (July) |
| Various | ..... | 5 Czechoslovakia Stations (Jan.) |
| Various | ..... | 13 Norway Stations (Jan.) |




**Red on white background with black bars above and below . . . a new one from Portugal.**

### Experimental Stations

VOWN, (near 8675 kc) at Northwest River, Labrador; new station of the Northwestern Skyways, Ltd. Station heard by Thomas J. Taaffe, Elmsford, N. Y., on November 2, 1936. It seems there are three men setting up a weather station at the location mentioned. They landed there September 13th and started the construction of a house, which was complete except for doors and windows. They use a gasoline-powered generator to run the station which is very powerful and a fine signal transmitted. Needless to say Mr. Taaffe received quite a thrill from the contact.

GOA, China, 10520 kc, 28.79 meters; test station heard by Ed Hughes, Long Branch, N. J., who has received card veri from Mr. Woo, Director, showing the antenna towers thereon.

JVD, Nazaki, Japan, 15860 kc; reported by Lyle Nelson, Yamhill, Oregon, as phoning KWU, Bolinas, Calif., 4 P.M. daily.

JVA, Nazaki, Japan, 18910 kc; reported by Howard Wilson, Jr., Ithaca, N. Y., phoning as late as 8:30 P.M.

OPM, Belgian Congo, 10140 kc; reported by J. Wendell Partner, Tacoma, Wash., as phoning Belgium 7 to 11 A.M. with good signal.

IUC, Addis Ababa, Ethiopia, also heard by Mr. Partner, 12 to 1 A.M. several times, good signal music occasionally.

HBO, Geneva, 11402 kc; Lyle Nelson says station tests with VK3LR, 1:40 to 2:00 A.M. E. S. TIME, every Sunday night.

Leo Herz, S. W. Editor of Globe Circlers DX Club, advises that TI4NRH, 9670 kc, Heredia, Costa Rica, will broadcast a special for that club every second Saturday of each month from 11:30 P.M. to 12 A.M., E. S. TIME.

### *Station Data*

ZBW, Hong Kong, China, is listed in this issue at 9525 kc in addition to the frequencies already listed—8750 and 5410 kc—although their announcements would indicate they are not now transmitting on the latter frequency. Their signal on 9525 kc has been exceptionally strong and consistent. For a brief spell they shifted to 15190 kc but the quality was inferior and apparently they have discarded its use.

Upon the last mentioned frequency hangs a tale. A certain DXer, of no mean ability, residing in the United States, picked up the frequency in question one early morning and had every reason to believe it was Hong Kong but could not get the announcement on account of the usual interferences when an-


Red, yellow, blue and black—a beauty from Ecuador.

nouncements come, and which all regular DXers will appreciate. Not wishing to be late to work he delegated "friend wife" to sit down and listen for the announcement, and went his way. Upon his return home at the close of his labors, he was greeted by "I got it—W8XK Pittsburgh." Needless to say interrogation followed as to whether the dial was turned—and the answer, "Just a tweeny bit, it was too noisy." Now far be it from us to start any arguments in any home, but this was too good to keep to ourself. Moral:—No tuning by proxy, unless the substitute is an experienced DXer. No reflection is intended to be cast upon the lady DXers, as there are many with ability, including Misses Eileen Hofmaster,, Sandusky, Ohio; Ivey E. Fugl, St. Paul, Minn.; and Margaret L. Hamilton, Coopersville, Mich., whose names have appeared in the pages of ALL-WAVE RADIO.

Letter from Mr. J. Sanders, Engineer-in-Charge, Java Wireless Stations, states, that all transmitters with first call letter "Y"—(YDA-YDB, etc.) are under control of the N.I.R.O.M.

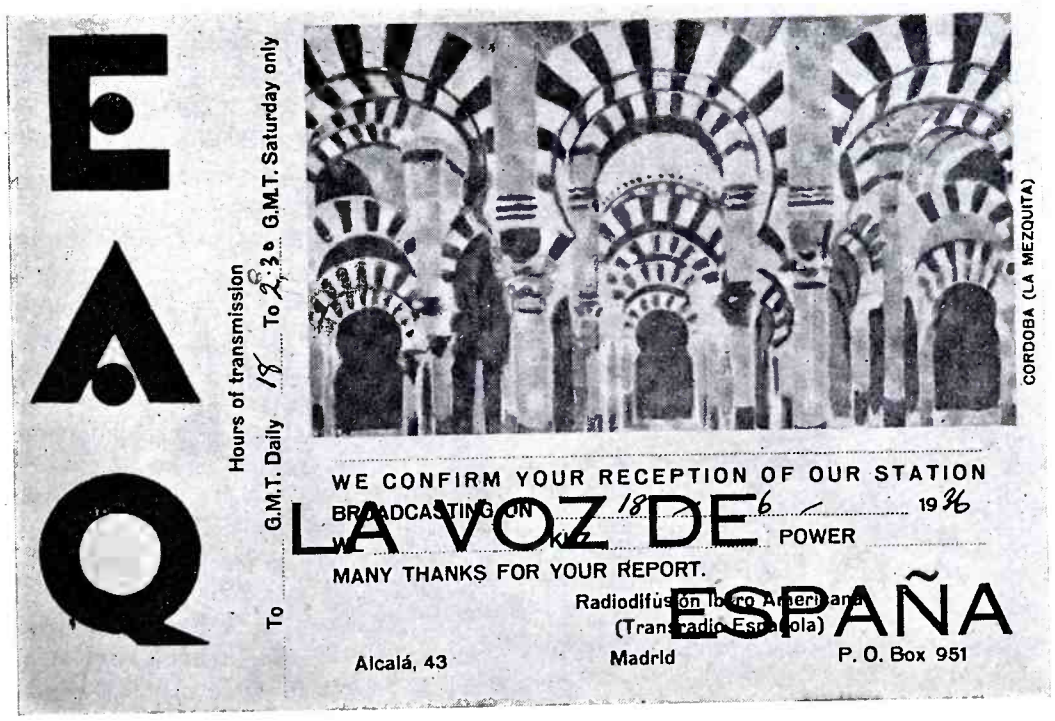
Other transmitters PMA-PLE-PLP-PMN-PLV-PMH are government telephone stations from which PLP and PMN are broadcasting the N.I.R.O.M. programs daily. Effective January 1, 1937 all reports of musical programs will be verified by the "Niro" only.

Prague, Czechoslovakia — Several listeners report the announced call letters as OLR and the frequencies already listed have now been given that call in the station list. If it develops that the calls are otherwise, a change will be made later. They are now using 11870 kc and 15320 kc according to reports of listeners and these frequencies have been added to the list. It is also understood that the following frequencies have been assigned to them in addition to those already reported:—6010, 9504, 11745, 11780 and 21450 kc.

If any of the five last-mentioned frequencies are heard, a report to this department would be appreciated.

From the many reports received as to time on the air it is assumed that a tentative schedule has been laid out by frequencies, but at this writing we are unable to allocate the time for each frequency and therefore showing all listed as between 4 A.M. and 9 P.M., E. S. TIME.

Norway, not to be outdone by other countries, will soon be on the air with the following calls and frequencies:—LKZ, 21500;—(?) 21460; LKX. 17785; LKW, 17755; LKV, 15780; LKU, 11830; LKO, 11735; LKE, 9572; LKD, 9555; LKJ, 9540; LKC, 9530; LKL,




A recent one from Madrid. The odd design is in a light shade of green.

6130. It is reported that each of these transmitters will employ 25 kw power and that a broadcast will be directed to American between 9 P.M. and 12 A.M.

With England, Germany, Japan, Czechoslovakia, Norway, France and a few more transmitting in the 13-16-19-25-31 and 49-meter bands, there might be a little confusion unless an understanding has been arranged between them as to the time the frequencies are to be used.

Nippon Hoso Kyokai, The Broadcasting Corporation of Japan, are now sending to listeners, free of cost, detailed monthly programs printed in English and Japanese, from their studios, Atagoyama, Siba-Ku, Tokyo, Japan, and covering their overseas broadcasts. Listeners desiring to receive them should write direct to the address given above.

### *Japanese Overseas Programs*

The Japanese Overseas programs are to be carried on the following frequencies:—JZM, 21520 kc; JZL, 17785 kc; JZK, 15160 kc; JZJ, 11800 kc; JZB, 10960 kc; JZI, 9535 kc and JZH, 6095 kc. According to information received, these stations are to transmit with 50 kw power and with directional antennas. Reports from George C. Sholin, San Francisco, Calif.; L. M. Clark, Snyder, N. Y.; Howard Wilson, Jr., Ithaca, N. Y.; Harold W. Bower, Sunbury, Pa., and Lyle Nelson, Yamhill, Oregon, are that JZI, 9535 kc; JZK, 15160 kc and JZJ, 11800 kc, have already been heard on test programs and asking for reports on signal strength and announcing that they were testing on Mondays and Thursdays between 4 and 5 P.M., E. S. TIME, on the first two named frequencies. The three transmitters mentioned are also reported as relaying JOAK during afternoons and from 4 to 7:40 A.M., E. S. TIME, alternating with JVN, 10660 kc and JVT, 6750 kc.

RV15, Khabarovsk, U.S.S.R., in station list at 4273 kc is reported by George C. Sholin, San Francisco, Calif., as now on 5700 kc transmitting R9 signal into that city as early at 10 P.M. and as late as 9:30 A.M., P.S. TIME E. H. Clark, Hollister City, Calif., reports them as working simultaneously on 5700 and 4723 kc. J. Wendell Partner, Tacoma, Wash., reports them on 5170 kc and not on 4273 kc. Further reports solicited.

HJ5ABC, 6150 kc, Cali, Colombia, has been deleted from station list. Advice has been received that this station is operating only on long waves (1300 kc.)

XGOX, Nanking, China, is on 6820 kc and it has been changed again in station list. J. Wendell Partner, Tacoma, Wash., has a verification card showing the above frequency.

COCX, Havana, Cuba, advises that they are working on 11435 kc, being the frequency temporarily assigned by the Cuban authorities. Permanent assigned frequency will be given them later.

W4XB, 6040 kc, Miami, Florida, has not yet returned to the air and the officials advise that they are not in a position at this time to state definitely when it will resume operation.

HJ3ABX, 6122, Bogota, Colombia, whose slogan is "La Voz de Colombia," sends its veri card bearing a reproduction of the Statue of Liberty. Their address is Apartado 25-65.

YNOP, Managua, Nicaragua, is reported by J. D. Ralston, Baton Rouge, La., as being heard near 5800 kc although he understood in announcement that frequency was 5758 kc. Howard Wilson, Jr., Ithaca, N. Y., reports this station at 5750 kc. R. B. Oxrieder, State College, Pa., also reports hearing a Nicaraguan station several times around 5760, but unable to determine the call. He states that the station generally leaves the air at 10 P.M., E. S. TIME.

XEFT, Vera Cruz, Mexico, is broadcasting on 6120 kc but not on 9505 kc their other assigned frequency.

Manila, Philippine Islands, is reported as having a new short-wave transmitter under construction, to be used for relaying programs to the United States from long-wave station KZRM. The frequency to be used is not known.

COCE, 8820 kc, is reported by Lyle Nelson as broadcasting irregularly between 11 P.M. and 1 A.M. relaying CMCE in Havana, Cuba.

VPD2, Suva, Fiji Islands, continues to be heard with a good signal on 9540 kc between 5:30 and 7 A.M., E. S. TIME. The British Broadcasting Corporation advise that this station will soon have a new transmitter of increased power.

GSA, 6040 kc, Daventry, has been heard recently, although it is not included in program schedules.

### *Madrid Frequencies*

EAQ, Madrid, was off 9860 kc for a spell but came back on this frequency, however, with very poor output, but which has again materially improved. They have also been using their 19720 frequency as well as 10070 kc which is evidently the transmitter of EDN.

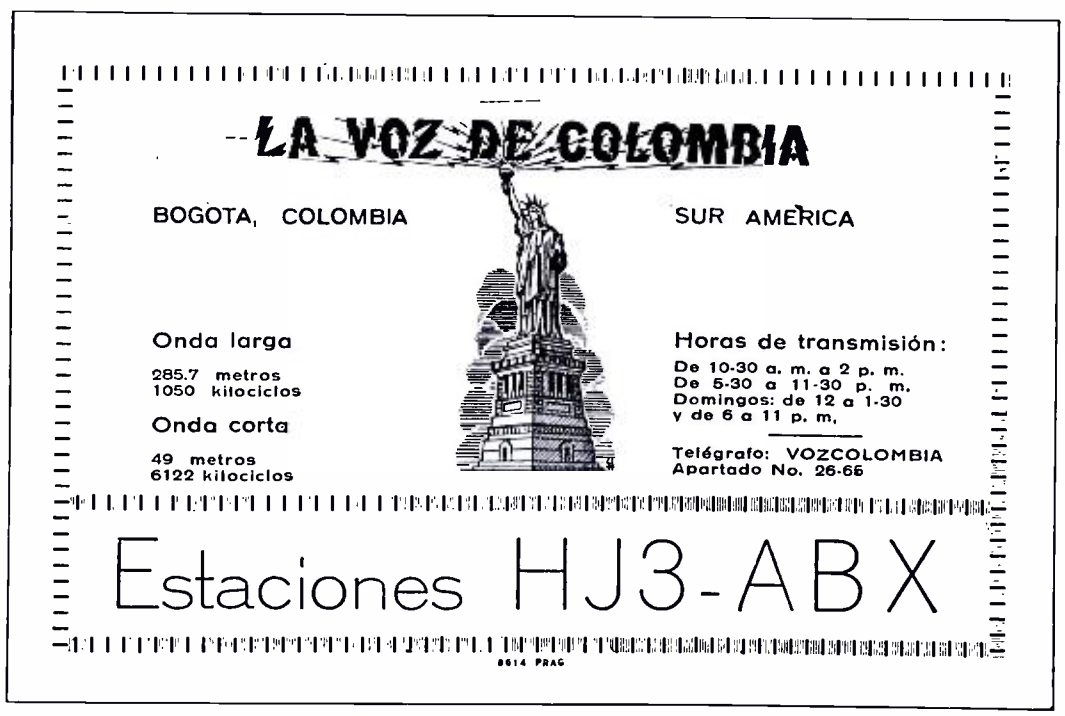
YNLF, Managua, Nicaragua, still continues to be the "mystery" station with 1000 watts power. H. Francis Shea, Cambridgeport, Vt., recently received a veri card which gave the frequency as 9595 kc although he heard the station working between 9650 and 9700 kc. J. D. Ralston, Baton Rouge, La., reports its sign-off on 9600 kc at 7 P.M. Ed Hughes, Long Branch, N. J., reports receiving a new blue and white veri card from them showing frequency as 6800 kc and time on the air as 12 to 1 P.M. and 6 to 9 P.M., C. S. TIME.

HP5L, 11740 kc, David, Panama, reported by R. B. Oxrieder, State College, Pa., as heard testing about 11 P.M., E. S. T. This station still reported in non-authenticated list.

XEUW, Vera Cruz, Mexico, in the station list at 6020 kc is reported by the Quixote Radio Club as heard on 9640 kc with test program.

CB954, Santiago, Chile, listed in non-authenticated section, is reported heard between 8 and 11 P.M., E.S.T., by two listeners on the West Coast. It is said to heterodyne W2XAF, Schenectady. Where are all you Easterners?

PDK, Kootwijk, Holland, radiophone station, 10410 kc, broadcasts special musical programs to Spain and Holland between 3:30 and 4 P.M., E. S. TIME. J. V. Saxton, New York, N. Y., recently re-




**All blue except call, which is in red. From "The Voice of Colombia."**

ceived a verification covering one of these broadcasts.

FIQA, Tananarive, Madagascar, 6000 kc, is being listed, as reported heard on several occasions. It is understood to relay long-wave station FIU. Though a low-powered station it is possible to receive it when conditions are favorable.

"Radio Algiers," 8960 kc or 33.48 meters, has furnished J. Wendell Partner, Tacoma, Wash., with verification covering his reception, which states that it operates on 10-kw power and phones Paris daily. Address is as follows:—Service Algerien des Postes, Telegraphes, Telephones, 137 Rue de Constantine, Alger, Algeria, Africa.

VP3BG, Georgetown, British Guiana, is reported as testing on 6132 kc, just above COCD, Havana, Cuba. Other reports would be appreciated. This station is still retained in station list at 7220 kc.

HJ2ABD, Bucaramanga, Colombia, in station list at 5980 kc has been heard broadcasting on a number of frequencies between 9600 and 9925 kc.

F3ICD, Saigon, Indo-China, on 11730 kc, was heard with fair signal on original test programs in early mornings but signal became weaker and those following finally could not bring in signal. R. Simpson, Concord West, N.S.W., Australia, reports it coming on air at 5:55 or 6:25 P.M. and closing at 9:25 P.M., E. S. TIME. Mr. Simpson says announcements are made in French and English and gives address as P. O. Box 295, Saigon.

FO8AA, 7100 kc, Papeete, Tahiti, is now in list. It is reported as broadcasting between 11 P.M. and 12:30 A.M., E. S. T., on Tuesdays and Fridays. Opens with "La Marseillaise" and closes with "Aloha Oè."

CT1AA, Lisbon, reported heard by R. Simpson, Australia, on about 11850 kc or 25.32 meters, broadcasting musical program about 5:15 P.M., E. S. TIME.

LSX, Buenos Aires, 10350 kc, announces an Argentina program on Mondays and Fridays which would indicate they are on summer time schedule and broadcasting between 5 and 7 P.M., E. S. TIME. It is not known as yet if this is to be a regular broadcast service or not.

VK9MI, Sydney, Australia, "S. S. Kanimbla," verifies the reception of Li Chi Chiang, St. Johns, Quebec, Canada. Congratulations extended to Mr. Chiang. The frequencies of this broadcasting ship are now included in the station list; namely; 11710 and 6010 kc.

YV1RH, Maracaibo, Venezuela, shows 6350 kc on veri card but is at present announcing as transmitting on 6360 kc. Change has accordingly been made in our station list.

COKG, Havana, Cuba, has moved from 6150 to 6200 kc according to report from the station.

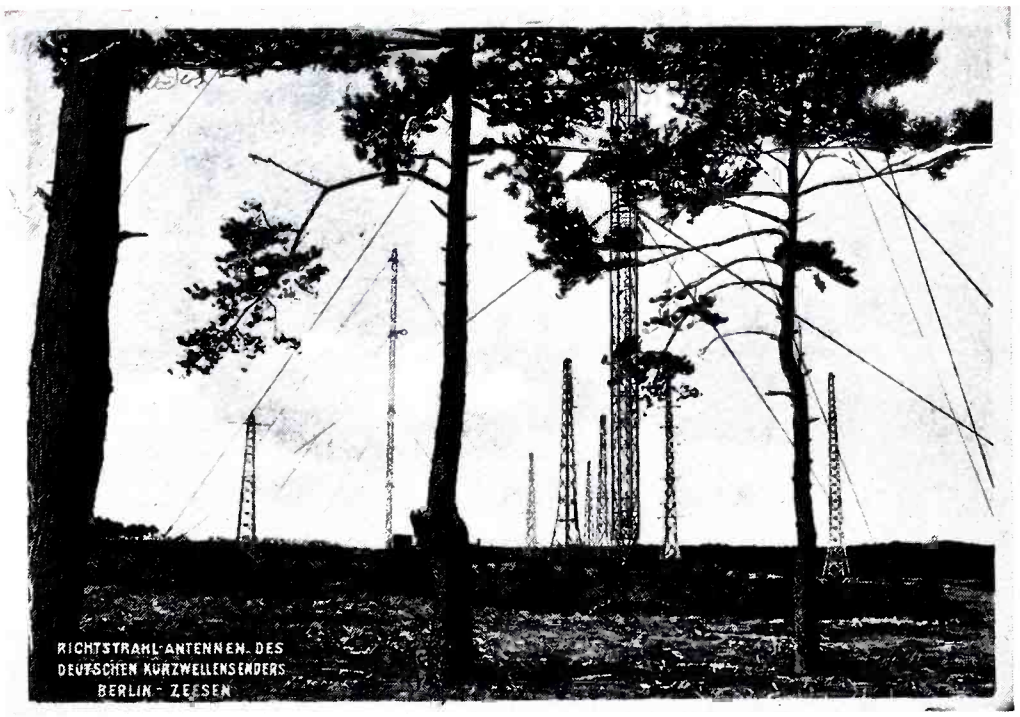



**Photo-veri from DJA, Berlin, showing the antenna system at Zeesen.**

EA9AH, 7030 kc, Tetuan, Spanish Morocco, Africa, has furnished Thomas J. Taaffe, Elmsford, N. Y., with verification in letter form. Fred L. Van Voorhees, Miller Place, N. Y., reports hearing this station between 12 and 2:30 A.M.

LRX, 9660, Buenos Aires, Argentina, is now transmitting from 7 to 11 P.M. and LRU on 15280 kc from 7 A.M. to 7 P.M. This in accordance with the latest schedule from "El Mundo."

XEW, 6005 kc, Mexico City, La Voz de la Americano Latina, is reported by Frank Bantista, San Leandeo, Calif. XEW are long wave call letters according to the Mexican official list of stations.

CT1AA, Lisbon, Portugal, has changed from 9650 to 9665 kc which explains why it was not at its accustomed place. This information was received direct from the Director of Radio Services of the Government of Portugal.

CQN, Macao, China, is now 9600 kc or 31.25 meters, broadcasting Mondays and Fridays from 7 to 8:30 A.M. E. S. TIME. Programs mostly Portuguese and Chinese music, sometimes foreign. Antenna power is 300 watts. Portuguese and English used in announcements alternately after numbers. Opening selection, "Maria da Fonte" closing National hymn, "A Portuguesa." No interval signals used. Information received direct from station.

### *Non-Verifiers*

The following stations are still delinquent in forwarding verifications: HJ1ABB, HJ3ABF, HJ4ABD, HJ4ABB, HJ2ABD, Colombia; HCETC, Ecuador; ZBJQ, Mexico, HRN, Honduras; YNVA, Nicaragua; CB960, Chila; HI2D, HI4V, HI5N, HI7P, HI9B, Dominican Republic.

Stations HJN, HKV and HC2CW have been removed from this block as many reports are being received of verifications having been furnished to listeners.

### *Amateur Phone Stations*

The following is a list of 20-meter amateur phone stations as listed in late reports and which have not been listed in previous issues. It is hoped it will be of assistance to those interested:—*Australia;* "LF"—VK2RG, 2AT, 2XS, 2RJ, 2JU, 2AC, 2JJ "HF"—VK2NA "LF"—VK3DQ, 3BW, 3HM, 3HL "HF"—VK4LW "LF"—VK5TR, VK5JA—12 to 3 A.M. and 6 to 8 A.M. *Argentina;* "LF"—LU6KQ 6-8 P.M. *Brazil;* "LF"—PY3AR 9:40 P.M. *Bermuda;* "HF"—VP9G 7-9 P.M. *Chile;* "LF"—CE3EW 7-9 P.M. *Colombia;* "HF"—HK3RC, HK2RS 5-7 P.M. *Cuba;* "LF"—CO2WA, CO2KL, CO2HY 6-8 P.M. *Costa Rica;* "LF"—TI2VC 7-9 P.M. *England;* "LF"—G6AL, G6OS, G2DV, G6VA, G5TP, G5RB, G2XB, G2BB, G5JA "HF"—G2IN, G6WD 6-9 P.M. *France;* "LF"—F8DK 8 P.M. *Hawaii;* "LF"—K6NPV 8-9 P.M. Haiti; "LF"—HH2D 7-8 P.M. Java; "LF"—PK1QU 7:30 A.M. *Mexico;* "LF"—XE2FM 6 P.M. *Newfoundland;* "LF"—VO1M 6:30 P.M. *Portugal;* "LF"—CT1ZZ 7:00 P.M. *Philippines;* "HF"—KA1AK 7:40 A.M. *Peru;* "LF"—OA4KI 6:30 P.M. *South Africa;* "LF"—ZU6P 10:30-11:30 P.M. *Scotland;* "HF"—G6KH, G6AK 6-9 P.M. *Uruguay;* "HF"—CT1DC 7 P.M. *Venezuela;* "LF"—YV5AK, YV5AN 7-9 P.M.

We are grateful to the following for supplying the above information: Howard Wilson, Jr., Ithaca, N. Y.; Roy Waite, Ballston Spa, N. Y.; Harry E. Kentzel, Averill Park, N. Y.; David T. Wieck, Bronx, N. Y. City, N. Y.; Walter E. Bishop, Rensselaer, N. Y.; Harold W. Bower, Sunbury, Pa.; E. H. Clark, Hol-

[*Continued on page 51*]

# Night-Owl Hoots

## By Ray La Rocque

***veries of old . . . "a hundred fires" dedications . . . tip program with the birdies . . . contest scores . . . cappie's back***

IN these days of all-night broadcasting stations and Mexican border super-power transmitters, it's very hard to believe that not more than 10 years ago "silent nights" were observed by Canadian and United States stations so that foreign stations could be heard. This fact was brought to our attention by a real old-time DXer, C. L. Horton, of Athol, Massachusetts, who has been kind enough to send us a stack of old verifications which are real gems. Unfortunately, most of them are not suitable for reproduction here, but we hope to include a few on these pages. We feel that we cannot let the others go unmentioned so we will do the next best thing and describe some of them briefly.

### *Veri Gems*

There's a card from HHK, heard in 1927, and another from WJBA, "Most Miles Per Watt," in Joliet, Ill. which says: "Would say your reception was excellent considering we are using only 50 watts." The prize of the collection is a card verification from OAX in Lima, Peru, heard during the international tests in 1926. Other cards include the famous PWX in Havana, Cuba, KDLS in Independence, Kans., KFMX in Fayetteville, Ark., and WCX in Detroit, Mich. The Reo Motor's old station in Lansing, Michigan, had a card bearing the call WREO in large red letters. KFKX of Hastings, Nebraska, which was known as "The Pioneer Repeating Station of the World," sent out a folder full of pictures.

The most interesting of the lot is from 6KW in Tuinucu, Cuba, dated 1924. Of this, Night-Owl Horton remarks, "To the older DXers 6KW was the foreign station for quite some time. The veri is in the form of a certificate booklet with descriptive facts about the station and Cuba. On the back cover are printed the words of the station's official song, "Tune in Tuinucu." One verse which we found very clever goes as follows:

"When you hear the cuckoo-coo, it's 6-K-W.

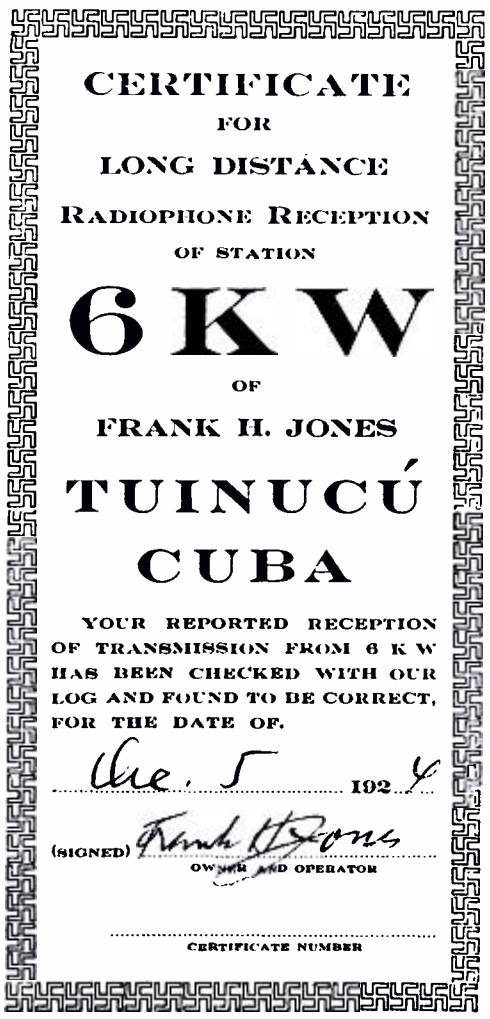
Means you've left the states and you are listening in on Tuinucu,

The cuckoo lives on Bacardi and somehow that appeals to me,

And when feeling dry, I wish that I were cuckoo like he."

*(Old 6KW was owned and operated by Frank H. Jones who now operates the well-known amateur station CO-6OM.—Ed.)*

But that was 1924—let's get back to Cuba of today! From Cienfuegos (meaning literally "a hundred fires") a letter arrives signed by senor Enrique Hidalgo, in charge of the DX department of station CMHJ, which contains a sample of the picture verification cards to be sent to DXers correctly reporting reception of the station. CMHJ's DX schedule for 1936-37 calls for a program from 2-3 A.M. on each first Thursday of the month, and from 5-6 A.M. on each third Thursday of the month. CMHJ operates on 1160 kc and will use a power of 200 watts. Senor Hidalgo has hopes of receiving reports from every state in the United States. DX clubs are requested to get in touch with the station regarding dedication of these programs to their respective organizations. Address of CMHJ is Sta. Elena 104, Cienfuegos, Cuba—"The Pearl of the South of Cuba."



CERTIFICATE
FOR
LONG DISTANCE
RADIOPHONE RECEPTION
OF STATION
6 K W
OF
FRANK H. JONES
TUINUCÚ
CUBA

YOUR REPORTED RECEPTION OF TRANSMISSION FROM 6 K W HAS BEEN CHECKED WITH OUR LOG AND FOUND TO BE CORRECT, FOR THE DATE OF.

Dec. 5 192 4

(SIGNED) Frank H Jones
OWNER AND OPERATOR

CERTIFICATE NUMBER

**Frontpiece of an old veri in the form of a certificate booklet. Frank Jones now operates amateur station CO6OM, at the same location.**

### Station Changes

A lot of news from down in Washington and also throughout the rest of the radio world, so we'll omit the remarks this month and just list the changes, classifying them according to their nature.

In the U. S. station list the following changes should be made:

| *Call* | *Location* | *kc* | *Pwr.* |
|---|---|---|---|
| WAIR | Winston-Salem, N. C. | 1250 | *250* |
| WBHP | Huntsville, Ala. | 1200 | 100 |
| WBJW | Kinston, N. C. | 1200 | 100 |
| WDRB | Wausau, Wis. | 1370 | *100* |
| ———— | Corsicana, Tex | 1310 | *100* |
| ———— | Jamestown, N. D. | 1310 | 100 |
| ———— | Moorehead, Minn. | 1310 | 100 |

*Power Changes*: KMO (1330) 250-1000 watts; WOL (1230) 100-1000; KGGM (1230) 250-1000; WIP (610) 500-1000; KRLC (1390) 100-250; WHDL (1400) 100-250; WATR (1290) 100-250; WLB (760) 1000-5000; WCAL (760) 1000-5000. Frequencies shown in parentheses.

*Changes in Frequency*: WOL 1310-1230; KRLC 1420-1390; WHDL 1420-1400; WATR 1190-1290; WCAL 1250-760; and WLB 1250-760.

*New Calls Assigned*: KSJS to Salina, Kans.; KGSS to Sioux Falls, S. D.; KXOX to St. Louis, Mo.; WEAU to Eau Claire, Wis.; WHIP to Hammond, Ind.; and KVSC to San Diego, Calif. These are not changes but merely assignments made to new stations recently authorized for the aforementioned cities. KIUJ changes to KRQA.

In the foreign station list we have some more changes. (IDA) means that the change is taken from the IDA Globe Circler.

| Call | Location | kc | Power |
|---|---|---|---|
| ——— | Boras, Sweden | 1447 | 200 |
| ——— | Eskilstuna, Sweden | 1240 | 200 |
| ——— | Gavle, Sweden | 1483 | 200 |
| ——— | Halmstad, Sweden | 1411 | 200 |
| ——— | Halsingborg, Sweden | 1384 | 200 |
| ——— | Jankoping, Sweden | 1515 | 200 |
| ——— | Kalmar, Sweden | 1447 | 200 |
| ——— | Karlskrona, Sweden | 1530 | 200 |
| ——— | Kiruna, Sweden | 1258 | 200 |
| ——— | Kristinehamm, Sweden | 1500 | 200 |
| ——— | Malmberget, Sweden, | 704 | 200 |
| ——— | Upsala, Sweden | 1492 | 200 |
| ——— | Tunis, Tunisia (IDA) | 877 | ——— |
| HJ1ABE | Cartagena, Colombia | 1250 | ——— |
| JBBK-1 | Heijo, Korea | 1090 | ——— |
| JBBK-2 | Heijo, Korea | 820 | ——— |
| SBM | Hudeksvall, Sweden | 1402 | 1000 |
| SBN | Ornskoldsvik, Sweden | 1402 | 500 |
| 3MB | Birchip, Australia (IDA) | 1490 | ——— |

*Power Changes:* 6AM (980) 100-2000 (IDA); Wilno (536) 16000-50000 (IDA); Lwow (795) 16000-50000 (IDA); SBC (1312) 250-2500; Uddevalla (1402) 50-500; PRE-8 (980) 10000-22000, and CMHJ (1160) 100-200.

*Frequency Changes:* Uddevalla, Sweden, from 1410 to 1402 kc, and PRE-8 from 1360 to 980 kc.

*Call Changes:* SDB (601) to SBD; SCO (1312) to SBI; SCQ (1312) to SBJ; SCK (1312) to SBK, and Umea (1402) to SBL.

### *Early Risers At WCOP*

"How! Chief Night Owl. Greetings from Talk-in-the-Mike." Thus begins a message from Morton W. Blender, Chief Announcer at Boston's popular daytime broadcaster, WCOP. The letter is to the effect that the boys at WCOP have agreed, willingly or unwillingly, to roll out of a nice warm bed each Saturday morning ere the stroke of five, dress, and stroll out into the invigorating air. (And how that Beantown air can be invigorating around 5 A.M. in midwinter!) "Ah," you will say, "But there must be some purpose for the stroll." And fellow Night Owls, there *is* a purpose. The boys want to get up to the studios by 6 A.M. so that they can put on a special one-hour DX tip program for the benefit of every one up and about at that hour.

The tips and DX news will be broadcast by Joe Lippincott, New England Director of NNRC, and all Mort Blender will have to do is take care of the station announcements, run the records and other general routine, while taking a hand in giving summaries of reports and dedicating music to some of the boys and gals who request it.—That's all he has to do!

Perhaps Mort doesn't remember, but we know that he can handle things in fine shape as we were one of the boys who spent a few hours in the control room at CKTB when he was doing similar duty during the CDXR Convention program a few years back. So give a listen, Night Owls! The program will *not* be a jam session by all the latest swing bands, but will contain a variety of tunes ranging from the hot type to a few Strauss waltzes and other light classics. For those who report, WCOP has a new and novel veri which grades your report according to a scale from 1 to 5!

## ALL-WAVE RADIO'S
## *Time Table of DX Programs*

*(All time is given in Eastern Standard Time)*

### Specials

TUESDAY MORNING, Dec. 15
WHAZ, Troy, N. Y. 1300 kc. 12:30-1:30

WEDNESDAY MORNING, Dec. 16
WOPI, Bristol, Tenn. 1500 kc. 3:00-5:00

THURSDAY MORNING, Dec. 17
CMHJ, Cienfuegos, Cuba 1600 kc. 4:00-5:00

TUESDAY MORNING, Dec. 22
—Emisora Nacional, Rua de Quelhas, Lisbon, Portugal. (IDA) 629 kc. 1:00-2:30

SATURDAY MORNING, Dec. 26
WTRC, Elkhart, Indiana 1310 kc. 6:00-7:00

SUNDAY MORNING, Dec. 27
CFLC, Prescott, Ontario 930 kc. 2:00-5:00
KWSC, Pullman, Wash. 1230 kc. 3:00-7:00

WEDNESDAY, MORNING, Dec. 30
KHBC, Hilo, Hawaii (NNRC) 1400 kc. 3:00-4:00

SUNDAY MORNING, Jan. 3
TINRH, Heredia, Costa Rica 920, 980, or 1450 kc. 2:00-3:00

THURSDAY MORNING, Jan. 7
CMHJ, Cienfuegos, Cuba 1160 kc. 2:00-3:00

SUNDAY MORNING, Jan. 10
WLVA, Lynchburg, Va. 1200 kc. 1:00-1:20
WNBC, New Britain, Conn. (NNRC) 1380 kc. 4:00-6:00

WEDNESDAY MORNING, Jan. 13
CMOX, Havana, Cuba (NNRC) 1300 kc. 3:00-6:00

THURSDAY EVENING, Jan. 14
—"Radio Jerusalem", Jerusalem, Palestine (IDA) 668 kc. 8:00-8:30

### Regulars

EVERY SUNDAY MORNING
XED, Guadalajara, Mexico 1160 kc. 12:01-2:00
TGW, Guatamala City, Guat. 1210 kc. 12:00-6:00
WLAC, Nashville, Tenn. 1470 kc. 12:45-1:00
XEP, Juarez, Mexico 1160 kc. 2:00-4:00

EVERY TUESDAY MORNING
WJAX, Jacksonville, Fla. 900 kc. 1:00-2:00

EVERY FRIDAY MORNING
CFCN, Calgary, Alberta 1030 kc. 12:00-2:00

EVERY SATURDAY MORNING
WCOP, Boston, Mass. 1120 kc. 6:00-7:00

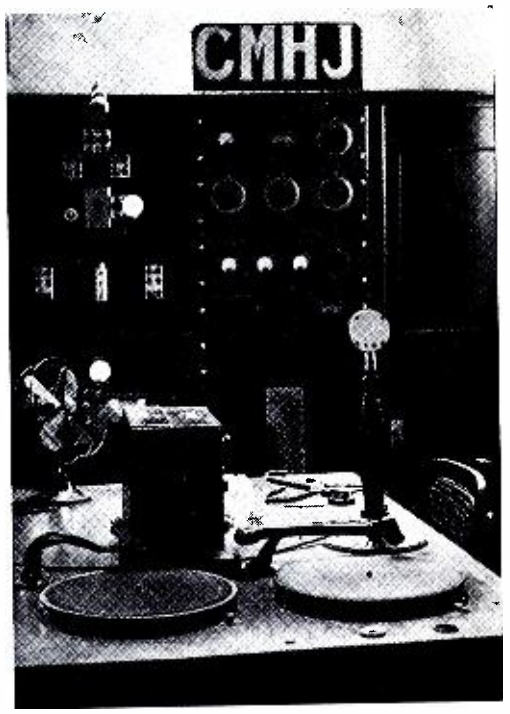



**Photo-veri from CMHJ, Cienfuegos, Cuba, received by Night-Owl LaRocque.**

### *Contest Scores*

After the prize announcement in the November issue, we thought that practically every DXer in existence would be taking advantage of an early opportunity to score, but evidently the unfavorable DX weather during the first weeks of scoring has kept everyone from the dials. Most DXers seem slow in submitting reports because they cannot hear any TA's or TP's yet, but they are making a big mistake by not cashing in on the nearer stations such as Mexicans, Cubans, and the domestics listed in the time-table. Those few who have taken advantage of an early start have an edge of a few hundred points over the rest of the field, but the best DX weather is now at hand which gives the Chief Night Owl high hopes that you will not disappoint us and that there will be many hundreds clamoring for those prizes. The score on November 1, 1936:

George Brode, Philadelphia, Pa.... 483
Bernard Ahman, Baltimore, Md. .. 400
John Gardner, New York, N. Y... 133
Kendall Walker, Yamhill, Ore..... 100
Bob Beadles, Salt Lake City, Utah.. 100
Carl Sylvester, Yale, Mich..... 83

Those who scored "Bullseye's" or "100's" were as follows: During September: Ahman on XEAW, XENT, XEPN, and XERA. Beadles on XEMO. During October: Walker on KGU, and Brode on XEP, XEPN, and KWSC.

[*Continued on page 49*]

# THE BAFFLING BAFFLE

BY McMURDO SILVER*

THE writer is so regularly surprised by daily correspondence which indicates such a lack of understanding of what a loudspeaker baffle is, that he is taking occasion to dispel the many false impressions regularly met with.

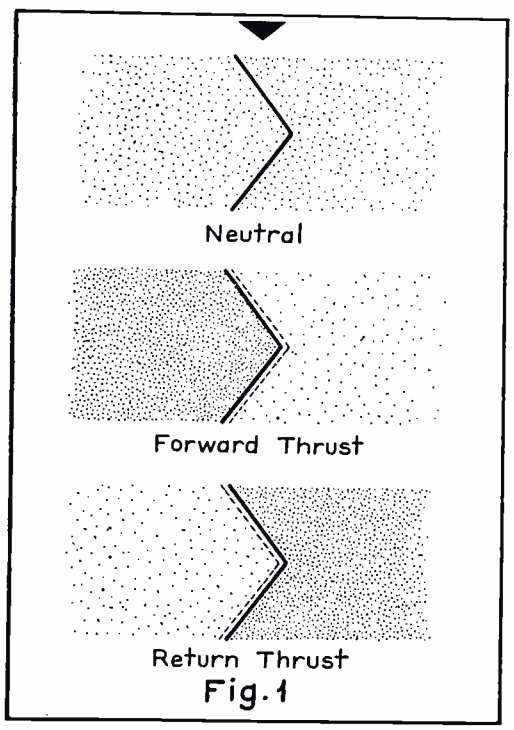
### How Speaker Works

A dynamic cone loudspeaker functions as a piston, driven by the audio output of any amplifier through the agency of its voice coil, which may best be considered as a motor driving the piston (cone). When the cone is so driven by an audio-frequency signal, it moves forward and backward, thus displacing surrounding air both in front of as well as behind the cone, as shown in Fig. 1. It is this displaced air which the ear perceives as sound.

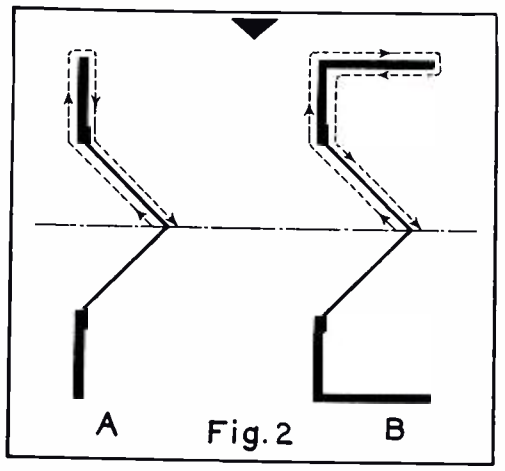
In such operation, the air pushed out in front by the cone moving forward must go somewhere, and as a partial vacuum is created at the rear of the cone as it moves forward, the displaced air in front finds it most easy to flow toward the vacuum at the rear, which needs new air to fill the vacuum left by the forward movement of the speaker cone. The net result of this action in theory is the generation of sound waves in only the air very near the cone.

This is true for very low frequencies, but not for high frequencies. Thus in practice, an unbaffled speaker will reproduce high tones, but will lack almost entirely all low tones, due to this cancellation previously described.

* Chief Engineer, McMurdo Silver Corp.




**Illustrating piston action of loudspeaker cone and result on air pressure.**




**The dotted lines indicate effective dimensions of a speaker baffle; A—flat baffle, B—folded baffle (cabinet).**

A baffle is any means at all placed between the cone front and the cone rear which lengthens the distance the air must travel from front to rear to cause cancellation of front pressure by rear vacuum, as the cone moves forward in its reproducing cycle. For high frequencies, the "baffle" provided by the size of the cone itself is sufficient to prevent cancellation. The low-tone reproduction range is dependent upon the size of the baffle, or more exactly, the length of the air path from the center of the cone in front to the center of the cone at the rear.

### Purpose of Baffle

The purpose of the baffle is to so lengthen the front-to-back air path that the air displaced by the forward movement of the cone cannot reach the vacuum at the rear until the vacuum has ceased to exist by virtue of the cone having had time to pull backward. When this is accomplished, the delayed sound (air displacement) from the front is aided by the air pushed from the rear, there is no cancellation, the two air displacements add together, and sound is radiated to be heard by the listener.

The baffle can be anything at all that will lengthen the air path from cone center front to cone center rear. It should be of some acoustically "dead" (non-vibratory) material, such as soft wood, celotex or the like. If it is hard and stiff (or thin) it will vibrate in itself, which it should never do, for if the baffle vibrates, it contributes tones to reproduction which were not originally present, thereby causing distortion.

### Calculating Baffle Size

There is a simple rule for figuring sizes of baffles to permit the reproduction of any desired low frequencies which a speaker can handle. It is based upon the speed of sound traveling in air (1130 feet per second approximately) and the number of oscillations (complete neutral to forward to neutral to back, to neutral movement of loudspeaker). By this same "rule of thumb," we get the following path lengths for different low-frequency cut-offs, below which our speaker will not reproduce:

| *Lowest frequency to be reproduced (Cut-Off Frequency)* | *Path length from front cone center to rear cone center* |
|---|---|
| 100 cycles | 5.65 feet |
| 60 cycles | 9.416 feet |
| 40 cycles | 14.125 feet |
| 30 cycles | 18.83 feet |
| 20 cycles | 28.25 feet |

Remember that these are figures in feet for the *shortest* distance from the cone center at front to the cone center at rear. If our baffle is to be flat, soft board 1 inch to 1½ inches thick, we will need the air path lengths given above in order to reproduce down to the frequencies given. If the baffle is a square, flat board with the speaker at the center, then these figures are for the actual size of the square baffle, since if the speaker is at the center, sound must travel *half* of each figure from front to baffle edge, and again *this same distance* around to the cone rear. See Fig. 2-A.

### Working Example

Let us take 40 cycles as the lowest tone to be reproduced. On a 40-cycle note, the cone will move from neutral to forward, back through neutral to rear, and then to neutral again 40 times per second. It will take one-half this time, or 1/80 of a second for the sound, to move from the front to the rear, so we want the baffle to delay the front sound 1/80th of a second before it is allowed to reach the rear, so that it will add to the rear sound, and not cancel it out. If we now multiply the speed of sound in air, 1130 feet per second by 1/80, we will get the path length that must be interposed between the cone front and cone rear in order for our speaker to reproduce all tones down to 40 cycles. Then 1130 divided by 80 gives 14.125, which tells us that the shortest path from

[*Continued on page 53*]

# Queries

***tuning indicators . . . radio law . . . auto-radio reception***

*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.*

## TUNING INDICATORS

### Question Number 21

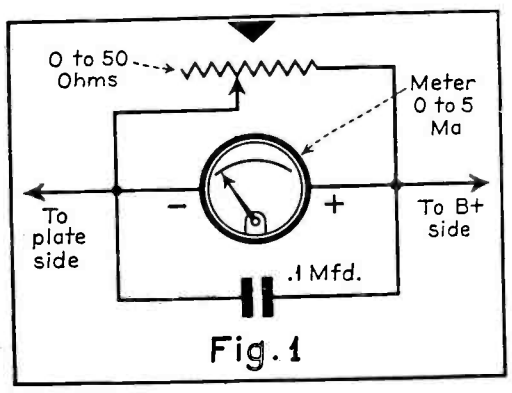
"I should like to connect a zero to 15-milliampere meter in the circuit of my Lafayette Professional 9 as a tuning indicator. Your assistance in this matter will be appreciated.—*J. W. G., Pittsburgh, Pa.*"

### Answer

It will be better first to consider the matter of adding a tuning meter as a general proposition. The addition is practical and easily made on any receiver having automatic volume control. It is only necessary to connect the meter in the plate circuit of any tube, or tubes affected by the a-v-c action.

When there is no signal impressed upon the circuit, the automatic sensitivity of the receiver will be at its maximum, only a low, fixed bias will be applied to the amplifying tubes and the plate current will be at its highest as indicated on the meter. As a signal is tuned in, the automatic volume control comes into action, tending to reduce amplification by applying an additional negative bias to the amplifying grids. This reduces the plate current, and the needle swings to the left. In other words, when using a tuning indicator, the station will be tuned for the least deflection. (In some special tuning meters, this deflection will be to the right.)

It is desirable to include the tuning meter in as many plate circuits affected by a-v-c action as possible, for, with the proper adjustment, this increases the apparent sensitivity of the meter. Assume for the moment that two tubes are controlled by a-v-c, each of them drawing 10 milliamperes on no signal and say 1 milliampere when a given station is tuned in. If the meter is in only one circuit, it will show a deviation of only 9 milliamperes for resonance, while if included in both circuits it will drop 18 milliamperes. It is usually simple to locate a plate lead common to two or more a-v-c operated tubes.




**How tuning indicator is connected in B-plus lead to plates of a-v-c operated tubes.**

Greatest sensitivity will always be secured when the meter is adjusted for full-scale deflection on no signal. In this case a zero to 10-milliampere meter will show just as great a deflection in the plate circuit of one tube as a zero to 20-milliampere meter will in the common plate circuit of two tubes. It is therefore desirable to obtain a meter the highest reading on which is *lower* than the plate current to be carried. A zero-5 milliampere meter is about right. The rating is lower than the normal plate current of most amplifying tubes, and the meter is less expensive than the zero-1 m.a. types. This meter should be shunted with a zero to 50-ohm rheostat as shown in Fig. 1. This rheostat should be adjusted until the meter shows full deflection when no signal is tuned in. In some instances the bypass condenser shown in the circuit diagram will be necessary—depending upon the exact design of the receiver, the reactance of the meter-rheostat combination and just where it is placed in the circuit. The meter should be connected, electrically, as close to the power supply as possible and still be in the common a-v-c plate circuits. Occasionally it may be necessary to shield the leads to the meter in addition to bypassing.

To return to the specific case of the Lafayette Professional 9: We suggest that J.W.G. and other interested readers turn to the circuit diagram of this receiver appearing on page 67 of All-Wave Radio for November 1935. The tuning indicator is best included in the common plate lead to the 6D6 tubes. On the diagram, the insertion should be made just under the second i-f transformer—the plate lead being the first lead shown below the .1-mfd, 400-volt condenser. It will be desirable to use the bypass condenser indicated in Fig. 1.

Many readers may not feel competent to make the installation of a tuning meter themselves. However, it is a simple job for the expert serviceman—as well as inexpensive. Parts will cost him from one to two dollars, depending upon quality, and labor charges should cover perhaps an hour's work. Special tuning meters are available, with escutcheons, if they are preferred over the laboratory type of instrument. These are cheaper than the conventional panel mounting designs.

The magic eye type of tuning indicator can also be applied to any receiver having automatic volume control. A complete kit, including tube, coded leads and assembly with full instructions can be secured from most mail order houses for about $1.60. However, these are no easier to install than the meter type of indicator, and in the majority of instances calls for a good serviceman.

## TRANSMITTING WITHOUT A LICENSE

### Question Number 22

"I am informed that the U. S. radio laws state that so long as one does not transmit across a state border, no operator or station license is required. I am located seventy-five miles from the closest state line, and wish to transmit

[*Continued on page 50*]

# A LOW-COST PHONE and C. W. TRANSMITTER

By MYRON MORRIS . W210J

Front-panel view of completed low-power phone and c.w. transmitter.

ABOUT this time of year, most hams start to get their rigs in shape for the coming winter DX. Some fellows are content with their old stand-by outfits, while others will start to build a brand new 1937 job with all the latest doo-dads. This article is intended for the fellow who is considering the construction of a low-power, all-band phone and c.w. rig at a low cost. This sounds like a large order, but with careful planning it can be done by using parts which are readily available.

As this transmitter is designed to go down to 28 megacycles, the insulation of the parts in the r.f end is of prime importance. For this reason the best types of insulation should be employed.

### *Design Details*

There is not a thing in the design that the ordinary ham will be unable to tackle. No hard and fast rules need be laid down as to mechanical arrangement, except that the layout in the grid and plate circuits of the oscillator should be followed precisely. Moving the wires to the feedback condenser from the position shown in the photographs considerably decreases the r.f. output.

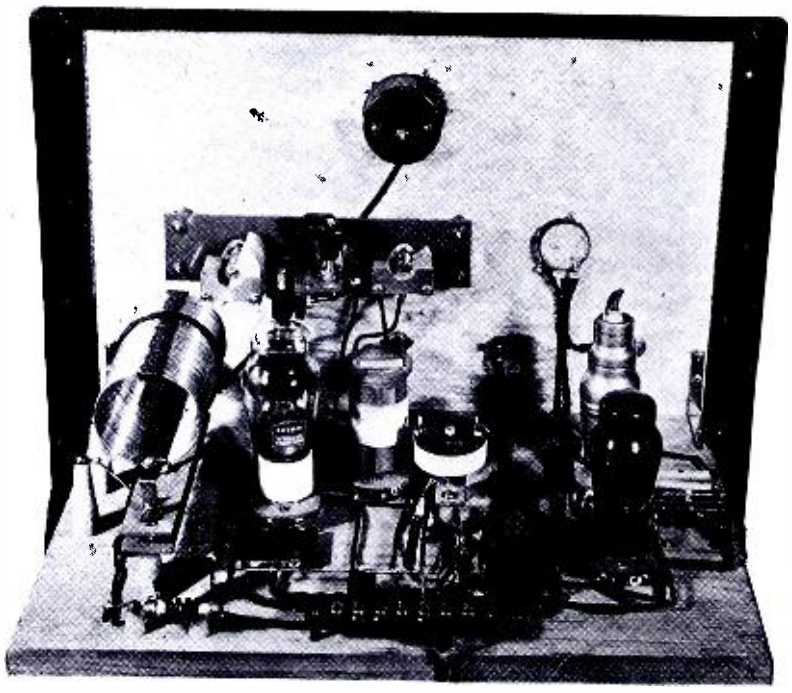
It can be seen from the photographs that the whole job is built on wooden baseboards and plywood panels. This was done because many hams haven't the tools and equipment necessary to "gnaw" holes in an ⅛-inch steel rack panel for meters, switch holes and the like. This type of construction is also cheaper but for those who wish to invest in steel chassis and panels, the latter type of construction is highly recommended.

If plywood panels are used, it is necessary that they be sanded to a smooth finish. Ours were given a thin coat of shellac, followed by a second coat of black enamel. Using care, the appearance will be similar to the standard steel rack panel with baked enamel finish. The base boards were sanded and shellacked.

After finishing and assembling the bases and panels, the next step is to mount the parts by following the layouts in the photographs. The panels were fastened with short wood screws to the baseboard and each unit strengthened with angle brackets bolted to the panel and baseboard.

All sockets are mounted on ¾-inch insulating bushings fastened to the baseboard with long wood screws. All stand-off insulators were mounted by passing a one-inch 8/32 bolt through the baseboard. All the variable condensers are mounted on a strip of bakelite which is supported from the panel with four one-inch insulating bushings fastened with 1½-inch ornamental head bolts. The condenser shafts are connected with the dials by means of ¾-inch insulated shaft extensions and ¼-inch bushings in the panel. This method of construction does away with hand-capacity effects and gives a "dead front" panel.

The name plates are fastened to the panel with short wood screws. This



Rear view of the modulator and r-f section of the transmitter. The crystal can be seen just to the right of the small plug-in coil. The RK-25 tube is to the left of this coil.

gives the panel a commercial appearance which all hams strive for. The resistors and condensers for the audio channel are mounted on two terminal strips which are fastened an inch and a half apart. The resistors are soldered to the lugs as well as the leads to the tubes. The grounds to the r.f. portion are made to a length of buss bar fastened between two single mounting lugs. A little care in wiring will result in a very neat and workmanlike appearance.

### *Audio Section*

The speech amplifier consists of a 79 type tube with the two triode sections in cascade, giving a compact, inexpensive speech amplifier which provides a gain of well over 80 db. The gain control is a half-megohm potentiometer in the grid circuit of the first triode section of the 79 tube. The microphone connector is one which has a locking feature and prevents the possibility of accidentally knocking out the microphone connection in the midst of a QSO. It also provides a secure and well shielded connection.

Particular care should be taken in the placement of the leads to the 79 tube. As the audio channel has a high gain its tendency to oscillate might be a source of trouble. If grid leads are brought close to plate leads, or if brought close to hot r.f. leads, feedback will result. To preclude this possibility, all grid and microphone leads should be well shielded. The speech amplifier has sufficient gain to fully modulate the oscillator working from a low-level velocity or crystal microphone of high impedance.

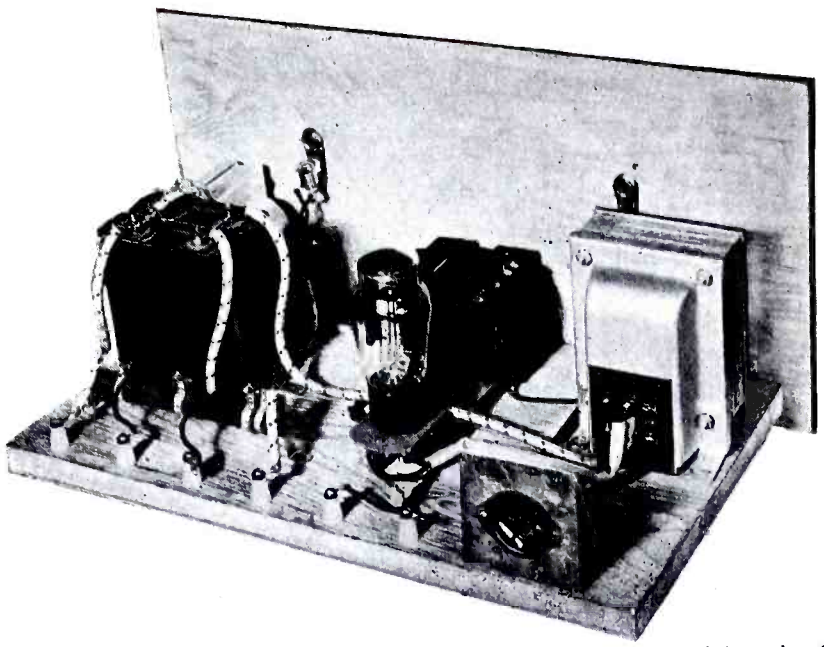
### *R. F. Section*

The radio-frequency portion of the transmitter consists of an RK-25 in a very flexible crystal oscillator circuit. It will be noticed that when using both crystal control and tritet oscillator, a tuned resonant circuit is in series with the cathode at all times. If the output frequency is the same as the crystal frequency, and the cathode circuit is tuned to one half the crystal frequency, a higher output with lower resultant crystal current is obtained than with ordinary crystal oscillator circuits.

On account of the excellent internal shielding of the RK-25, it is necessary to use a small condenser to provide feedback between grid and plate of the oscillator tube.

The tuning of the oscillator is not at all critical. The plate tank circuit is tuned to resonance by means of the plate-current dip on the milliammeter. The cathode tank is then adjusted for minimum plate current. This is followed by setting the feedback condenser for maximum output. Coupling the plate link to the antenna filter and tuning the antenna filter according to the standard procedure completes the tuning adjustments for the transmitter. As most hams are familiar with the tuning methods used in this rig, no further explanation is deemed necessary. For those who may not be familiar with tuning procedure, further information is readily available in amateur handbooks.

Modulation is accomplished by connecting the suppressor grid of the RK-25 to the secondary of the modulation transformer, T3. By impressing the audio voltage on the suppressor grid, 100 percent modulation of the electron stream is assured. The modulator tube is a 6B5.



**Rear view of the power-supply unit for the low-power transmitter, containing the filament and power transformers, choke, filter condensers, and 5Z3 rectifier.**

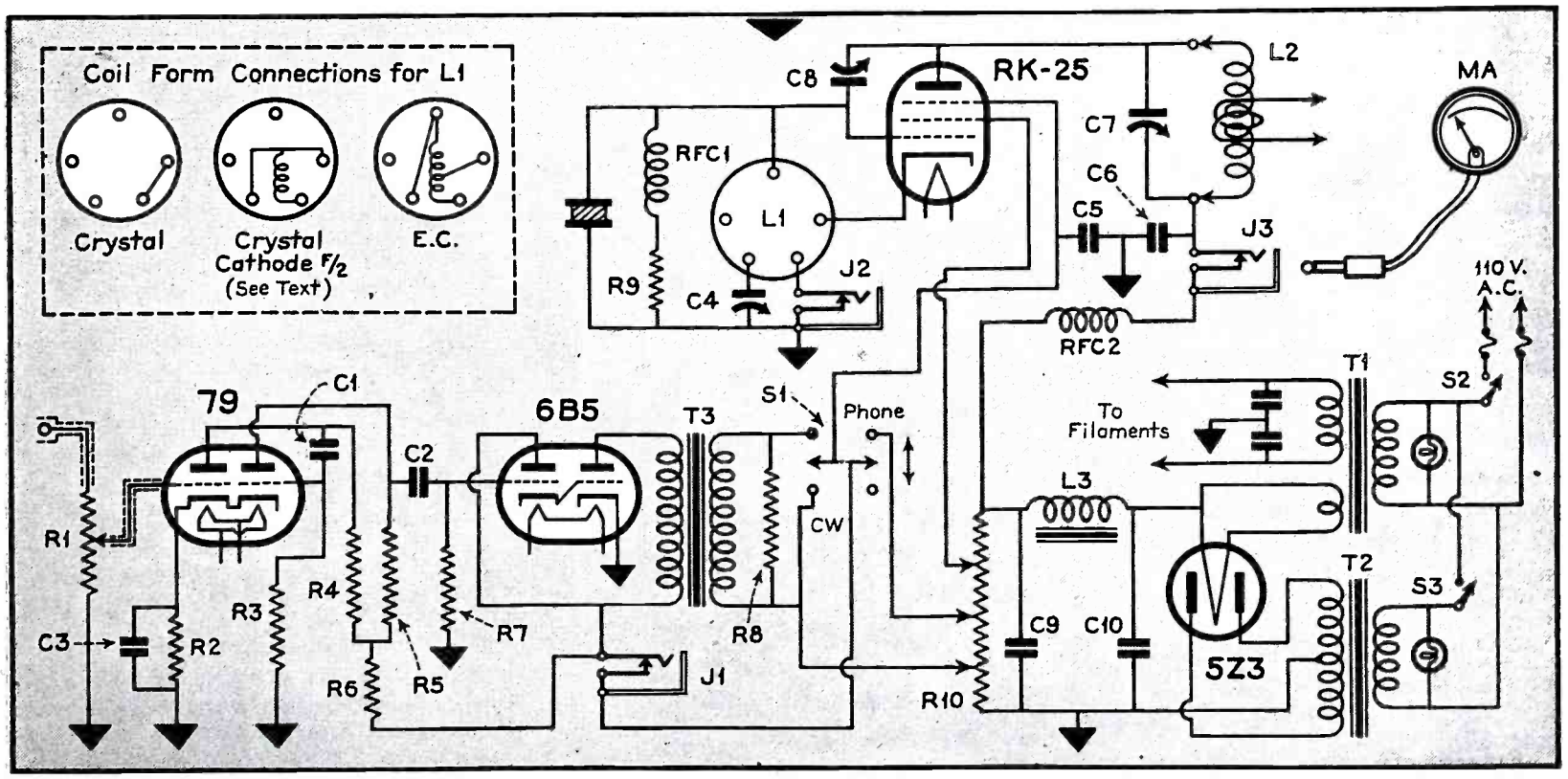



**Diagram of low-cost transmitter. Coil connections are given in upper left corner**

**TABLE 1**

| | L1 | | | | L2 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Freq | Turns | Gauge | Winding Length | Turns | Gauge | Diam. | Winding Length | |
| A | 1.75 Mc. | 60 | 28 | 1½" | 40 | 14 | 3" | 3" | F |
| B | 3.5 " | 35 | 22 | 1½" | 40 | 14 | 2" | 3" | G |
| C | 7.0 " | 20 | 16 | 1½" | 18 | 12 | 2" | 3" | H |
| D | 14.0 " | 10 | 16 | 1¼" | 8 | 12 | 2" | 3" | I |
| E | 28.0 " | - | - | - | 3 | 12 | 2" | 3" | J |

**Coil-winding data.**

**TABLE 2**

| Crystal F | Output F | L1 | L2 | L1 F/2 |
|---|---|---|---|---|
| 1.75 | 1.75 | S | F | - |
| 1.75 | 3.5 | A | G | - |
| 3.5 | 3.5 | S | G | A |
| 3.5 | 7.0 | B | H | - |
| 7.0 | 7.0 | C | H | B |
| 7.0 | 14.0 | C | I | - |
| 14.0 | 14.0 | D | D | C |
| 14.0 | 28.0 | D | E | - |

**Coil combinations for the various bands.**

Keying is accomplished by making and breaking the cathode return circuit through the key jack J2. This method permits rapid keying with practically no tails or chirps.

In wiring the r.f. portion, the usual care should be taken in keeping grid and plate leads as far apart as possible. Particular precautions should be taken in wiring the coil socket to correspond with the connections in the coil form. It can be seen that by plugging in the proper combination of cathode and plate coils, straight crystal control, electron coupled or tritet oscillator, for straight frequency or frequency doubling can be easily accomplished. This novel arrangement permits a very flexible circuit for easy QSY.

All the coils for the plate tank circuit are of the air-wound type. There are several commercial makes of coils on the market today which are quite satisfactory for this transmitter. However, if the constructor desires to wind his own coils, Mycalex coil strips are available which lend to making a very neat and efficient tank coil. All the cathode coils are wound on 1½-inch diameter plug-in coil forms. The plate coupling link is two turns of hookup wire around the outside of the plate inductance.

Complete coil specifications are given in the accompanying tables. Table I provides all necessary coil-construction data. Table II provides the coil combinations for the various frequency bands covered by the transmitter. As previously mentioned, electron coupling (E.C.) may be used, as shown in the circuit diagram. However, in a transmitter of this type, crystal control is preferable.

Below the heading "LI F/2" in Table II, are listed the coils that are used when the cathode circuit is tuned to one-half the crystal frequency, as previously explained. The letters refer to the coils listed in Table I. No F/2 coil is shown for the 1.75-mc band for the simple reason that it would resonate in the broadcast band and undoubtedly cause BCL interference.

### *Power-Supply Section*

The power supply consists of a type 5Z3 high vacuum full-wave rectifier and a brute-force filter. A separate plate and filament transformer are used to remove plate voltage during the standby periods. If a single plate and filament transformer is used, the standby switch should be inserted between the B

[*Continued on page 52*]

## PARTS LIST

### Modulator

AMERICAN RADIO HARDWARE

2 — Type 1306 Mycalex 6-prong sockets
1 — Type 280 panel receptacle
1 — Type 281 microphone connector
4 — Type 5420 terminal lug strips
1 — Type 501 terminal lug strip
4 — Type 69 Ameroid bushings

AEROVOX

1 — Type PR25 condenser, 10 mfd, 25 volt, C3
2 — Type 484 condensers, .01 mfd, 400 volt, C1, C3

INTERNATIONAL RESISTANCE

1 — Type B1, 3,000 ohms, R2
1 — Type B1, 30,000 ohms, R3
2 — Type B1, .25 meg., R4,R5
1 — Type B1, 50,000 ohms, R6
1 — Type B1, .5 meg., R7
1 — Type F2, 10,000 ohms, R8

ELECTRAD

1 — Type 203 potentiometer, .5 meg., R1

SYLVANIA

1 — Type 79 tube
1 — Type 6B5 tube

UNITED TRANSFORMER

1 — Type CS22 modulation transformer, T3

### R. F. Unit

AMERICAN RADIO HARDEWARE

1 — Type 1308 large 7-prong socket, Mycalex.
1 — Type 1305 5-prong socket
1 — Type 1310 crystal holder, Mycalex
1 — Type 1320 plug-in base
1 — Type 1321 jack base
1 — Type 1318 midget variable condenser, 100 mmfd, C4
1 — Type 1317 midget variable condenser, 50 mmfd, C7
1 — Type 1315 midget variable condenser, 15 mmfd, C8
2 — Type 13 insulators
8 — Type 10 insulators
4 — Type 16 insulators
2 — Type 512 lug strips
1 — Type 1515 terminal strip
4 — Type 69 Ameroid bushings
4 — Type 59 Ameroid bushings

AEROVOX

4 — Type 1460 mica condensers .002 mfd, C5,C6,C11,C12

HAMMARLUND

1 — Type SWF5 plug-in coil form

NATIONAL

2 — Type R-100 r.f. chokes
2 — Type O dials
1 — Type HRO dial

INTERNATIONAL RESISTANCE

1 — Type F2 resister, 10,000 ohms, R9

RAYTHEON

1 — Type RK-25 tube

WHOLESALE RADIO

2 — Type W6451 jacks

TRIPLETT

1 — Type 223 milliammeter, 0-100 mils

### Power Supply

AMERICAN RADIO HARDEWARE

2 — Type 93 candelabra sockets
1 — Type 1304 4-prong socket, Mycalex
1 — Type 127 double fuse base

ELECTRAD

1 — Variohm, 40,000 ohms, 75 watts, with 3 sliders, R10

CORNELL-DUBILIER

2 — Type TDF10020, 2 mfd, 1,000 volts, C9,C10

SYLVANIA

1 — Type 5Z3 tube

UNITED TRANSFORMER

1 — Type CS301 filter choke, L3
1 — Type CS200 power transformer, T2 (Disregard filament winding)
1 — Type LM4 filament transformer, T1

MISCELLANEOUS

2 — 110-volt candelabra bulbs
2 — 3-ampere cartridge fuses
2 — SPST toggle switches
1 — Kit of hardware
1 — Roll hookup wire
1 — Flush male receptacle
1 — Female plug
1 — DPDT switch
1 — Plywood panel for R.F. unit, 10¾"x19"
1 — Plywood panel for power supply, 9" x 19"
2 — Wood baseboard, 11" x 17"

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

# The Ham Bands

## By George B. Hart

**W8GCR**

***cyclone network . . . the ot's trek back . . . regenerative i. f. . . . check your horoscope and freak drift . . . sixes on ten . . .***

RECEIVED a letter from W9FWY, The Terrible Swede of Kansas, several days ago enclosing a card making me an honorary member of the Kansas Cyclone Network. "Cyclone" is a good name for this outfit as it is made up of the windiest bunch in forty-eight States and Canada.

Organized to eliminate much of the QRM on the phone bands by tying up some of the interfering stations in a roundtable, the Kansas Cyclone Network is an amateur body without dues and sans regular meetings. Most of its members are 160-meter phone men. However, there are also members who operate on the other phone bands as well as the C. W. bands. With the exception of a small group known as the Northwest Kansas Cyclone Net the organization is without officers. In conjunction with the Nebraska net they publish *Radio Times* as an official paper.

At the present time the net is being extended to other states. The only change that is made is in the name of the state. Nebraska, Missouri and Kansas are all operating successful nets and we sincerely hope other states will soon follow suit.

Here, at last is a successful method of eliminating much of the hash that now prevails on our phone bands and at the same time sponsor a friendly attitude that is bound to be of value to both beginner and OT.

If any of the gang are interested in forming such nets in their own states or joining an already existing one, we suggest that you drop us a line and we'll endeavor to place them in touch with the fellows who are interested.

✦

INCIDENTALLY, the boys out Kansas-way are doing a lot of talking about W9DSR of Greenleaf, who works more 160-meter phone dx with 3 watts than the rest do with 40 and more. FWY has promised us a photo and description of DSR's rig, so look for it in an early issue.

✦

OLD-TIMERS will soon be hearing a once-familiar fist when W8QIX gets on the air. QIX is the new call of Frank MacDonald, whose fist used to pound brass in the China Sea for the Admiralty Line. Some of you OT6's may remember him as R. I. at San Francisco around 1919 and 1920. Frank is now a motion picture projectionist for the Jam Handy Picture Service. The QRA will be 12314 East Outer Drive, Detroit, Michigan. 500 watts on 40 and 20 meter c.w. should make him WAC in no time at all.

✦

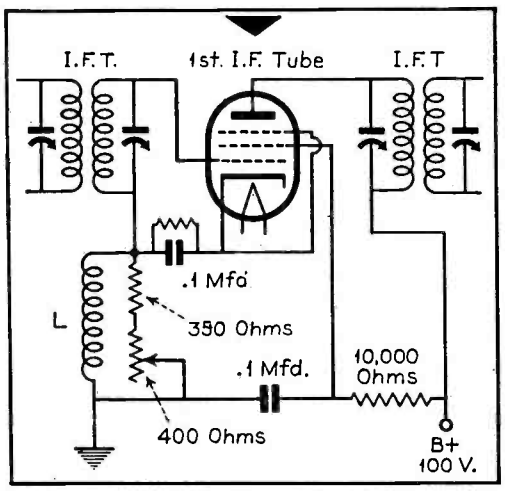
SPEAKING of 8's, FSA is maintaining *regular* schedules with Africa on 10-meter phone from his QRA in Royal Oak, Michigan. 100 watts into a Johnson "Q" is putting his sigs down where they belong; a beautiful 14-tube home-constructed super brings in more answers to his CQ's than he can handle. FB.

✦

VE2MC certainly has an appropriate call; you can cut Mac's Scotch accent with a very dull knife. Located at Verdes, a small village just outside of Montreal, MC uses a 40-meter crystal to swing a 59 tri-tet; the 59 drives an RK-23 as doubler to excite four RK-20's in push-pull parallel with an input of 150 watts. MC is consistently RST 589 here in Detroit and from general reports cuts a nasty swath through the east coast QRM. As far as we know 20-meter phone is the only band he is using.

✦

ANOTHER OT to write this month was Carl Drumeller of W9EHC, in Colorado Springs. EHC dates his brass-pounding from 1919. In between times in the shack he teaches radio in one of the local schools with Radiotelephone First and Amateur Class A tickets on the wall.




**Simple circuit of regenerative i.f. stage for sniggle-sniggle results.**

✦

JUST WHY W3EWW down east pays the electric power company so much money when he gets in here just as well with 50 watts input as with his normal 225 watts is a little too much for us. It is a fact that EWW puts in just as good a signal with the low power as with the high. Of course, a Johnson "Q" 90 feet above ground on steel masts should make a signal get out and go places. The rig uses a 40-meter crystal and a 47 in the oscillator capacity coupled to an RK-23, link-coupled to an 825, link-coupled to a pair of 825's in push-pull. W3EWW really puts Baltimore on the 20-meter phone map. FB, OM.

✦

HEARD W3FUI telling W4COW on 40 meters that he had just returned to the air after a long lay-off. Glad to have you back, OM; one more in the 40-meter pot won't make it any worse. That is, if 40 can be made worse. Even single-signal doesn't help much. We are using both a crystal filter and a regenerative i-f stage in order to slice through the terrific QRM that exists on that band. Perhaps we're wrong, but we believe that the power input allowance on this band should be materially reduced if any degree of satisfaction is to be obtained by the majority from its use.

Now don't get us wrong—we are not advocating reduced power on all bands. That would be a fallacy that would undoubtedly cripple the art, but we do believe that 100 watts input is all that is justified on 40 meter c.w. under present conditions. Moreover, we know from actual experience that 100 watts input in conjunction with a *modern* receiver is entirely adequate for WAC dx.

As a practical example—although he'll probably be surprised to find himself put up as an example—take W9RSL of Moline, Illinois. RSL uses only 50

[*Continued on page 56*]

# "BARB AND "ERNEST"—

# "THE VALVE

### *Sun-Through-The-Clouds*

*Dear Gerald:*

You're getting a joint letter this time because our "reactions are in resonance." Hi! Barb and I think your last letter was a revelation. It certainly clinched a lot of points that were worrying us—so now the sun is shining through the clouds.

The valve idea certainly covers a lot of territory, and it seems to us now that once a person gets it into his head that coils, condensers and chokes have critical acceptance or non-acceptance points of frequency where they go into action, that half of the story is told. I don't see that it's even necessary to know all about reactance, impedance, etc., if you think of the electrical currents as water and the radio parts as valves in the pipe line (circuit to you). If you see things that way, then all you have to remember is what values of capacity and what-not are needed to pass or block a current. It's all very simple!

Remember 'way back when the code had us loco? Now we think nothing of it. That's one worry behind us. Now we've put a couple more bad spells behind us and await with interest and confidence the dope on complete circuits. Make it soon.

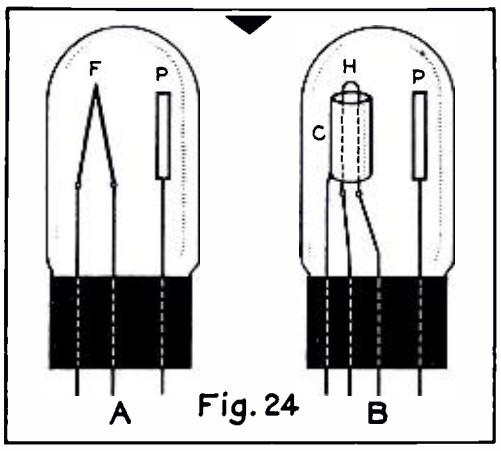
*Barb* and *Ernest.*

✦

### *Valves That Are Valves*

*Dear Barb and Ernest:*

Swell. In a few more months I'll be expecting you to tell *me* things. I've always wanted the real low-down on what an electrical current is. It's supposed to be electrons in motion, and that's probably the case, but there is still a great deal to be learned about these fundamentals.




**Simplest type of vacuum tube: A, battery type; B, a-c type. These are diodes.**

And speaking of electrons in motion brings us to the valve of valves—the vacuum tube. The operation of this device is also based on electron motion or flow, but the flow in this case is through *space*—not through a wire. The electrons, which are negatively-charged particles, are made to fly through a vacuum from one conducting element to another and thereby connect an otherwise open circuit. In this manner an electrical current is made to flow through space.

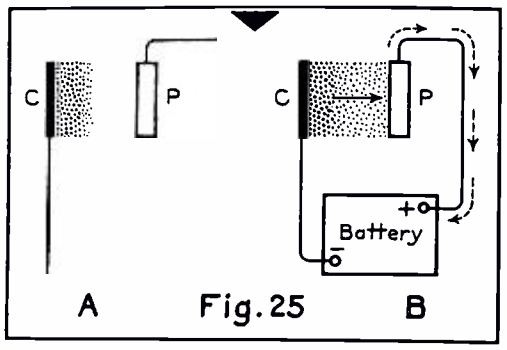
The simplest type of vacuum tube is shown at A in Fig. 24. It consists of a filament, F, and a metal plate, P, enclosed in an evacuated glass or metal envelope. Since there are but two electrodes, the tube is known as a *diode.*

If current from a battery is passed through the filament, intense local heat is developed in the filament wire. This heat increases the motion or vibration of the electrons in the filament wire to such a degree that electrons break away from their mother atoms and fly off into space, in much the same manner that steam is liberated from boiling water. This is known as *electronic emission.*

In many types of modern vacuum tubes the filament is not relied upon to supply the electronic emission. Instead, the filament is merely employed to heat a separate element, called the *cathode,* which in turn provides the electronic emission. The filament, in this case, is often referred to as the *heater* since heating the cathode is its only function. This arrangement is shown at B in Fig. 24, where C is the cathode, H the heater and P the plate. Though this tube actually employs an additional element, it is also referred to as a diode since the filament is put to the sole job of heating the cathode and is no longer an actual part of the electronic circuit. Since the cathode is the emitter of electrons, we can disregard the heater for the time being as it plays no other role in the functioning of the vacuum tube apart from heating the cathode.

### *Space Charge*

Therefore in A of Fig. 25 we have shown only the cathode, C, and the plate, P. Since the cathode is heated, electrons are liberated. Though a few of these electrons may reach plate, P, the majority of them remain close to the cathode, as shown. This cloud of electrons is known as the *space charge,* and it is important to know why such a cloud exists when it would seem more probable that each electron would continue its journey through the evacuated area within the tube envelope.




**Electrons from the cathode are drawn to the plate when the latter is given a positive potential.**

To begin with, it should be remembered that each and every electron is a negative charge of electricity; no positive electrons (protons) escape from the cathode. In all instances, therefore, we are dealing with electrical charges of negative value. Now it so happens that electrical charges of the same character *repel* each other, whereas electrical charges of unlike or opposite character *attract* each other. The only two characters electrical charges can have are *positive* (plus) and *negative* (minus). Therefore, since all electrons are negative, they tend to *repel* each other.

Now let us return to A of Fig. 25; electrons liberated from the cathode travel off into space but with decreasing velocity. They therefore form a negatively-charged area around the cathode that tends to *repel* the outward transit of additional electrons. If the negatively-charged area, or *space charge,* is sufficiently intense, it will force electrons back into the cathode. Under such a condition few if any electrons are able to break through the barrier and reach the plate; instead, they are turned back and either return to the cathode or become a part of the space charge.

But remember that unlike signs (minus and plus) *attract* each other. Therefore, if a positive voltage is impressed on the plate, P, of the tube, by connecting the plate to the positive terminal of a battery or some other source of positive voltage, the plate itself will *attract* the electrons emitted by the cathode.

# EMBRYO RADIO HAMS OF VALVES"

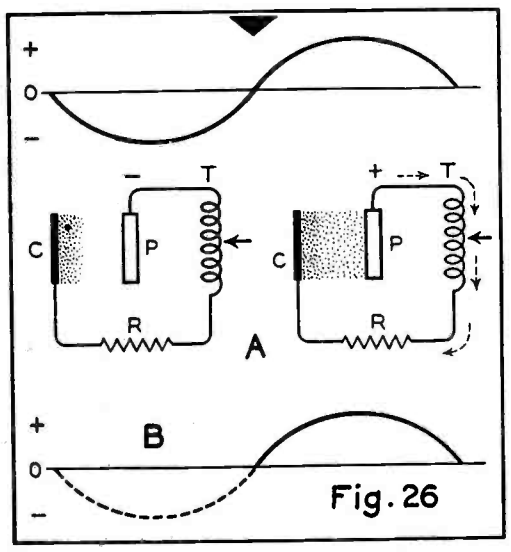
This is shown at B in Fig. 25, where the electrons are seen to be flowing from cathode to plate. This electronic flow constitutes an actual electric current in the space between cathode and plate, almost as if the cathode and plate were connected together by a wire. The current thus developed flows from the cathode to the plate and back to the battery through the plate connection, as shown by the arrows.

### *"One-Way" Tube*

It is obvious that under no conditions can the current flow from the plate to the cathode—in other words, the tube is a one-way proposition or uni-directional. Increasing the positive voltage will, of course, increase the flow of electrons from cathode to plate, and therefore increase the current flow in the plate circuit, but if the plate is made *negative* instead of positive it will *repel* the electrons and no current will flow. The diode therefore functions as an electrical valve that will permit current flow in one direction but not in the other.

It is this characteristic of the diode that provides a means of converting or "rectifying" an alternating current into a direct current. The diode is therefore useful as a signal rectifier or "detector" in a radio receiver, and as a power rectifier in the unit employed to change the a.c. house current into a direct current for the operation of a receiver or transmitter.

The rectifying or detection properties of a diode will be better appreciated by reference to the sketches shown in Fig. 26. Here we show two diode circuits




**Illustrating the one-way action of a simple diode rectifier tube.**

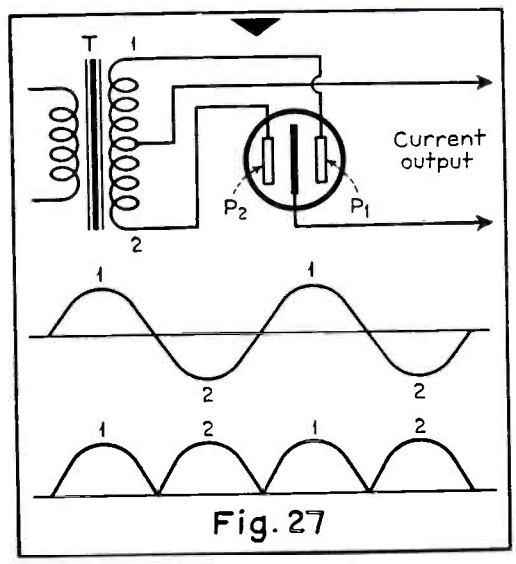
that are identical except as to operating conditions. The tube in each case is represented by the cathode, C, and the plate, P. The plate circuit contains the secondary winding of a radio-frequency transformer, T, and a resistor, R. The latter component completes the circuit back to the cathode of the tube. Above these two circuits, and in the proper relation to them, is shown a graphic representation of one complete cycle of a radio signal. The straight line indicates zero voltage while the curved lines represent the excursions of the signal voltage into the negative and positive regions—in other words, a negative and a positive alternation.

Assume this signal voltage to be impressed upon or developed in the secondary coil, T, of the radio-frequency transformer, as indicated by the arrow. During the negative half of the cycle, the plate, P, of the diode is negative, as indicated in the left diagram, and as a result the plate repels the electron flow from the cathode and no current flows. However, during the positive half of the cycle, as indicated in the right diagram, the plate is positive and therefore attracts the electrons from the cathode. The result is that current flows in the plate circuit, as shown by the small arrows. This current flows through the winding, T, and the resistor, R, back to the cathode. If a pair of headphones were connected across the resistor, the signal could be heard.

A graphic representation of what actually takes place is shown at B in Fig. 26. This is also related to the diagrams, and indicates that during the negative half of the cycle no current flows in the output circuit of the diode but that current does flow during the positive half of the signal cycle. It is clear from this that the negative half of the cycle is eliminated or lopped off by the uni-directional behavior of the diode. The resultant signal is therefore composed of a series of "humps" or pulsating unidirectional currents separated from one another by the time durations of the negative halves of the cycles. Since only half of each cycle of the signal is utilized (the negative halves being "killed off") the simple diode is known as a "half-wave rectifier."

### *Full-Wave Rectifier*

If a second plate is added to the diode,




**Illustrating the action of a full-wave rectifier tube.**

full-wave rectification may be obtained, as shown in Fig. 27. In this case we have shown the tube connected to a power transformer, T, the primary of which we will assume to be connected to a 110-volt line. The secondary winding has a center tap. The disposition of the voltage developed in this winding will be such that the center tap will be at zero voltage with respect to terminals 1 and 2, and during the period terminal 1 is positive, terminal 2 will be negative. Therefore plate P1 will draw current while plate P2 is idle, and vice versa. In this manner both the positive and negative halves of the cycles are utilized and the resultant output current is a series of unidirectional pulses with no spacing between them, as shown below the alternating current graph. In other words the negative halves (2) have been made to assume the same direction as the positive halves (1).

Though half-wave and full-wave diodes make excellent rectifiers and detectors, they cannot be employed as amplifiers. This brings us to the three-element vacuum tube, or *triode,* which can be used as an amplifying detector in a radio receiver or as an amplifier of radio or audio-frequency voltages.

### *The Triode Tube*

The elements of the triode are shown in the simple diagram at A of Fig. 28. There is the heater, H, the cathode, C, and the plate, P, just as they are in the diode. The third element, G, is a mesh-like structure of fine wire interposed between the cathode and the plate. It

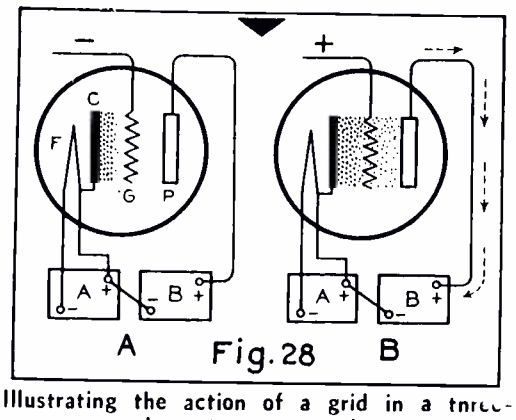


Fig. 28

Illustrating the action of a grid in a three-element vacuum tube.

is called the *grid* or, in tubes having more than one type of grid, the *control grid.*

As in the case of the diode, there is the cloud of electrons in the vicinity of the cathode. Forgetting the grid for the moment—we know that this space charge can be at least partially dissipated by placing a positive voltage on the plate of the tube, and furthermore that the greater the value of the positive plate voltage the more electrons the plate can draw from the cathode. However, a point is finally reached where a further increase in plate voltage does not bring about an increase in electron flow. This is called the *saturation point* of the tube.

Now, for the sake of the example, let us assume that the voltage on the plate of the tube shown in the circuit at A in Fig. 28 is of such a value that the greatest possible number of electrons are being drawn from the cathode. In the circuit under discussion the heater obtains its energy from a battery marked "A." The filament or heater supply is always referred to as the "A" power. The voltage of this supply is much too low for the plate, so an additional battery or other source of power is provided for the plate. This is known as the "B" battery or "B" power supply, and its voltage may be anything from 180 to 250 or 300 volts, depending upon the type of tube and the conditions under which it operates.

### Function of Grid

Under these conditions there is maximum electron flow from cathode to plate. Now consider the grid, G. It is of open structure and therefore the electrons pass freely through it. But suppose we place a *negative* voltage on this grid. We know that like signs repel each other, and it is therefore evident that the grid is going to repel the electrons and thereby prevent them from reaching the plate. The grid is therefore much like an electrical control valve. If the negative grid voltage is made high enough a point is reached where the flow of electrons to the plate ceases altogether. The negative grid voltage at which plate current cut-off is reached is known as the *cut-off bias.*

Now suppose that instead of placing a negative voltage on the grid of the triode we gave it a positive voltage, as shown at B in Fig. 28. This looks like a good scheme, as in this instance the grid *attracts* the electrons and thereby increases their speed toward the plate. Moreover, the positive grid tends to dissipate the space charge around the cathode. It appears, therefore, that a positive potential on the grid would be a good thing—but it isn't, except in certain forms of power amplifications that you will learn more about later.

When the grid is positive a number of things happen. In the first place the grid begins to function like a plate with the result that not only is there a flow of plate current but also a flow of grid current. This condition, which you will appreciate more thoroughly as you learn more regarding load conditions and vacuum-tube characteristic curves, will introduce losses into the grid circuit, affect selectivity and sensitivity in a receiver, and cause a form of frequency distortion in both r.f. and a.f. amplifiers. A positive grid will also intensify a condition known as *secondary emission,* which amounts to the bouncing off of high-velocity electrons from the surface of the plate. These electrons tend to reduce the number of cathode electrons reaching the plate, and therefore decrease the amplifying properties of the tube. In most cases, secondary emission is an undesirable condition; it is sought only in special types of tubes not ordinarily employed in radio work.

It may be assumed, then, that the grid of a triode should always be maintained at a negative voltage. This will be understood more readily by reference to the circuit of Fig. 29, illustrating the essentials of a radio-frequency signal amplifier.

### Amplifier Action

The first point that should be clearly understood is that the vacuum tube is a *voltage-operated* device; that is, the action of the tube is controlled by the degree of voltage impressed on the plate in the case of a diode, or on the grid in the case of a triode or other more complex types of tubes. The second point that should be clear is that in the case of the diode the plate voltage is the signal voltage itself and therefore there can be no amplification of the signal. But in the case of the triode the plate voltage is obtained from a separate source and this is, to all intents and purposes, "triggered off" by the signal voltage impressed on the grid. The signal output in the plate circuit is therefore an amplified version of the signal input in the grid circuit. Or, to put the matter in another way, the diode is controlled by the signal voltage whereas the triode is controlled by the grid upon which the signal voltage is impressed.

Now, we wish to maintain the grid at a constant negative potential. This we do by adding to the circuit a "C" battery, with its negative terminal connected to the grid through the coil L. We will assume that the value is 4 volts. This is sufficient to reduce considerably the flow of electrons from cathode to plate, but is not sufficient to produce plate-current cut-off.

We have indicated an incoming signal, S, directly above the coil, L. It is to be assumed that this is the voltage being induced into the coil from a primary winding, as indicated by the arrow. Two complete cycles of the signal are indicated, and they are marked accordingly. We will say that the highest potential attained at the peaks of these cycles is 3 volts, or 1 volt less than the grid bias.

### Grid Voltage Variation

Now let's see what happens. As the first cycle of the signal starts its excursion from zero voltage to a positive peak value, the negative bias on the grid will alter from 4 volts to a minimum of 1 volt, as the positive signal voltage will tend to cancel the negative bias voltage by simple subtraction. Then, as the signal starts into a negative excursion, the grid voltage will rise in negative value and reach a peak of 7 volts, in this case the negative signal and bias voltages being additive.

The result is a variation in grid voltage in conformance with the signal, as indicated by the graph, G, shown directly above the grid. It will be noted from this graph that, though the voltage of the grid varies over fairly wide limits, it never extends over the zero-voltage line into the positive region. Therefore the grid is never driven positive by the signal and in consequence there is no flow of grid current at any time. If the signal had a peak of 5 volts, however, the grid would go 1 volt positive during positive excursions of the signal voltage.

In the meantime the variation in neg-

*(Continued on page 53)*

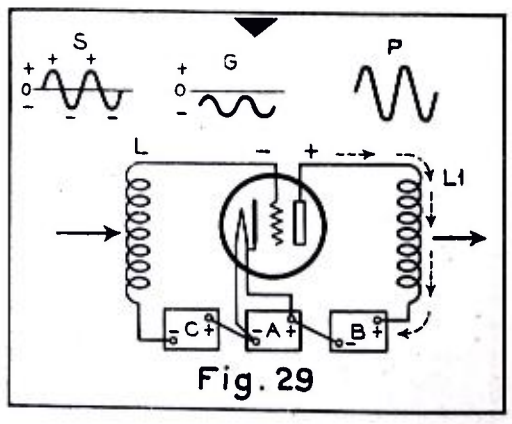


Fig. 29

The functioning of a triode, illustrating how it amplifies a signal.

# Backwash

## Orchids

*Editor,* ALL-WAVE RADIO:

First "Orchids": October issue—"Editorial Quotes"—J. B. L. Hind's Department—Hart's "Ham Bands"—Foreign B.C. Station List. No issue ever hit me so hard and I'm from the days of "Modern Electrics" and earliest issues of *QST*. I've a collection in two cedar chests that represents the cash for a KW station and no exaggeration.

Second. I'm not connected commercially in any way with the industry. Mag looks free from "ole" propaganda—rate now SWL and re: Editorial SML—"serious minded listener."

The bottom paragraph (center) of page 429 is the meat of the matter—and you may be surprised at the response. My hobby (15 year log.) has been observation of skip effects relation to DX, power, frequency, seasons, etc. and sunspot correlation but *one alone* can do so little even with 100,000 observations over a long period. DX clubs could have a real task and our local club will assist in group reporting.

I've never had any difficulty securing QSL's "Hams or S.W.B.C. stations, because I've told 'em of my hobby.

Set up the machinery and clearing house. I'll guarantee the flood of reports and material will swamp you.

J. F. SATTERTHWAITE,
TOLEDO, OHIO

*How about the "Electrical Experimenter" and "Wireless Age"? We had a flock of those until recently. Hope we get the flood you predict—Ed.*

✦

## The GCDX Club

*Editor,* ALL-WAVE RADIO:

The Globe Circlers DX Club was first organized by a group of DX friends at Hackensack, New Jersey, in September, 1932. It was founded on the hopes of making dxers better acquainted with one another, keeping each other posted on latest dx news tips, etc. It grew slowly at first, but as it gradually gained prominence among other radio units the membership increased more rapidly. The volume of work in its running gradually became too heavy for the founders to bear, so in February, 1935, practically all of the present officers took over operations and established headquarters in Brooklyn, N. Y. With renewed vigor a membership campaign began that tripled the membership during the summer of 1935. It became known among dxers everywhere as the club of real friendship with the feeling of good-fellowship held high by all members. It gained further strength by absorption of the Mid-County DX Exchange in January, 1935. Now it holds one of the high spots among dx clubs throughout the world.

In the official bulletin called the "Hot Spot," the endeavors of the officers to give the members what they want is carried out at all times. Such features as: Singleton and Eliminator contests for both short-wave and broadcast band, latest news from broadcasters the world around, including the news direct from our own Federal Communications Commission, cartoon page giving caricatures of members, schematic diagrams of reception gadgets submitted by members, etc. Tip page giving latest dx tips and mailbag containing news from members; and then an excellent Short Wave Department conducted by none other than Joe Stokes, ace dx commentator of radio station KDKA and W8XK. Many other features are also included in each issue of the "Hot Spot." Tips are sent out weekly during the regular DX season, so that dxers are always kept informed of latest dx broadcasts.

A Courtesy Programs Committee offers an opportunity for the ardent dxer to aid himself as well as others by arranging special dx broadcasts from hard-to-get stations. The committee stresses quality in these broadcasts, not quantity.

Why not send for sample bulletin? Address your request to GCDXC at 254 Cleveland Street, Brooklyn, N. Y.

RAYMOND S. SWENSON,
ROCKFORD, ILL.

✦

## Wants Proving Post "As Was"

*Editor,* ALL-WAVE RADIO:

I have every issue of your magazine from the first and think it is the best general-interest radio magazine on the market. I do not agree with those who wish to have the "Radio Proving Post" written in more technical language, as this would make it useless to many of us who know practically nothing about that phase of radio but are interested in radio receiver performance.

I do not know of any changes which I would recommend as I am very well satisfied with your magazine the way it is.

EDWIN PETERMAN,
SAULT STE. MARIE, MICH.

✦

## Each to His Favored Band

*Editor,* ALL-WAVE RADIO:

Your editorial on forming a society to study reactions of radio was read in your October issue of ALL-WAVE RADIO and I think it is a very good idea.

As I have been a very steady B.C. and S.W. listener for a number of years I find there is very much that is unknown of reception to the fans. Much good could come from just such a society.

My suggestion is, if you do form such a society and have enough members, to let each member take the wavelength he or she is most interested in. By that I mean, some never listen to the B.C. bands and play with S.W. all of the time. They could give more correct information than a new B.C. listener coming down to S.W. For myself, I listen to all at times, although my most interesting are the ham fone bands. Spend much time on the 20 meter fone band. Others hardly ever go on that. So by giving each the bands he or she is interested in, there should be a wealth of information coming in each month.

SPENCER E. LAWTON,
WESTERLY, R. I.

✦

## AWR "Esquire" plus "Time"

*Editor,* ALL-WAVE RADIO:

Your magazine contains many articles that others, such as _____ and _____, do not have. There is always plenty of good reading material no matter whether one is interested in DX, new transmitters, radio time tables or what not. I particularly like "Globe Girdling" conducted by Mr. Hinds, who is one of my dearest friends. His articles are an inspiration to all who enjoy DX.

The manner and form in which your magazine is printed, as well as the fine paper and printing, puts it in a class by itself; I might say it is the "Esquire" and "Time" of all radio literature.

DONALD I. GROSS,
W. ASHEVILLE, N. C.

*(Thanks for the nice compliment. Now, if we could only get 'hold of Petty!—Ed.)*

✦

## Clean Signal

*Editor,* ALL-WAVE RADIO:

Thanks for a radio publication that recognizes the "man-who-wants-the-facts-without-the-hooey."

I don't know very much about radio. I play around with an old receiver, but that's all.

I'm awed by every other radio publication save ALL-WAVE RADIO. It comes across with the dope, and the QRM of "ballyhoo"—pictures that mislead the inexperienced reader—biased opinions—these are not in your signal.

AWR is about R9 plus around here and I read your articles and departments without being afraid I'll be "left out" in a flood of "glorified mush."

Thanks again, particularly for your complete Station Identification feature—your department men, genuinely expressive and well informed.

Thanks for a real radio magazine for just another fellow who is trying to "get the dope."

WILLIAM AUMENT,
GRAND RAPIDS, MICH.

*(To date* AWR *has been put in a class with* Fortune, Esquire and Time. *Your remark should spike any references to* AWR *being in a class with* Ballyhoo.*—Ed.)*

# A Five-Meter "Transceptor"

## "UNIVERSAL" UNIT FOR 6 OR 110-VOLT OPERATION

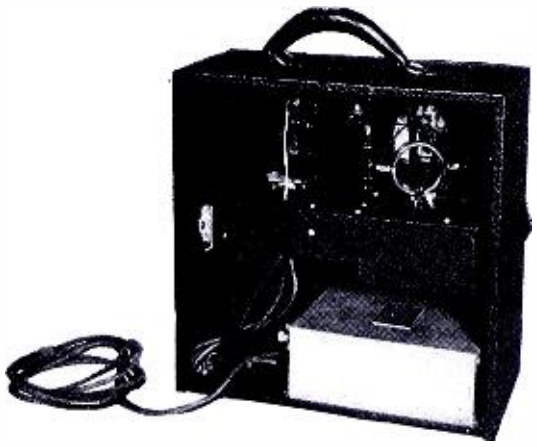
By Frank Lester • W2AMJ*

THE term "Transceptor" is unfamiliar to some of the readers and it might be well to preface this article by an explanation of just what the device consists.

The word itself implies that it is a combination receiver and transmitter, but the great difference between a "Transceptor" and a "Transceiver" is in the fact that the "Transceptor" incorporates two entirely individual units for reception and transmission and only employs the audio section for both purposes. Most "Transceivers" employ the entire circuit for transmission and reception. On the other hand, the "Transceptor" does not make use of the entire circuit for both purposes. It will be obvious, therefore, that a "Transceptor" unit will be more effective, for it consists of a very carefully designed and sensitive receiver in conjunction with a suitable transmitter, both units having high over-all efficiency.

### *Battery-Operated*

The 6-volt, or Universal "Transceptor" is the result of many months of painstaking research and it is, in our belief, the first device of its kind which is capable of operating from a 6-volt storage battery. Battery operation eliminates the usual power-supply noises and provides a high degree of reception. Anyone who has had some experience in adapting the several types of power supplies operating from the 6-volt storage battery to 5-meter and other high-frequency receivers will readily appreciate just what the foregoing statement means,



**Rear view of the Universal Transceptor. The 6-volt power-supply unit is located at the bottom of the case.**

as it is almost impossible to filter any of the heretofore available power-supply units which were operated from a 6-volt source.

Several months of unsuccessful endeavor to employ motor-generators with 5-meter receiving equipment resulted in the abandonment of this type of power supply in favor of the vibrator type

**Front view of the Universal Transceptor, showing controls and location of compartment for the handset.**

which we were able to filter, thus providing good reception. The main drawback of all of the available vibrator types of power supply is their voltage and current limitation. This drawback was overcome by the development of a new vibrator unit which has been incorporated in the "Transceptor." This supply unit develops 300 volts at 100 ma, and it is just as efficient as the average motor-generator. The efficiency of this unit is 50%.

### *Receiver Layout*

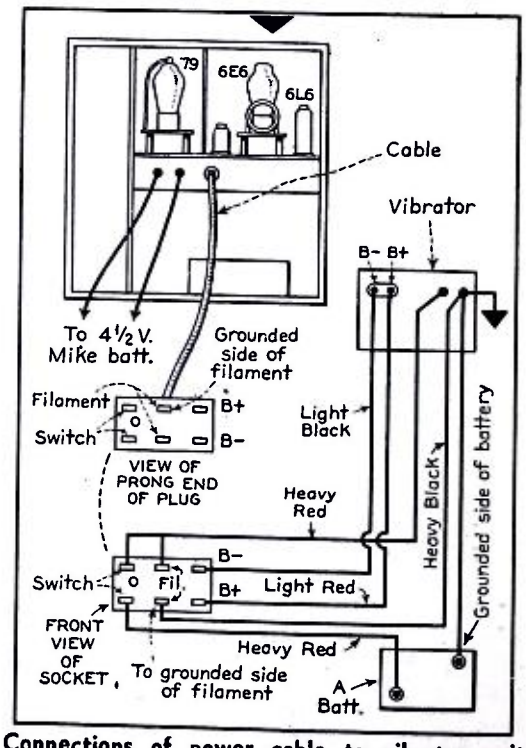
We illustrate this article with complete circuit diagrams of the 6-volt "Transceptor," and show that the tubes are used in the following manner: one type 6K7 tube is employed as a semi-tuned r.f. amplifier which works into a type 79 tube, which serves as a combination super-regenerative detector and first audio amplifier. As the 79 tube is a dual triode, one of these triodes is employed in the new very popular "Minute Man" super-regenerative detector circuit, the output of this being resistance-capacity coupled to the second triode of the tube, which functions as a resistance coupled amplifier. In the receiver position the output of the second triode of the 79 is resistance coupled into the grid circuit of the new 6L6 beam power tube which is employed as the second and output audio amplifier, making it possible to employ any of the permanent-magnet or magnetic type speakers, as more than sufficient audio output is obtained to operate them.

### *Transmitter Layout*

In the "transmit" position, the transmit-receive switch automatically connects a special microphone input transformer in the grid circuit of the second triode of the 79, which now becomes a speech amplifier driving the 6L6 which also, due to the switching arrangement, is now the modulator for the 6E6 unity coupled oscillator. We are therefore only using four tubes, and due to the dual function of the type 79 both in the "receive" and "transmit" positions, we actually have the equivalent of five tubes. 100% modulation is obtained as well as exceptionally good quality.

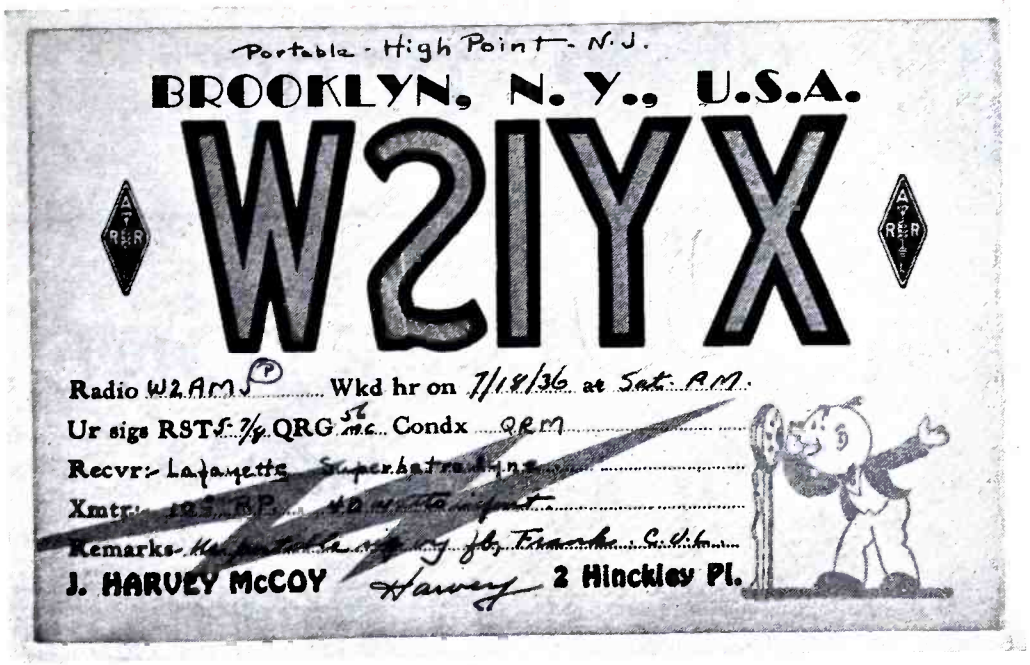
### *Receiver Circuit*

The receiving circuit employed in the "Transceptor" needs no introduction to the Amateur Fraternity for it is, in the author's opinion, now the most popular super-regenerative detector circuit being employed on the 5-meter amateur band. The advantages of this circuit are increased selectivity and very little radiation when properly adjusted, with good




**Connections of power cable to vibrator unit and storage battery.**

*Chief Engineer, Transmitter Division, Wholesale Radio Service Co.




QSL card received by Lester from Harvey McCoy, acknowledging 60-mile QSO on 5 meters.

audio output. Due to the fact that we are employing the 6K7 semi-tuned r.f. amplifier, practically all re-radiation is eliminated, regardless of the adjustment of the detector, as well as a very slight gain obtained in this stage. This detector circuit has also the advantage of being operated as a straight regenerative or autodyne detector, as well as a super-regenerative detector. Either of these conditions is obtainable by different settings of the regeneration control, which controls the plate voltage applied to the detector tube.

We have also found it possible, due to the stability of this circuit, to obtain what is, in a sense, a hissless super-regenerative action, for if the regeneration control is adjusted critically to a point just below where it starts to hiss, an incoming carrier or received signal, if it is of sufficient strength, will trigger the detector tube into super-regeneration. This adjustment, as mentioned previously, is critical and also depends upon the strength of the signal that is being received, insofar as successful performance in this respect is concerned.

It is therefore possible to do away with the annoying hiss when good conditions prevail, which means that when the station carrier is not present, the usual hiss of super-regeneration will not take place. This is only an added feature when the receiver is being employed for quite a period of time during standby for test periods, for usually, immediately after transmission from the station being contacted is finished, the switch is thrown to the "transmit" position. This feature does, however, allow good high-fidelity reception from stabilized transmitters of the MOPA or crystal-controlled type, as it is not necessary to have the super-regenerative action which tends to affect high-fidelity reception to some degree. On the other hand, when the receiver is being employed in a car or noisy location, super-regeneration may be employed, resulting in the cancellation of a lot of noise, as well as increased sensitivity.

### *Transmitter Circuit*

Vernier tuning dials are employed on both the transmitter and receiver controls, the ratio being high enough for more than comfortable tuning adjustment. The frequency range covered by the receiver is from approximately 50 megacycles to 62 megacycles. The transmitter or oscillator portion of this unit, as previously explained, uses a single 6E6 dual triode tube in the popular unity coupled circuit, due to the proper circuit constants being chosen, and the fact that both cathode and grid leak bias is employed, a very stable oscillator is the result.

No tendency toward creeping was noted when this unit was being tested in the field, and it was actually received on superheterodyne receivers, all reports remarking at the stability and quality that was put into the air by this unit.

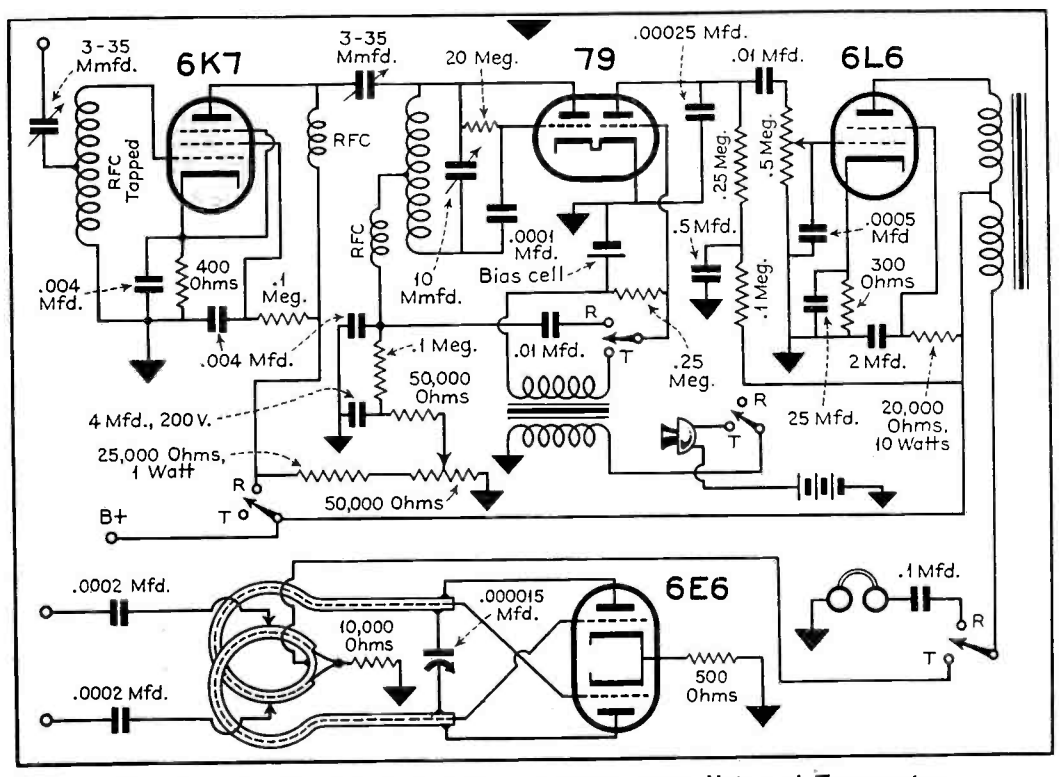
### *The Power Supply*

The power supply is completely shielded and built into the special case housing this equipment. In order to avoid any possible inductive hum or noise pick-up being amplified in either the "transmit" or "receive" positions, a special hum-balanced microphone input transformer is used. This transformer is not in the circuit at all when in the "receive" position, as better quality was obtained by using resistance coupling. Absolutely no noise is picked up by this transformer in the "transmit" position. The signal produced by this transmitter is actually quieter than any a-c operated transmitter, for the power supply is so completely filtered, that there is not a trace of hum or any other noise on the carrier, making it sound like "B" batteries, or a very well filtered a-c power supply transmitter.

The entire unit is self-contained, including the built-in 6-volt power supply, in a case measuring 15"x15"x7½", and is therefore hardly larger than a portable typewriter. The weight of the complete unit, equipped with tubes is 33 pounds.

An a-c power supply can be used externally, however, which is why this unit is called a "6-volt *Universal* Transceptor." Merely by removing the back cover and interchanging plugs, the unit can be converted from 6 volt d.c. operation to 110 volt a.c. operation.

*(Continued on page 54)*




Complete circuit, with parts values, of the 5-meter Universal Transceptor.

# RADIO PROVING POST

## SEARS, ROEBUCK SILVERTONE

### MODELS 4465 · 4485 · 4565 · 4585

THESE four receivers use the same chassis, and vary only in the cabinets and speaker sizes. The chassis is obtainable in an upright table design (model 4465 upon which tests were made), horizontal table type and in console cabinets. These receivers are all in a sub-medium price class, and are representative of the excellent values that many manufacturers are engineering into their 1937 model receivers. They are full-size sets in every respect (as contrasted with cheap midget and toy types) with adequate baffle area for genuinely good quality reproduction. For instance the baffle area of model 4465 is close to three square feet which is practically identical with the area of good table models selling for two to three times the price of the Silvertone.

#### *Special Features*

These models also incorporate other features rarely found in receivers selling in the lower price brackets—including automatic sensitivity control, tuned antenna circuits on all three bands, tuned pre-selector and r-f amplifier on all bands, a separate oscillator, a fairly sensitive electronic tuning eye (about as good as one can do without amplified a.v.c.) and a goodly complement of controls, to wit: volume control, wave-band selector, tuning control, high-fidelity adjustment, and, lastly, a continuously variable (rather than two, three or four-point) tone control.

The Silvertone (there are many Silvertones, but we are of course referring to the chassis models referred to above) is an all-wave 8-tube (counting the tuning indicator, 6G5 tube) superheterodyne for a-c operation, 105 to 125 volts, 25 and 50-60 cycles. The power consumption of all models, regardless of voltage or frequency, is 85 watts—a little more than a satisfactory reading lamp. (This represents from 25c to 50c a month for average operation—depending upon your electric-light rates). The circuit diagram is shown in Fig. 1—in AWR's original co-ordinated or road-map style.

#### *The Circuit*

The antenna section is located from A-1 to E-3. Three posts are provided, for ordinary open aerial operation, and for use of a noise-reducing doublet without necessity for a special coupling transformer. The switch at B-2 (which operates simultaneously with the other wave-change switches at B-4, B-10 and I-18, controlling respectively the r-f, translator or first detector, and oscillator circuits) changes the antenna coils for each band. The r-f tube, the 6K7G, at C-8 contributes to sensitivity, selectivity (with reduction of image frequency response and i-f interference) and a favorable signal-to-noise ratio. The translator or first detector tube (or mixer), the 6L7G at C-16, is electronically coupled to the oscillator—the 6C5 triode at J-16—through the grid circuit of the latter. This arrangement makes for very stable operation, and the frequency drift of this receiver is negligible even on the higher frequency bands. The main tuning condensers of the r-f, translator and oscillator circuits are located respectively at B-5½, B-13 and H-17. One intermediate frequency tube, the 6K7G, at C-20, is employed. The 6Q7G tube at C-24 is a combination detector (or second detector if you prefer), automatic-volume-control tube, and first a-f tube. The diode section of this tube functions as the a.v.c. The diode current flowing through resistor R-8 (F-22) creates a voltage drop varying with carrier strength which is applied to both the 6K7 and the 6L7 tubes for a.v.c. action.

The output tube is a 6N6G pentode at C-29. The undistorted output is 3

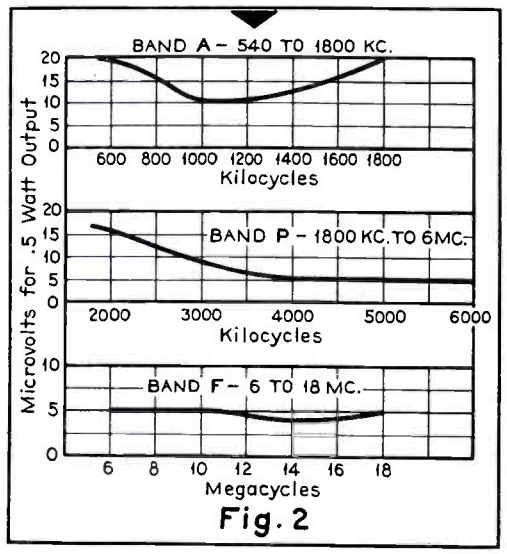


Fig. 2

**Sensitivity curves taken on the Model 4465.**

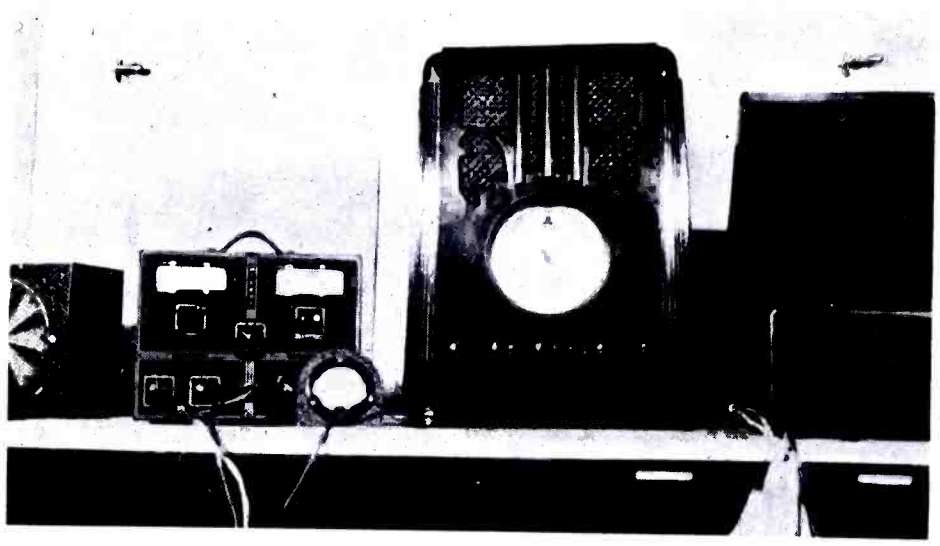


**Fig. 3. Photo taken during tests on the Model 4465 Silvertone.**

watts (ample for almost any home) and it can be pushed to over 9 watts with fair quality. The rectifier is a 5Y3 at J-28. The 6G5 magic eye tuning indicator will be readily located at J-23.

### Receiver Characteristics

The frequency response of the Silvertone is from 50 to 5000 cycles without noticeable attenuation. This is really quite good, though it does not touch some of the more enthusiastic high-fidelity claims. It is decidedly better than the characteristics of other receivers in the same price class, with which this laboratory is familiar—not to mention a goodly number of sets priced higher. The high-fidelity control (or selectivity switch) is shown on the diagram at F-18, and functions by means of varying the coupling in the intermediate-frequency transformer. The difference between broad and sharp tuning is sufficient to eliminate interference between many adjacent channels with unfavorable power ratios, and often to discriminate between piped and studio programs. High frequencies are lost in piped (any program is "piped" by land-wire unless originated at the station to which you are listening) transmissions. Therefore the difference in quality between broad and sharp tuning will be more pronounced on programs received directly from a high-quality station originating them.

The Silvertone covers from 540 kilocycles to 18 megacycles in three bands—A band, 540 to 1800 kc; P band, 1800 kc to 6 megacycles; and the F band, 6 mc to 18 mc. In wavelength, from 550 meters to below 17 meters. Sensitivity is automatically increased on the P and F bands by the switch at K-31 which eliminates resistor R-17 on all but the A (long-wave or low-frequency) band, thus removing the extra bias.

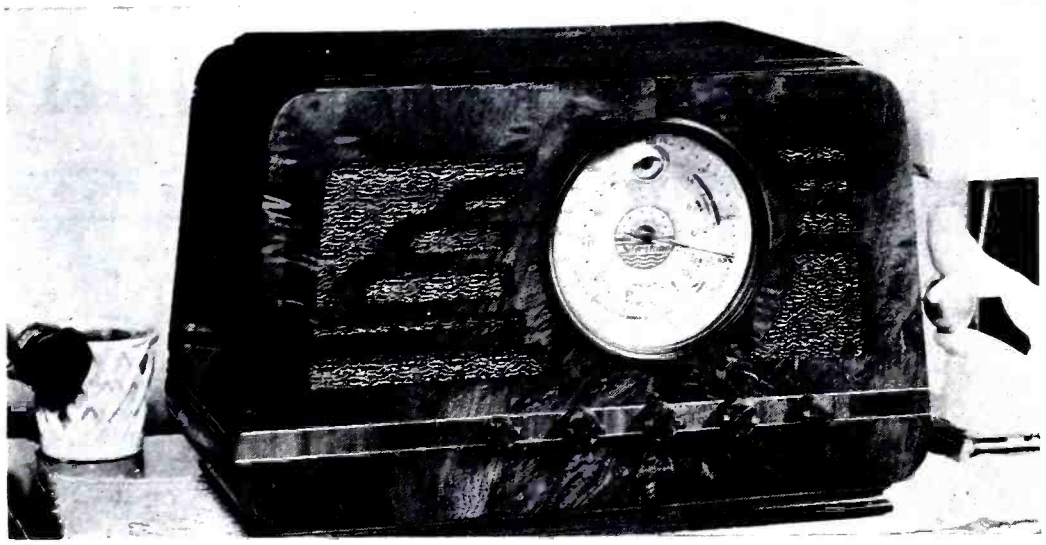


Fig. 4. Photo of the Silvertone Model 4565 which employs the same chassis as Model 4465, shown in Fig. 3.

### Sensitivity Curves

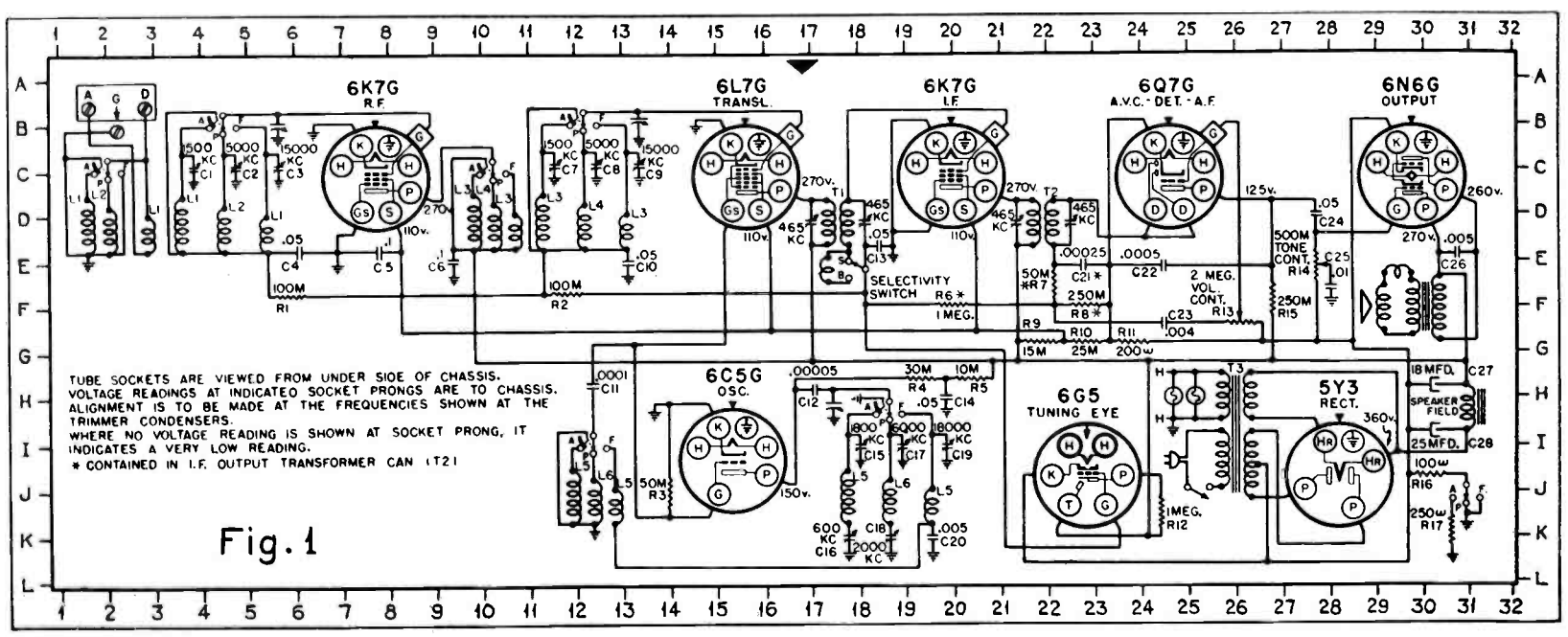
Sensitivity curves on the three bands are shown in Fig. 2. These curves show the microvolts input at different frequencies required to obtain a standard output of one-half watt. That the sensitivity indicated is wholely satisfactory was indicated in air tests. During three weeks of the time this receiver was in the AWR Proving Laboratory, it was used consistently on a 12-foot standardized test antenna by Zeh Bouck in collecting material for "Channel Echoes" and his short-wave column in the New York *Sun*. Mr. Bouck's report is that the receiver was wholely adequate and that everything from the foreign locals (Germany and England) to Australia was logged with excellent volume and quite satisfactory automatic volume control action.

### Mechanical Details

The mechanical details of the Silvertone are, for the greater part, on a par with its electrical efficiency. The dial is well illuminated and measures 7 inches in diameter. Workmanship on the chassis is quite good. It is shipped with glass-octal tubes which may be replaced later, if the purchaser so desires, with the metal type (at his own expense, of course). A 6-inch speaker is used in the table types and an 8-inch in the console models. Both speakers, as will be observed from the diagram, are of the electro-dynamic type. As has been said, the smaller model is capable of excellent quality output. It follows that somewhat superior tone may be expected from the consoles, with the bigger speaker and baffle area.

Larger control knobs would be desirable—particularly on the wave-change switch, where some leverage is necessary. Also, the positions of the various control knobs, other than tuning, are not so clearly indicated as they might be.

The outward appearance of the receivers is very good—the cabinet being expertly finished and the dial glass enclosed. Fig. 3 shows the model 4465 under test. Fig. 4 is a photo of the 4565 horizontal type.




Schematic diagram of the Silvertone receiver chassis dealt with in the accompanying review.

# SHORT-WAVE STATION LIST

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

| KC | Meters | Call | Location | Time |
|---|---|---|---|---|
| 31600 | 9.4 | W1XKA | • Boston, Mass. | Daily 9 A.M.-12 A.M. 3-11 P.M. daily |
| 31600 | 9.4 | W8XKA | • Pittsburgh, Pa. | Daily 12-10 P.M. |
| 31600 | 9.4 | W3XKA | • Philadelphia, Pa. | Sunday 2:30-7:30 P.M. |
| 31600 | 9.4 | W8XWJ | • Detroit, Mich. | Daily 6:15 A.M.-12:30 P.M., 2-5 P.M., 7-10 P.M. |
| 24380 | 12.3 | CRCX | • Bowmanville, Ont. | Experimental |
| 21540 | 13.92 | W8XK | • Pittsburgh, Pa. | 7 A.M.-9 A.M. daily |
| 21530 | 13.93 | GSJ | • Daventry, England | Not in use. |
| 21520 | 13.94 | W2XE | • Wayne, N. J. | 7:30 A.M.-1 P.M. daily |
| 21520 | 13.94 | JZM | • Nazaki, Japan | Irregular |
| 21500 | 13.95 | NAA | Washington, D. C. | (E) Time signals |
| 21470 | 13.97 | GSH | • Daventry, England | 6-8:45 A.M., 9 A.M.-12 noon daily |
| 21420 | 14.01 | WKK | Lawrenceville, N. J. | (P) Phones LSN - PSA daytime; HJY - OCI-OCJ irregular |
| 21160 | 14.19 | LSL | Buenos Aires, Arg. | (P) Phones GAA mornings; DFB-DHO-PSE-EHY irreg. |
| 21140 | 14.19 | KBI | Manila, P. I. | (P) Tests and relays P. M. irregular |
| 21080 | 14.23 | PSA | Rio de Janeiro, Brazil | (P) Phones WKK-WLK daytime |
| 21060 | 14.25 | KWN | Dixon, Calif. | (P) Phones afternoon irregular |
| 21020 | 14.29 | LSN | Buenos Aires, Arg. | (P) Phones WKK-WLK daily; EHY, FTM irregular |
| 20860 | 14.38 | EHY | Madrid, Spain | (P) Phones LSM-PPU-LSY mornings |
| 20860 | 14.38 | EDM | Madrid, Spain | (P) Phones LSM-PPU-LSY mornings |
| 20835 | 14.40 | PFF | Kootwijk, Holland | (P) Phones Java days |
| 20830 | 14.40 | PFF | Kootwijk, Holland | (P) Phones Java days |
| 20825 | 14.41 | PFF | Kootwijk, Holland | (P) Phones Java days |
| 20820 | 14.41 | KSS | Bolinas, Calif. | (P) Phones Far East A.M. |
| 20380 | 14.72 | GAA | Rugby, England | (P) Phones LSL mornings; LSY-LSM-PPU irregular |
| 20040 | 14.97 | OPL | Leopoldville, Belgian Congo, Africa | (P) Tests with ORG mornings and noon |
| 20020 | 14.99 | DHO | Nauen, Germany | (P) Phones PPU-LSM-PSA-LSL-YVR A.M. |
| 19987 | 15.01 | CFA | Drummondville, Que. | (P) Phones north America irregular |
| 19980 | 15.02 | KAX | Manila, P. I. | (P) Phones KWU evenings; DFC-JVE A.M.; early A.M. |
| 19820 | 15.14 | WKN | Lawrenceville, N. J. | (P) Phones GAU A.M. |
| 19720 | 15.21 | EAQ | Madrid, Spain | (P) Relays & tests A.M. |
| 19680 | 15.24 | CEC | Santiago, Chile | (P) Phones OCI - HJY afternoons |
| 19620 | 15.29 | VQG | Nairobi, Kenya, Africa | (P) Phones GAD 7-8 A.M. |
| 19600 | 15.31 | LSF | Buenos Aires, Arg. | (P) Phones and tests irregularly |
| 19530 | 15.36 | EDR2 | Madrid, Spain | (P) Phones LSM-PPU-YVR mornings |
| 19530 | 15.36 | EDX | Madrid, Spain | (P) Phones LSM-PPU-YVR mornings |
| 19520 | 15.37 | IRW | Rome, Italy | (P) Phones LSM-PPU-mornings. Broadcasts irregularly |
| 19500 | 15.40 | LSQ | Buenos Aires, Arg. | (P) Phones daytime irregularly |
| 19355 | 15.50 | FTM | St. Assisse, France | (P) Phones LSM-PPU-YVR mornings |
| 19345 | 15.52 | PMA | Bandoeng, Java | (P) Phones PCK-PDK early mornings |
| 19270 | 15.57 | PPU | Rio de Janeiro, Brazil | (P) Phones DFB-EHY-FTM mornings |
| 19235 | 15.60 | DFA | Nauen, Germany | (P) Phones HSP-KAX early mornings |
| 19220 | 15.61 | WKF | Lawrenceville, N. J. | (P) Phones GAS-GAU mornings |
| 19200 | 15.62 | HS8PJ | • Bangkok, Siam | 8-10 A.M. Mondays |
| 19200 | 15.62 | ORG | Brussels, Belgium | (P) Phones OPL A.M. |
| 19160 | 15.66 | GAP | Rugby, England | (P) Phones Australia A.M. |
| 19140 | 15.68 | LSM | Buenos Aires, Arg. | (P) Phones DFB-FTM-GAA-GAB A.M. |
| 18970 | 15.81 | GAQ | Rugby, England | (P) Phones ZSS A.M. |
| 18960 | 15.82 | WQD | Rocky Point, N. Y. | (E) Tests LSY irreg. |
| 18920 | 15.85 | WQE | Rocky Point, N. Y. | (E) Programs, irreg. |
| 18910 | 15.86 | JVA | Nazaki, Japan | (P) Phones Europe days to 8:30 P.M. |
| 18890 | 15.88 | ZSS | Klipheuvel, So. Africa | (P) Phones GAQ-GAU mornings |
| 18830 | 15.93 | PLE | Bandoeng, Java | (P) Phones PCV mornings early; KWU evenings |
| 18680 | 16.06 | OCI | Lima, Peru | (P) Phones CEC-HJY days; WKK-WOP noon |
| 18620 | 16.11 | GAU | Rugby, England | (P) Phones VWY-ZSS early A.M.; Lawrenceville, daytime |
| 18545 | 16.18 | PCM | Kootwijk, Holland | (P) Relays and phones Java early A.M. |
| 18540 | 16.19 | PCM | Kootwijk, Holland | (P) Relays and phones Java early A.M. |
| 18535 | 16.20 | PCM | Kootwijk, Holland | (P) Relays and phones Java early A.M. |
| 18480 | 16.23 | HBH | Geneva, Switzerland | (E) Relays to N. Y. mornings irreg. |
| 18450 | 16.26 | HBF | Geneva, Switzerland | (E) Commercial; irreg. |
| 18440 | 16.25 | HJY | Bogota, Colombia | (P) Phones CEC - OCI noon; music irreg. |
| 18410 | 16.29 | PCK | Kootwijk, Holland | (P) Phones PLE - PMC early A.M. |
| 18405 | 16.30 | PCK | Kootwijk, Holland | (P) Phones PLE - PMC early A.M. |
| 18400 | 16.31 | PCK | Kootwijk, Holland | (P) Phones PLE - PMC early A.M. |
| 18388 | 16.31 | FZS | Saigon, Indo-China | (P) Phones FTK early mornings |
| 18340 | 16.36 | WLA | Lawrenceville, N. J. | (P) Phones GAS A.M. |
| 18310 | 16.38 | GAS | Rugby, England | (P) Phones WLA-WMN mornings |
| 18295 | 16.39 | YVR | Maracay, Venezuela | (P) Phones DFB-EHY-FTM mornings |
| 18270 | 16.42 | IUD | • Addis Ababa, Ethiopia | Irregular |
| 18250 | 16.43 | FTO | St. Assise, France | (P) LSM-LSY A.M. |
| 18220 | 16.46 | KUS | Manila, P. I. | (P) Phones Bolinas nights |
| 18200 | 16.48 | GAW | Rugby, England | (P) Relays and phones N. Y. irreg. |
| 18190 | 16.49 | JVB | Nazaki, Japan | (P) Phones Java early mornings, U. S. evenings |
| 18180 | 16.51 | CGA | Drummondville, Que. | (P) Phones GBB A.M. |
| 18135 | 16.54 | PMC | Bandoeng, Java | (P) Phones PCK - PCV early A.M. |
| 18115 | 16.56 | LSY3 | Buenos Aires, Arg. | (E) Phones DFB-FTM-GAA-PPU A.M.; evening broadcasts occasionally |
| 18075 | 16.59 | PCV | Kootwijk, Holland | (P) Phones PLE early mornings |
| 18070 | 16.60 | PCV | Kootwijk, Holland | (P) Phones PLE early mornings |
| 18065 | 16.61 | PCV | Kootwijk, Holland | (P) Phones PLE early mornings |
| 18060 | 16.61 | KUN | Bolinas, Calif. | (P) Phones Manila afternoons and nights |
| 18040 | 16.63 | GAB | Rugby, England | (P) Phones LSM noon |
| 18020 | 16.65 | KQJ | Bolinas, Calif. | (P) Phones afternoons; irregular |
| 17980 | 16.69 | KQZ | Bolinas, Calif. | (E) Tests and relays to LSY irreg. |
| 17940 | 16.72 | WQB | Rocky Point, N. Y. | (E) Tests with LSY, A.M. |
| 17920 | 16.74 | WQF | Rocky Point, N. Y. | (P) Phones Ethiopia irregular |
| 17900 | 16.76 | WLL | Rocky Point, N. Y. | (E) Relays to Geneva and Germany, A.M. |
| 17850 | 16.81 | LSN | Buenos Aires, Arg. | (P) Phones S. A. irreg. |
| 17790 | 16.86 | GSG | • Daventry, England | Not in use. |
| 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. | Irreg. before 8 A.M., 4-6 P.M. or special |
| 17775 | 16.88 | PHI | • Huizen, Holland | Sunday 7:30-9:30 A.M., 1-2 P.M.; Mon., Thu., Fri., Sat., 7:30-9:30 A.M. |
| 17760 | 16.89 | DJE | • Zeesen, Germany | 12:05-5:15 A.M.; 5:55-11 A.M. daily |
| 17750 | 16.91 | IAC | Pisa, Italy | (P) Phones and tests to ships A.M. |
| 17740 | 16.91 | HSP | Bangkok, Siam | (P) Phones DFA-DGH-KAY early A.M. |
| 17710 | 16.94 | CJA-3 | Drummondville, Que. | (P) Phones Australia and Far East early A.M. |
| 17699 | 16.95 | IAC | Pisa, Italy | (P) Phones and tests to ships A.M. |
| 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 |
| 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. |

## Short-Wave Station List

| KC | Meters | Call | Location | Time |
|---|---|---|---|---|
| 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. daily |
| 15860 | 18.90 | CEC | Santiago, Chile | (P) Phones OCJ A.M. |
| 15810 | 19.02 | LSL | Buenos Aires, Arg. | (P) GAA, A.M.; GCA, PSE, PSF, P.M. |
| 15785 | 19.01 | XOJ | Shanghai, China | (E) Phones GBA 6-7 A.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. |
| 15595 | 19.24 | DFR | Nauen, Germany | (E) Tests and relays mornings irreg. |
| 15505 | 19.36 | CMA-3 | Havana, Cuba | (P) Phones and tests irregularly |
| 15490 | 19.37 | KEM | Bolinas, Calif. | (P) Phones Java and China; irregular |
| 15475 | 19.39 | KKL | Bolinas, Calif. | (P) Phones Manila and Japan; irregular |
| 15460 | 19.41 | KKR | Bolinas, Calif. | (P) Phones Manila and Japan; irregular |
| 15450 | 19.42 | IUG | Addis Ababa, Ethiopia | (P) Phones irregular |
| 15430 | 19.44 | KWE | Bolinas, Calif. | (P) Tests JYK - JYT - PLE evenings |
| 15415 | 19.46 | KWO | Dixon, Calif. | (P) Phones JVF evenings |
| 15370 | 19.52 | HAS3 | ● Budapest, Hungary | Sunday 9-10 A.M. |
| 15360 | 19.53 | DJT | ● Zeesen, Germany | Irregular |
| 15355 | 19.54 | KWU | Dixon, Calif. | (P) Phones Japan, Manila and Java evenings |
| 15340 | 19.56 | DJR | ● Zeesen, Germany | 8-9 A.M. daily |
| 15330 | 19.56 | W2XAD | ● Schenectady, N. Y. | 10 A.M.-3:45 P.M. daily |
| 15320 | 19.58 | OLR | ● Prague, Czechoslovakia | 4 A.M.-9 P.M. daily |
| 15310 | 19.60 | GSP | ● Daventry, England | 6-8 P.M. daily |
| 15305 | 19.60 | CP7 | La Paz, Bolivia | (E) Relays CP4; tests daytimes |
| 15280 | 19.63 | LRU | ● Buenos Aires, Arg. | 7 A.M.-7 P.M. daily |
| 15280 | 19.63 | DJQ | ● Zeesen, Germany | 6-8 A.M., 8:15-11 A.M. daily. Sun., 11:10 A.M.-12:25 P.M. |
| 15270 | 19.64 | W2XE | ● Wayne, N. J. | 1-6 P.M. daily |
| 15260 | 19.66 | GSI | ● Daventry, England | 12:15-4 P.M. daily |
| 15252 | 19.67 | RIM | Tashkent, USSR. | (P) Phones RKI early mornings |
| 15243 | 19.68 | TPA2 | ● Pontoise, France | 2-2:55 A.M., 5:55-11 A.M. daily |
| 15230 | 19.69 | OLR | ● Prague, Czechoslovakia | 4 A.M.-9 P.M. daily |
| 15220 | 19.71 | PCJ | ● Eindhoven, Holland | Tuesday 4:30-6 A.M.; Wednesday 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. daily; 11:10 A.M.-12:25 P.M. Sunday only |
| 15183 | 19.76 | RV96 | ● Moscow, USSR. | 1:30-2 P.M. Sunday |
| 15180 | 19.76 | GSO | ● Daventry, England | 3-5 A.M. daily |
| 15160 | 19.79 | JZK | ● Nazaki, Japan | Irregular |
| 15150 | 19.80 | YDC | ● Bandoeng, Java | 5:30-11 A.M., 5:45-6:45 P.M., 10:30 P.M.-1:30 A.M. daily |
| 15145 | 19.81 | RKI | ● Moscow, USSR. | Broadcasts 10-11 A.M. Sun. Phones RIM A.M. |
| 15140 | 19.82 | GSF | ● Daventry, England | 6-8:45 A.M., 9 A.M.-12 noon, 4-5:45 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. |
| 15055 | 19.92 | WNC | Hialeah, Fla. | (P) Phones daytime |
| 15040 | 19.95 | HIR | Ciudad Trujillo, R. D. | (P) Phones WNC days |
| 14985 | 20.02 | YSL | San Salvador, Salvador | (P) Phones days irreg. |
| 14980 | 20.03 | KAY | Manila, P. I. | (P) Phones DFC-DFD-GCJ early A.M.; KWU evenings |
| 14970 | 20.04 | LZA | ● Sofia, Bulgaria | Weekdays 5-6:30 A.M., 12-2:45 P.M. Sundays 12 A.M.-4:30 P.M. |
| 14940 | 20.06 | HJB | Bogota, Colombia | (P) Phones WNC-PPU-YVQ days |
| 14935 | 20.07 | PSE | Rio de Janeiro, Brazil | (P) Phones LSL-WLK day irreg.; EDM-EHY 8 A.M. Broadcasts irreg. |
| 14920 | 20.11 | KQH | Kahuku, Hawaii | (P) Tests irregularly |
| 14910 | 20.12 | JVG | Nazaki, Japan | (P) Phones Formosa and broadcasts 1-2:30 A.M. irreg. |
| 14845 | 20.19 | OCJ2 | Lima, Peru | (P) Phones HJY and others daytime |
| 14800 | 20.27 | WOV | Rocky Point, N. Y. | (E) Tests Europe irreg. |
| 14790 | 20.28 | RIZ | Irkutsk, USSR. | (P) Calls RKI 9:30 A.M. |
| 14770 | 20.31 | WEB | Rocky Point, N. Y. | (E) Tests with Europe; irregular |
| 14730 | 20.37 | IQA | Rome, Italy | (P) Phones Japan and Egypt; sends music at times |
| 14690 | 20.42 | PSF | Rio de Janeiro, Brazil | (P) Phones LSL-WLK-WOK daytime |
| 14653 | 20.47 | GBL | Rugby, England | (P) Phones Nazaki early A.M. |
| 14620 | 20.52 | EHY | Madrid, Spain | (P) Phones LSM mornings irreg. |
| 14620 | 20.52 | EDM | Madrid, Spain | (P) Phones PPU-PSA-PSE mornings |
| 14600 | 20.55 | JVH | ● Nazaki, Japan | (E) Phones DFB-GTJ-PCJ - TYB early mornings. B.C. music 12-1 A.M. daily. Mon. & Thurs., 4-5 P.M.; Tues. & Fri., 5-6 P.M.; Wed. & Sat., 2-3 P.M. |
| 14590 | 20.56 | WMN | Lawrenceville, N. J. | (P) Phones England days |
| 14535 | 20.64 | HBJ | Geneva, Switzerland | (E) Relays to Riverhead daytime |
| 14530 | 20.65 | LSN | Buenos Aires, Arg. | (P) Phones PSF-WLK-WOK irreg. |
| 14485 | 20.71 | TIR | Cartago, Costa Rica | (P) Phones WNC days |
| 14485 | 20.71 | TIU | Cartago, Costa Rica | (P) Phones WNC days |
| 14485 | 20.71 | YNA | Managua, Nicaragua | (P) Phones WNC days |
| 14485 | 20.71 | HPF | Panama City, Panama | (P) Phones daytime |
| 14485 | 20.71 | HRM | Tela, Honduras | (P) Phones WNC days |
| 14485 | 20.71 | TGF | Guatemala City, Guatemala | (P) Phones WNC days |
| 14480 | 20.72 | PLX | Bandoeng, Java | (P) Phones Europe and B.C. irregular to 3 P.M. |
| 14470 | 20.73 | WMF | Lawrenceville, N. J. | (P) Phones England daytime |
| 14460 | 20.75 | DZH | ● Zeesen, Germany | Irregular |
| 14440 | 20.78 | GBW | Rugby, England | (P) Phones Lawrenceville daytime |
| 14410 | 20.82 | IBC | San Paolo, Italy | (P) Irregular |
| 14410 | 20.80 | DIP | Zeesen, Germany | (E) Experimental; irreg. |
| 14250 | 21.00 | W10XDA | Schooner Morrissey | (P) Irregular |
| 13990 | 21.44 | GBA2 | Rugby, England | (P) Phones Argentina & Brazil irreg. |
| 13900 | 21.58 | WQP | Rocky Point, N. Y. | (E) Test daytime |
| 13820 | 21.70 | SUZ | Cairo, Egypt | (P) Phones DFC-DGU-GBB daytime |
| 13780 | 21.77 | KKW | Bolinas, Calif. | (P) Special relays; tests afternoon and evening |
| 13745 | 21.83 | CGA-2 | Drummondville, Que. | (P) Phones Europe irreg. |
| 13738 | 21.82 | RIS | Tiflis, USSR. | (P) Tests with Moscow irregular |
| 13720 | 21.87 | KLL | Bolinas, Calif. | (P) Special relays; tests afternoon and evening |
| 13690 | 21.91 | KKZ | Bolinas, Calif. | (P) Tests Japan and Java early A.M.; days Honolulu |
| 13667 | 21.98 | HJY | Bogota, Colombia | (P) Phones CEC afternoons |
| 13635 | 22.00 | SPW | ● Warsaw, Poland | 11:30 A.M.-12:30 P.M., Mon., Wed., Fri. |
| 13610 | 22.04 | JYK | Kemikawa-Cho, Japan | (E) Tests irregular A.M. |
| 13595 | 22.07 | GBB2 | Rugby, England | (P) Phones Canada days |
| 13585 | 22.08 | GBB | Rugby, England | (P) Phones CGA3-SUV-SUZ daytime |
| 13560 | 22.12 | JVI | Nazaki, Japan | (P) Phones Manchukuo irregularly |
| 13465 | 22.28 | WKC | Rocky Point, N. Y. | (E) Tests and relays irregular |
| 13435 | 22.33 | WKD | Rocky Point, N. Y. | (E) Tests and relays irregular |
| 13415 | 22.36 | GCJ | Rugby, England | (P) Tests with JVH afternoons |
| 13410 | 22.37 | YSJ | San Salvador, Salvador | (P) Phones WNC days |
| 13390 | 22.40 | WMA | Lawrenceville, N. J. | (P) Phones GAS - GBS - GBU-GBW daily |
| 13380 | 22.42 | IDU | Asmara, Eritrea, Africa | (P) Phones Italy early A.M. and sends music |
| 13345 | 22.48 | YVQ | Maracay, Venezuela | (P) Phones WNC-HJB days |
| 13285 | 22.58 | CGA3 | Drummondville, Que. | (P) Phones England days |
| 13240 | 22.66 | KBJ | Manila, P. I. | (P) Phones nights and early A.M. |
| 13220 | 22.70 | IRJ | Rome, Italy | (P) Phones Japan 5-8 A.M., and works Cairo days |
| 13180 | 22.76 | DGG | Nauen, Germany | (P) Relays to Riverhead days |
| 13020 | 23.04 | JZE | Nazaki, Japan | (P) Phones ships irreg. |
| 13000 | 23.08 | FYC | Paris, France | (P) Phones CNR A.M. |
| 12985 | 23.11 | DFC | Nauen, Germany | (P) Phones KAY-SUV-SUZ early A.M. |
| 12865 | 23.32 | IAC | Pisa, Italy | (P) Phones ships irreg. |
| 12860 | 23.33 | RKR | Novosibirsk, USSR. | (P) Daily, 7 A.M. |
| 12840 | 23.36 | WQO | Ocean Gate, N. J. | (P) Phones ships days |

# Short-Wave Station List

| KC | Meters | Call | Location | Time |
|---|---|---|---|---|
| 12830 | 23.37 | HJC | Barranquilla, Colombia | (P) Phones HJB-HPF-WNC days |
| 12830 | 23.38 | HJA-3 | Barranquilla, Colombia | (P) Phones HJB-HPF-WNC days |
| 12830 | 23.38 | CNR | Rabat, Morocco | (P) Phones FYB-TYB-FTA near 4 P.M. |
| 12830 | 23.38 | CNR | ● Rabat, Morocco | Special broadcasts irreg. |
| 12795 | 23.45 | IAC | Pisa, Italy | (P) Phones ships and tests Tripoli, irreg. |
| 12780 | 23.47 | GBC | Rugby, England | (P) Phones VWY early A.M. |
| 12394 | 24.21 | DAN | Nordenland, Germany | (P) Phones ships irreg. mornings |
| 12300 | 24.39 | PLM | Bandoeng, Java | (P) Phones 2ME near 6:30 A.M. |
| 12295 | 24.40 | ZLU | Wellington, N. Z. | (P) Phones ZLJ early A.M. |
| 12290 | 24.41 | GBU | Rugby, England | (P) Phones Lawrenceville days |
| 12280 | 24.43 | KUV | Manila, P. I. | (P) Phones early A. M. |
| 12250 | 24.49 | TYB | Paris, France | (P) Phones JVH - XGR and ships irreg. |
| 12235 | 24.52 | TFJ | Reykjavik, Iceland | (P) Phones England days |
| 12235 | 24.52 | TFJ | ● Reykjavik, Iceland | English broadcast each Sun., 1:40-2:30 P.M. |
| 12220 | 24.55 | FLJ | Paris, France | (P) Phones ships irreg. |
| 12215 | 24.56 | TYA | Paris, France | (P) Algeria days |
| 12150 | 24.69 | GBS | Rugby, England | (P) Phones Lawrenceville days |
| 12130 | 24.73 | DZE | ● Zeesen, Germany | Irregular |
| 12100 | 24.79 | CJA | Drummondville, Que. | (P) Tests VIY early A. M. and evenings |
| 12060 | 24.88 | PDV | Kootwijk, Holland | (P) PLE - PLV - PMC early mornings |
| 12055 | 24.89 | PDV | Kootwijk, Holland | (P) PLE - PLV - PMC early mornings |
| 12050 | 24.90 | PDV | Kootwijk, Holland | (P) PLE - PLV - PMC early mornings |
| 12020 | 24.95 | VIY | Rockbank, Australia | (P) Tests CJA6 early A.M. and evenings |
| 12000 | 25.00 | RNE | ● Moscow, USSR. | Sundays 6-7 A.M., 10-11 A.M., 4-5 P.M.; Mon. 4-5 P.M.; Wed., 6-7 A.M., 4-5 P.M.; Friday 4-5 P.M. |
| 11991 | 25.02 | FZS | Saigon, Indo-China | (P) Phones FTA - FTK early A.M. |
| 11955 | 25.09 | IBC | San Paolo, Italy | (P) Irregular |
| 11955 | 25.09 | IUC | ● Addis Ababa, Ethiopia | 12-1 A.M.; music at times |
| 11950 | 25.11 | KKQ | Bolinas, Calif. | (P) Relays programs to Hawaii eve. |
| 11940 | 25.13 | FTA | St. Assise, France | (P) Phones FZS - FZR early A.M. |
| 11935 | 25.14 | YNA | Managua, Nicaragua | (P) Cent. and S. A. stations, days |
| 11900 | 25.21 | XEWI | ● Mexico City, Mexico | Sun., 1-2:15 P.M.; Tues. and Thurs., 7:30-8:45 P.M., 10:30 P.M.-12 A.M.; Mon., Wed., 3-4 P.M.; Fri., 3-4 P.M., 9 P.M.-12 A.M.; Sat., 9-10 P.M. |
| 11885 | 25.24 | TPA3 | ● Pontoise, France | 2-5 A.M., 12:15 A.M.-6 P.M. daily |
| 11875 | 25.26 | YDB | ● Soerabaja, Java | 5:30-11 A.M., 5:45-6:45 P.M., 10:30 P.M.-1:30 A.M. daily |
| 11870 | 25.26 | OLR | ● Prague, Czechoslovakia | 4 A.M.-9 P.M. daily |
| 11870 | 25.26 | W8XK | ● Pittsburgh, Pa. | 7-9 P.M. daily |
| 11860 | 25.29 | GSE | ● Daventry, England | Not in use |
| 11855 | 25.31 | DJP | ● Zeesen, Germany | Irregular |
| 11830 | 25.36 | W2XE | ● Wayne, N. J. | 6-10 P.M. daily |
| 11830 | 25.36 | W9XAA | ● Chicago, Ill. | Daily 8:30 A.M.-5 P.M. |
| 11820 | 25.38 | GSN | ● Daventry, England | Not in use |
| 11810 | 25.40 | 2RO4 | ● Rome, Italy | 6:43 A.M.-12:40 P.M. (See 9635 kc.) |
| 11800 | 25.42 | JZJ | ● Nazaki, Japan | Irregular |
| 11795 | 25.43 | DJO | ● Zeesen, Germany | Irregular |
| 11790 | 25.43 | W1XAL | ● Boston, Mass. | News Mon. to Fri. inc., 6-6:30 P.M.; Sat., 5-7 P.M.; Sun., 10:15 A.M.-12:30 P.M., 5-7 P.M. |
| 11770 | 25.49 | DJD | ● Zeesen, Germany | 11:35 A.M.-4:30 P.M., 4:50-10:45 P.M. |
| 11760 | 25.51 | OLR | ● Prague, Czechoslovakia | 4 A.M.-9 P.M. daily |
| 11750 | 25.53 | GSD | ● Daventry, England | 12:15-5:45 P.M., 6-8 P.M., 9-11 P.M. daily |
| 11730 | 25.58 | F3ICD | ● Saigon, Indo-China | 7:30-9:30 A.M. daily |
| 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 P.M.-1 A.M. daily |
| 11710 | 25.62 | VK9MI | ● Sydney, Australia; "S.S. Kanimbla" | 11 P.M.-7 A.M. Irregular |
| 11705 | 25.63 | SM5SX | ● Stockholm, Sweden | Weekdays 6:25-7 A.M., 11 A.M.-4 P.M. Sun., 3 A.M.-4 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. |
| 11570 | 25.93 | HH2T | ● Port-au-Prince, Haiti | Sp'l programs irreg. |
| 11560 | 25.95 | CMB | Havana, Cuba | (P) Phones New York irreg. |
| 11538 | 26.00 | XGR | Shanghai, China | (P) Tests irregularly |
| 11500 | 26.09 | XAM | Merida, Mexico | (P) Phones XDF-XDM-XDR irreg. |
| 11495 | 26.10 | VIZ3 | Rockbank, Australia | (P) Tests CJA4 early A.M. |
| 11435 | 26.24 | COCX | ● Havana, Cuba | 8 A.M.-1 A.M. daily |
| 11413 | 26.28 | CJA4 | Drummondville, Que. | (P) Phones VIZ3 early A.M. |
| 11402 | 26.31 | HBO | Geneva, Switzerland | (E) Broadcasts Sundays 11:30 P.M.; commercial, irreg. |
| 11280 | 26.60 | HIN | ● Ciudad Trujillo, R. D. | Daily 11:40 A.M.-1:40 P.M., 4:30-6 P.M., 7:10-9:10 P.M. |
| 11275 | 26.61 | XAM | Merida, Mexico | (P) Phones XDR-XDM irregular |
| 11050 | 27.15 | ZLT | Wellington, N. Z. | (P) Phones VLZ early mornings |
| 11000 | 27.27 | PLP | Bandoeng, Java | (P) Phones early A.M.; broadcasts 5:30-11 A.M. week days; Sun., 5:30-10:30 A.M. |
| 11000 | 27.26 | XBJQ | ● Mexico D. F., Mexico | 8:15-10:30 P.M. irreg. |
| 10975 | 27.35 | OCI | Lima, Peru | (P) Phones CEC - HJY days |
| 10975 | 27.35 | OCP | Lima, Peru | (P) Phones HKB early evenings |
| 10960 | 27.37 | JZB | ● Nazaki, Japan | Irregular |
| 10955 | 27.38 | HS8PJ | ● Bangkok, Siam | Mondays 8-10 A.M. |
| 10940 | 27.43 | TTH | St. Assise, France | (P) Phones So. America irreg. |
| 10910 | 27.50 | KTR | Manila, P. I. | (P) Phones DFC early A.M. irreg. |
| 10850 | 27.63 | DFL | Nauen, Germany | (P) Relays programs afternoons irreg. |
| 10840 | 27.68 | KWV | Dixon, Calif. | (P) Phones Japan, Manila, Hawaii, A.M. |
| 10795 | 27.79 | GCL | Rugby, England | (P) Phones Japan days |
| 10790 | 27.80 | YNA | Managua, Nicaragua | (P) Phones So. America days, irreg. |
| 10770 | 27.86 | GBP | Rugby, England | (P) JYS and XGR irreg.; Phones VLK early A.M. & P.M. |
| 10740 | 27.93 | JVM | ● Nazaki, Japan | 4-7:30 A.M. daily; Wed. & Sat. 2-3 P.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 | CEC | ● Santiago, Chile | Daily ex. Sat. and Sun., 7-7:20 P.M. (see CED, 10230 KC.) |
| 10660 | 28.14 | JVN | Nazaki, Japan | (P) Phones JIB early A.M.; Relays JOAK irreg. |
| 10660 | 28.14 | JVN | ● Nazaki, Japan | 4-7:30 A.M. irreg.; Mon. & Thurs. 4-5 P.M.; Tues. & Fri. 5-6 P.M. |
| 10620 | 28.25 | WEF | Rocky Point, N. Y. | (E) Relays program service irregularly |
| 10620 | 28.25 | EHX | Madrid, Spain | (P) Phones CEC and EHZ afternoons |
| 10610 | 28.28 | WEA | Rocky Point, N. Y. | (E) Tests Europe irreg. |
| 10550 | 28.44 | WOK | Lawrenceville, N. J. | (P) Phones LSN - PSF - PSH-PSK nights |
| 10530 | 28.49 | JIB | Tawian, Japan | (P) Phones JVL - JVN early mornings to 8 A.M.; sp'l 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. |
| 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 | WCG | Rocky Point, N. Y. | (E) Programs, irreg. |
| 10375 | 28.92 | JVO | Nazaki, Japan | (P) Manchuria and Dairen early A.M. |
| 10370 | 28.93 | EHZ | Tenerife, Canary Islands | (P) Phones EDN 3:30-6 A.M. |
| 10350 | 28.98 | LSX | ● Buenos Aires, Arg. | Near 10 P.M. irregular; 6-7:15 P.M. daily |
| 10335 | 29.03 | ZFD | Hamilton, Bermuda | (P) Phones afternoons |
| 10330 | 29.04 | ORK | ● Brussels, Belgium | 1:30-3 P.M. daily |
| 10310 | 29.10 | PPM | Rio de Janeiro, Brazil | (P) Tests New York and B.A. evenings |

# Short-Wave Station List

| KC | Meters | Call | Location | Time |
|---|---|---|---|---|
| 10300 | 29.13 | LSQ | Buenos Aires, Arg. | (P) Phones GCA - HJY - PSH afternoons |
| 10300 | 29.13 | LSL | Buenos Aires, Arg. | (P) Phones GCA - HJY - PSH afternoons. Broadcasts irreg. |
| 10290 | 29.15 | DZC | ● Zeesen, Germany | Used irregularly |
| 10290 | 29.15 | HPC | Panama City, Panama | (P) Phones C. A. and S. Am. daytime |
| 10260 | 29.24 | PMN | Bandoeng, Java | (P) Tests VLJ early A.M.; broadcasts 5:30-11 A.M. week days; 5:30-10:30 A.M. Sundays |
| 10250 | 29.27 | LSK3 | Buenos Aires, Arg. | (P) Afternoons |
| 10230 | 29.33 | CED | ● Antofagasta, Chile | Retransmits programs of CEC, 10670 KC., daily ex. Sat. and Sun., 7-7:20 P.M. |
| 10220 | 29.35 | PSH | Rio de Janeiro, Brazil | (P) Phones LSL-WOK evenings; broadcasts irreg. |
| 10169 | 29.50 | HSG | Bangkok, Siam | (P) Phones DGH early A.M. |
| 10160 | 29.53 | RIO | Bakou, USSR. | (P) Phones RIR-RNE irreg. A.M.; News irreg. 11 P.M.-3 A.M. |
| 10140 | 29.59 | OPM | Leopoldville, Belg-Congo | (P) Calls 7-11 A.M. daily. Phones ORK afternoons |
| 10080 | 29.76 | RIR | Tiflis, USSR. | (P) Phones RIM-RKI 7-11 A.M. |
| 10070 | 29.79 | EDN | Madrid, Spain | (P) Phones YVR after noons |
| 10055 | 29.84 | ZFB | Hamilton, Bermuda | (P) Phones WNB days |
| 10055 | 29.84 | SUV | Cairo, Egypt | (P) Phones DFC-DGU-GCA-GCB days |
| 10042 | 29.87 | DZB | ● Zeesen, Germany | Irregular |
| 10040 | 29.88 | HJA3 | Barranquilla, Colombia | (P) Tests early evenings, irreg. |
| 9990 | 30.03 | KAZ | Manila, P. I. | (P) Phones JVQ-KWX-PLV early A.M. |
| 9966 | 30.08 | IRS | Rome, Italy | (P) Tests irregularly |
| 9950 | 30.13 | GBU | Rugby, England | (P) Phones WNA evenings |
| 9930 | 30.21 | CSW | ● Lisbon, Portugal | 4-7 P.M. daily |
| 9930 | 30.21 | HKB | Bogota, Colombia | (P) Phones CEC - OCP-PSH - PSK afternoons |
| 9930 | 30.21 | HJY | Bogota, Colombia | (P) Phones LSQ afternoons |
| 9890 | 30.33 | LSN3 | Buenos Aires, Arg. | (P) Phones WOK-WLK; broadcasts evenings irregular |
| 9870 | 30.40 | WON | Lawrenceville, N. J. | (P) Phones and tests; England irreg. |
| 9860 | 30.43 | EAQ | ● Madrid, Spain | Saturday 1-3:30 P.M.; daily 5:15-9:30 P.M. |
| 9840 | 30.47 | JYS | Kemikawa-Cho, Japan | (E) Tests irregular |
| 9830 | 30.50 | IRM | Rome, Italy | (P) Phones JVP - JZT - LSX-WEL A.M. |
| 9810 | 30.58 | DFE | Nauen, Germany | (P) Relays and tests afternoons irreg. |
| 9800 | 30.59 | GCW | Rugby, England | (P) Phones Lawrenceville eve. and nights |
| 9800 | 30.59 | LSI | Buenos Aires, Arg. | (P) Relays very irreg. |
| 9760 | 30.74 | VLJ | Sydney, Australia | (P) Phones PLV- ZLT early A.M. |
| 9760 | 30.74 | VLZ | Sydney, Australia | (P) Phones PLV- ZLT early A.M. |
| 9750 | 30.77 | COCQ | ● Havana, Cuba | 8 A.M.-12 mid. daily |
| 9750 | 30.77 | WOF | Lawrenceville, N. J. | (P) Phones GCU irreg. |
| 9710 | 30.88 | GCA | Rugby, England | (P) Phones LSL afternoons |
| 9700 | 30.93 | LQA | Buenos Aires, Arg. | (P) Tests and relays early evenings |
| 9675 | 31.00 | DZA | ● Zeesen, Germany | Irregular |
| 9670 | 31.02 | TI4NRH | ● Heredia, Costa Rica | Daily 9-10 P.M., 11:30 P.M.-12 A.M.; Sat. night to 2 A.M. Sun. |
| 9665 | 31.04 | CT1AA | ● Lisbon, Portugal | Tues., Thurs., Sat., 3-6 P.M. |
| 9660 | 31.06 | CR6AA | ● Lobito, West Africa | 3:45-5:30 P.M. Wed. & Sat. |
| 9660 | 31.06 | LRX | ● Buenos Aires, Arg. | 7-11 P.M. daily, experimentally |
| 9660 | 31.06 | PSJ | Rio de Janeiro, Brazil | (P) Irreg., Argentina |
| 9650 | 31.09 | YDB | ● Soerabaja, Java | 5:30-11 A.M., 5:45-6:45 P.M., 10:30 P.M.-1:30 A.M. daily |
| 9635 | 31.13 | 2RO3 | ● Rome, Italy | 12:40-6 P.M. Mon., Wed., Fri. Amer. Hour, 6-7:30 P.M., Tues., Thurs., Sat. Lat. Amer., 6-7:30 P.M. Sunday, off at 5:30 P.M. |
| 9630 | 31.15 | CFA5 | Drummondville, Que. | (P) Phones No. America days |
| 9620 | 31.17 | DGU | Nauen, Germany | (P) Phones SUV A.M. Relays irreg. |
| 9620 | 31.17 | FZR | Saigon, Indo-China | (P) Phones Paris early A.M. |
| 9600 | 31.25 | CQN | ● Macao, China | Mon. & Fri. 7-8:30 A.M. |
| 9600 | 31.25 | RAN | ● Moscow, USSR. | English 7-7:30 P.M.; German 7:30-8 P.M. daily |
| 9600 | 31.25 | HJ1ABP | ● Cartagena, Colombia | Daily 6-11 P.M. |
| 9600 | 31.25 | CB960 | ● Santiago, Chile | Daily ex. Sun. 11:30 A.M.-2 P.M., 6-9 P.M.; Sun. 3-5 P.M., 6-9 P.M. |

| KC | Meters | Call | Location | Time |
|---|---|---|---|---|
| 9595 | 31.27 | HBL | ● Geneva, Switzerland | Saturday 5:30-6:15 P.M. First Monday each month 6-7 P.M. |
| 9595 | 31.27 | HH3W | ● Port-au-Prince, Haiti | 1-2 P.M., 7-8:30 P.M.; ex. Sunday |
| 9595 | 31.27 | YNLF | ● Managua, Nicaragua | 8-9 A.M., 1-3 P.M., 6:30-10:30 P.M. daily |
| 9590 | 31.28 | W3XAU | ● Philadelphia, Pa. | 12-8 P.M. daily |
| 9590 | 31.28 | VK2ME | ● Sydney, Australia | Sunday 1-3 A.M., 5-9 A.M., 9-11 A.M. |
| 9590 | 31.28 | HP5J | ● Panama City, Panama | Week days 12-1:30 P.M., 6-10:30 P.M. Sundays 10:30 A.M.-1:30 P.M., 7-10:30 P.M. |
| 9590 | 31.28 | PCJ | ● Eindhoven, Holland | Tues. 1:30-3 P.M.; Wed. 7-10 P.M. |
| 9580 | 31.32 | GSC | ● Daventry, England | 6-8 P.M., 9-11 P.M. daily |
| 9580 | 31.32 | VK3LR | ● Melbourne, Australia | Week days 3:30-8:30 A.M.; Friday also 10 P.M.-2 A.M. Sunday, 3:30-7:30 A.M. |
| 9575 | 31.33 | HJ2ABC | ● Cucuta, Colombia | 11 A.M.-12 noon; 6:30-9 P.M. daily |
| 9570 | 31.33 | W1XK | ● Boston, Mass. | Weekdays 6:30 A.M.-1 A.M. Sundays, 8 A.M.-1 A.M. |
| 9565 | 31.36 | VUY VUB | ● Bombay, India | Thurs. and Fri., 11 P.M.-12:30 A.M.; Sun., 1:30-3:30 A.M. |
| 9560 | 31.38 | DJA | ● Zeesen, Germany | 12:05-5:15 A.M., 5:55-11 AM., 4:50-10:45 P.M. daily |
| 9560 | 31.38 | HJ1ABB | ● Barranquilla, Colombia | 7 A.M.-12:30 P.M. daily |
| 9545 | 31.44 | HH2R | ● Port-au-Prince, Haiti | Special programs irreg. |
| 9540 | 31.45 | DJN | ● Zeesen, Germany | 12:05-5:15 A.M., 4:50-10:45 P.M. daily |
| 9540 | 31.45 | VPD2 | ● Suva, Fiji Islands | 5:30-7 A.M. daily |
| 9535 | 31.46 | JZI | ● Nazaki, Japan | Irregular |
| 9530 | 31.48 | W2XAF | ● Schenectady, N. Y. | 4 P.M.-12 A.M. daily |
| 9530 | 31.48 | LCJ1 | ● Jeloy, Norway | 5-8 A.M., 11 A.M.-5 P.M. daily |
| 9525 | 31.49 | ZBW | ● Hong Kong, China | 11:30 P.M.-1:15 A.M., 4-10 A.M. daily |
| 9520 | 31.51 | XEME | ● Merida, Yucatan, Mex. | 10 A.M.-3:30 P.M., 5:30-11 P.M. |
| 9520 | 31.51 | HJ4ABH | ● Armenia, Colombia | 5-10 P.M. daily |
| 9510 | 31.55 | GSB | ● Daventry, England | 3-5 A.M., 9 A.M.-12 noon, 12:15-5:45 P.M. daily |
| 9510 | 31.55 | VK3ME | ● Melbourne, Australia | Mon., Sat. 4-7 A.M. |
| 9510 | 31.55 | HJU | ● Buenaventura, Colombia | 12-2 P.M., 8-11 P.M., Mon., Wed., Fri. |
| 9505 | 31.56 | XEFT | ● Vera Cruz, Mexico | Not in use. (See 6120 kc.) |
| 9500 | 31.56 | PRF5 | ● Rio de Janeiro, Brazil | 4:45-5:45 P.M. ex. Sun. |
| 9500 | 31.58 | HI5E | ● Ciudad Trujillo, R. D. | 6:40-8:40 A.M., 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M. |
| 9500 | 31.58 | HJ1ABE | ● Cartagena, Colombia | 7:30-8 A.M., 11:30 A.M.-1 P.M., 6-10:30 P.M. daily |
| 9490 | 31.61 | KEI | Bolinas, Calif. | (P) Phones Indo-China and China A.M. |
| 9480 | 31.65 | PLW | Bandoeng, Java | (P) Phones Australia early A.M. |
| 9480 | 31.65 | KET | Bolinas, Calif. | (P) Phones WEL evenings & nights |
| 9470 | 31.68 | WET | Rocky Point, N. Y. | (E) Tests LSX-PPM-ZFD evenings |
| 9460 | 31.71 | ICK | Tripoli, Africa | (P) Phones Italy A.M. |
| 9450 | 31.75 | TGWA | ● Guatemala City, Guate. | Daily ex. Sun. 12-2 P.M., 8-9 P.M., 10 P.M.-12 A.M.; Sun., 12 noon-2 P.M.; 12 A.M.-6 A.M. |
| 9430 | 31.80 | YVR | Maracay, Venezuela | (P) Tests mornings |
| 9428 | 31.81 | COCH | ● Havana, Cuba | Week days 7 A.M.-12 night. Sun., 8-9 A.M., 11:30 A.M.-1:30 P.M., 6-9 P.M. |
| 9415 | 31.86 | PLV | Bandoeng, Java | (P) Phones PCV-PCK-PDK-VLZ-KWX-KWV early A.M. |
| 9400 | 31.92 | XDR | Mexico City, Mexico | (P) Phones XAM irreg., days |
| 9385 | 31.97 | PGC | Kootwijk, Holland | (P) Phones East Indies nights |
| 9375 | 32.00 | PGC | Kootwijk, Holland | (P) Phones East Indies nights |
| 9370 | 32.02 | PGC | Kootwijk, Holland | (P) Phones East Indies nights |
| 9350 | 32.09 | HS8PJ | ● Bangkok, Siam | Thurs., 8-10 A.M. |
| 9330 | 32.15 | CGA4 | Drummondville, Que. | (P) Phones GCB-GDB-GBB afternoons |
| 9280 | 32.33 | GCB | Rugby, England | (P) Phones Canada afternoons |
| 9240 | 32.47 | PDP | Kootwijk, Holland | (P) Phones East Indies nights |
| 9235 | 32.49 | PDP | Kootwijk, Holland | (P) Phones East Indies nights |
| 9180 | 32.68 | ZSR | Klipheuvel, S. Africa | (P) Phones Rugby afternoons seasonally |
| 9170 | 32.72 | WNA | Lawrenceville, N. J. | (P) Phones GBS-GCU-GCS afternoons |
| 9147 | 32.79 | YVR | Maracay, Venezuela | (P) Phones EHY afternoons |
| 9125 | 32.88 | HAT4 | ● Budapest, Hungary | 6:00-7:00 P.M. Sundays |
| 9110 | 32.93 | KUW | Manila, P. I. | (P) Tests and phones early A.M. |
| 9091 | 33.00 | CGA-5 | Drummondville, Que. | (P) Phones Europe days |
| 9020 | 33.26 | GCS | Rugby, England | (P) Phones Lawrenceville afternoons |

# Short-Wave Station List

| KC | Meters | Call | | Location | Time |
|---|---|---|---|---|---|
| 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 | | | "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 | 12-2 P.M., 6-10 P.M. daily except Monday (see 4107 KC.) |
| 8930 | 33.59 | WEC | | Rocky Point, N. Y. | (P) Phones Ethiopia irregular |
| 8900 | 33.71 | ZLS | | Wellington, N. Z. | (P) Phones VLZ early mornings |
| 8830 | 33.98 | LSD | | Buenos Aires, Arg. | (P) Relays to New York early evenings |
| 8795 | 34.13 | HKV | ● | Bogota, Colombia | (E) Tests early evenings and nights; broadcasts news Mon. and Thurs. 7-7:30 P.M. |
| 8790 | 34.13 | TIR | | Cartago, Costa Rica | (P) Phones Cent. America daytime |
| 8775 | 34.19 | PNI | | Makasser, D. E. I. | (P) Phones PLV early mornings |
| 8760 | 34.35 | GCQ | | Rugby, England | (P) Phones ZSR afternoons |
| 8750 | 34.29 | ZBW | ● | Hong Kong, China | 11:30 P.M.-1:15 A.M., 4-10 A.M. daily |
| 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 |
| 8665 | 34.62 | CO9JQ | ● | Camaguey, Cuba | 7:45-9:00 P.M. weekdays. Sundays irreg. |
| 8650 | 34.68 | WVD | | Seattle, Wash. | (P) Tests irregularly |
| 8630 | 34.76 | CMA | | Havana, Cuba | (P) Phones New York irreg. |
| 8590 | 34.92 | YNVA | ● | Managua, Nicaragua | 1-2:30 P.M., 7:30-10 P.M. daily |
| 8560 | 35.05 | WOO | | Ocean Gate, N. J. | (P) Phones ships days |
| 8515 | 35.23 | IAC | | Pisa, Italy | (P) Phones and tests irreg. |
| 8500 | 35.29 | JZF | | Nazaki, Japan | (P) Phones ships irreg. |
| 8470 | 35.39 | DAN | | Nordenland, Germany | (P) Phones ships irreg. |
| 8404 | 35.70 | HC2CW | ● | Guayaquil, Ecuador | Week days 11:30 A.M.-1 P.M., 7:30-11 P.M.; Sundays 4-4:30 P.M., 9-10:30 P.M. |
| 8185 | 36.65 | PSK | | Rio de Janeiro, Brazil | (P) Phones LSL-WOK evenings. Broadcasts irreg. |
| 8155 | 36.79 | PGB | | Kootwijk, Holland | (P) Phones Java irreg. |
| 8140 | 36.86 | LSC | | Buenos Aires, Arg. | (P) Tests evenings and nights irreg. |
| 8120 | 36.95 | KTP | | Manila, P. I. | (P) Phones KWX-KWV-PLV-JVQ A.M. |
| 8110 | 37.00 | ZP10 | ● | Asuncion, Paraguay | 8:00-10:00 P.M. |
| 8075 | 37.15 | WEZ | | Rocky Point, N. Y. | (E) Program service P.M.; irregular |
| 8035 | 37.33 | CNR | | Rabat, Morocco | (P) Phones France nights |
| 8035 | 37.33 | CNR | ● | Rabat, Morocco | Special broadcasts irreg. |
| 7970 | 37.64 | XGL | | Shanghai, China | (P) Tests early mornings |
| 7968 | 37.65 | HSJ | | Bangkok, Siam | (P) Tests early A.M. |
| 7960 | 37.69 | VLZ | | Sydney, Australia | (P) Phones ZLT early A.M. |
| 7920 | 37.88 | GCP | | Rugby, England | (P) Phones VLK irreg. |
| 7900 | 37.97 | LSL | | Buenos Aires, Arg. | (P) Phones PSK-PSH evenings |
| 7890 | 38.02 | 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.-1:30 P.M., 6-11:15 P.M. |
| 7840 | 38.27 | PGA | | Kootwijk, Holland | (P) Phones Java irreg. |
| 7835 | 38.29 | PGA | | Kootwijk, Holland | (P) Phones Java irreg. |
| 7830 | 38.31 | PGA | | Kootwijk, Holland | (P) Phones Java irreg. |
| 7797 | 38.47 | HBP | ● | Geneva, Switzerland | 5:30-6:15 P.M. Saturdays. First Mon. each month, 6-7 P.M. |
| 7790 | 38.49 | YNA | | Managua, Nicaragua | (P) Phones Cent. & So. America daytime |
| 7770 | 38.61 | PDM | | Kootwijk, Holland | (P) Special relays to E. Indies |
| 7765 | 38.63 | PDM | | Kootwijk, Holland | (P) Special relays to Dutch Indies |
| 7760 | 38.66 | PDM | | Kootwijk, Holland | (P) Special relays to E. Indies |
| 7740 | 38.76 | CEC | | Santiago, Chile | (P) Phones evenings to 8:30 P.M. |
| 7735 | 38.78 | PDL | | Kootwijk, Holland | (P) Special relays to E. Indies |
| 7730 | 38.81 | PDL | | Kootwijk, Holland | (P) Special relays to E. Indies |
| 7715 | 38.39 | KEE | | Bolinas, Calif. | (P) Relays programs to Hawaii seasonally |
| 7669 | 39.11 | TGF | | Guatemala City, Guate. | (P) Phones TIU-HPF daytime |
| 7626 | 39.31 | RIM | | Tashkent, USSR. | (P) Phones RKI early mornings |
| 7620 | 39.37 | IUB | ● | Addis Ababa, Ethiopia | Irregular |
| 7610 | 39.42 | KWX | | Dixon, Calif. | (P) Phones KKH nights; KAZ-KTP-PLV-JVT-JVM A.M. |
| 7565 | 39.66 | KWY | | Dixon, Calif. | (P) Phones Shanghai early mornings |
| 7550 | 39.74 | TI8WS | ● | Puntarenas, Costa Rica | Sun., 4-5 P.M. Week days, 5-7 P.M., 8:30-10 P.M. |
| 7520 | 39.89 | KKH | | Kahuku, Hawaii | (P) KEE-KEJ evenings, KWX-KWV nights |
| 7518 | 39.90 | RKI | | Moscow, USSR. | (P) Phones RIM early mornings |
| 7510 | 39.95 | JVP | ● | Nazaki, Japan | (P) Tests Point Reyes early A.M.; broadcasts Mon., Thurs., 2-3, 4-5 P.M. |
| 7500 | 40.00 | CFA-6 | | Drummondville, Que. | (P) Phones N. America days |
| 7470 | 40.16 | JVQ | | Nazaki, Japan | (P) Relays and phones early A.M.; broadcasts Mon., Thurs., 2-3, 4-5 P.M. |
| 7470 | 40.16 | HJP | | Bogota, Colombia | (P) Phones HJA3-YVQ early evenings |
| 7445 | 40.30 | HBQ | | Geneva, Switzerland | (E) Relays special B.C. evenings irreg. |
| 7430 | 40.38 | ZLR | | Wellington, N. Z. | (P) Phones VLJ early mornings |
| 7400 | 40.45 | WEM | | Rocky Point, N. Y. | (E) Special relays evenings |
| 7390 | 40.60 | ZLT-2 | | Wellington, N. Z. | (P) Phones Sydney 3-7 A.M. |
| 7385 | 40.62 | OEK | | Wein, Austria | (P) Tests early evenings very irreg. |
| 7380 | 40.65 | XECR | ● | Mexico City, Mexico | Sundays 7-8 P.M.; occasionally later |
| 7370 | 40.71 | KEQ | | Kahuku, Hawaii | (P) Relays programs evenings |
| 7345 | 40.84 | GDL | | Rugby, England | (P) Phones Japan irreg. A.M. |
| 7220 | 41.55 | VP3BG | ● | Georgetown, Br. Guiana | 6-8:45 P.M. daily |
| 7100 | 42.25 | HKE | ● | Bogota, Colombia | Monday 6-7 P.M.; Tues. and Friday 8-9 P.M. |
| 7100 | 42.25 | FO8AA | ● | Papeete, Tahiti | Tues. & Fri. 11 P.M.-12:30 A.M. |
| 7080 | 42.37 | PI1I | ● | Dordrecht, Holland | Sat., 10-10-11:10 A.M |
| 7030 | 42.67 | EA9AH | ● | Tetuan, Spanish Morocco, Africa | 4-4:25 P.M. daily; 12-2:30 A.M. irregular |
| 7010 | 42.80 | EA8AB | ● | Santa Cruz de Tenerife, Canary Islands | Mon., Wed., Fri., Sat., 3:15-4:15 P.M. |
| 7000 | 42.86 | PZH | ● | Paramaribo, D. Guiana | S. A. Sun., 9:45-11:45 A.M.; Mon. and Fri., 5:45-9:45 P.M.; Tues. and Thurs., 2:45-4:45 P.M., 8:45-10:45 P.M.; Wed., 3:45-4:45, 5:45-9:45 P.M.; Sat., 2:45-4:45 P.M. |
| 6990 | 42.92 | JVS | | Nazaki, Japan | (P) Phones China mornings early |
| 6977 | 43.00 | XBA | | Tacubaya, D. F., Mex. | (E) 6-8 P.M. daily |
| 6950 | 43.17 | WKP | | Rocky Point, N. Y. | (E) Relays programs evenings |
| 6950 | 43.17 | GBY | | Rugby, England | (P) Phones U.S.A. irreg. |
| 6922 | 43.34 | IUF | | Addis Ababa, Ethiopia | (E) Irregular |
| 6905 | 43.45 | GDS | | Rugby, England | (P) Phones WOA-WNA-WCN evenings |
| 6900 | 43.48 | HI2D | ● | Ciudad Trujillo, R. D. | Daily 6:40-8:40 A.M., 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M. |
| 6895 | 43.51 | HCETC | ● | Quito, Ecuador | 8:15-10:30 P.M. ex. Sun. |
| 6890 | 43.54 | KEB | | Bolinas, Calif. | (P) Tests KAZ-PLV early A.M. |
| 6880 | 43.60 | CGA-7 | | Drummondville, Que. | (P) Phones Europe days |
| 6860 | 43.73 | KEL | | Bolinas, Calif. | (P) Tests KAZ-PLV early A.M. |
| 6845 | 43.83 | KEN | | Bolinas, Calif. | (P) Used irregularly |
| 6830 | 43.92 | CFA | | Drummondville, Que. | (P) Phones N. America nights |
| 6820 | 43.99 | XGOX | ● | Nanking, China | Week days 6:30-8:30 A.M.; Sun. 7:30-9:30 A.M. |
| 6800 | 44.12 | HI7P | ● | Ciudad Trujillo, R. D. | Daily 6:40-8:40 A.M., 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M. |
| 6796 | 44.14 | HIH | ● | San Pedro de Macoris, R. D. | Sunday, 3-4 A.M., 12:30-3 P.M., 4-5 P.M.; week days 12:15-2 P.M., 7-8:30 P.M. |
| 6795 | 44.15 | GAP | | Rugby, England | (P) Phones Canada irreg |
| 6767 | 44.33 | PMH | | Bandoeng, Java | (E) Phone and B.C. early A.M. |
| 6760 | 44.38 | CJA-6 | | Drummondville, Que. | (P) Phones Australia early A.M. |
| 6755 | 44.41 | WOA | | Lawrenceville, N. J. | (P) Phones GDW-GDS-GCS evenings |
| 6750 | 44.44 | JVT | | Nazaki, Japan | (P) Phones JOAK irregular; Phones Point Reyes at times |
| 6750 | 44.44 | JVT | ● | Nazaki, Japan | 1:45-2:15 A.M., 4-7:45 A.M., 5-5:20 P.M., 7-7:15 P.M., 9:45 P.M.-11:45 P.M. |
| 6730 | 44.58 | HI3C | ● | La Romana, R. D. | Week days 12:10-2:10 P.M., 6:10-7:40 P.M. Sun., 12:10-2:40 P.M. |
| 6725 | 44.60 | WQO | | Rocky Point, N. Y. | (E) Tests evenings irreg. |

## Short-Wave Station List

| KC | Meters | Call | Location | Time |
|---|---|---|---|---|
| 6720 | 44.64 | YVQ | Maracay, Venezuela | (P) Phones and relays N. Y. evenings |
| 6720 | 44.64 | YVQ | ●Maracay, Venezuela | 8-9 P.M. Saturdays |
| 6718 | 44.66 | KBK | Manila, P. I. | (P) Phones A.M. seasonally |
| 6710 | 44.71 | TIEP | ●San Jose, Costa Rica | 7:00-10:30 P.M. daily |
| 6690 | 44.84 | CGA-6 | Drummondville, Que. | (P) Phones Europe irregularly |
| 6680 | 44.91 | DGK | Nauen, Germany | (P) Relays to Riverhead evenings irreg. |
| 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. |
| 6550 | 45.81 | TIRCC | ●San Jose, Costa Rica | Daily 12-2 P.M. 6-7 P.M. Thurs. Extra 7-10 or 11 P.M. Sunday 11 A.M.-1 P.M., 8-10 P.M. |
| 6548 | 45.82 | XBC | Vera Cruz, Mexico | (E) 7-8 P.M. irreg. |
| 6545 | 45.84 | YV11RB | ●Ciudad Bolivar, Venez. | 7-10 P.M. daily; 3-6 P.M. Sun. |
| 6520 | 46.01 | YV6RV | ●Valencia, Venezuela | 10:30 A.M.-1:30 P.M., 4:30-9:30 P.M. daily |
| 6500 | 46.15 | HIL | ●Ciudad Trujillo, R. D. | 12-2 P.M., 6-8 P.M. |
| 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 | HI8A | ●Ciudad Trujillo, R. D. | Daily ex. Sunday 8:40-10:40 A.M., 2:40-4:40 P.M. |
| 6450 | 46.51 | HI4V | ●Ciudad Trujillo, R. D. | 11:40 A.M.-1:40 P.M., 5:10-6:40 P.M. daily |
| 6420 | 46.72 | HI1S | ●Santiago de los Caballeros, R. D. | 11:40 A.M.-1:40 P.M., 5:40-7:40 P.M. |
| 6415 | 46.77 | HJA3 | Barranquilla, Colombia | (P) Phones HJA2 evenings |
| 6410 | 46.80 | TIPG | ●San Jose, Costa Rica | 7:30-9:30 A.M., 12-2 P.M., 6-11:30 P.M. daily |
| 6400 | 46.88 | YV9RC | ●Caracas, Venezuela | 7-11 P.M. irreg. |
| 6375 | 47.10 | YV4RC | ●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 |
| 6350 | 47.24 | YV1RV | ●Valera, Venezuela | 6-11 P.M. daily |
| 6340 | 47.32 | HIX | ●Ciudad Trujillo, R. D. | Mon. to Sat., 12:10-1:10 P.M., 4:40-5:40 P.M. Sunday, 7:40-9:40 A.M. Tues. & Fri., 8:10-9:10 P.M. |
| 6330 | 47.39 | JZG | ●Nazaki, Japan | 5-7 A.M. irregular |
| 6325 | 47.43 | HH3NW | ●Port-au-Prince, Haiti | 1-2 P.M., 7-8:30 P.M. ex. Sunday |
| 6316 | 47.50 | HIZ | ●Ciudad Trujillo, R. D. | Daily 11:30 A.M.-2:45 P.M., 5:30 P.M.-9 P.M. Sat. to 10 & 11 P.M. |
| 6300 | 47.62 | YV12RM | ●Maracay, Venezuela | 6:30-9:30 P.M. ex. Sun. |
| 6280 | 47.69 | CO9WR | ●Sancti-Spiritus, Cuba | 9-10 A.M., 12-1 P.M., 4-6 P.M., 9-11 P.M. daily |
| 6280 | 47.77 | HIG | ●Ciudad Trujillo, R. D. | 7:10-8:40 A.M., 12:40-2:10 P.M., 8:10-9:40 P.M. |
| 6243 | 48.05 | HIN | ●Ciudad Trujillo, R. D. | (See 11280 KC.) 11:40 A.M.-1:40 P.M., 7:10-9:10 P.M. daily |
| 6240 | 48.08 | HI8Q | ●Ciudad Trujillo, R. D. | Daily 10:40 A.M.-1:40 P.M., 4:40-8:40 P.M. |
| 6235 | 48.11 | OCM | Lima, Peru | (P) Phones afternoons |
| 6235 | 48.11 | HRD | ●La Ceiba, Honduras | 8-11 P.M., Sundays 4-6 P.M. |
| 6230 | 48.15 | HJ4ABJ | ●Ibague, Colombia | 8-11 P.M. |
| 6230 | 48.15 | OAX4G | ●Lima, Peru | 7-11 P.M. daily |
| 6200 | 48.39 | COKG | ●Santiago, Cuba | Sundays 12:01-1 A.M., 8 A.M.-10:30 P.M. to 12 A.M. daily |
| 6190 | 48.47 | HI1A | ●Santiago de Caballeros, R. D. | Daily 11:40 A.M.-1:40 P.M., 7:40-9:40 P.M. |
| 6182 | 48.53 | XEXA | ●Mexico City, Mex. | 8-11:30 A.M., 3-5 P.M., 7-11 P.M. ex. Sunday |
| 6170 | 48.62 | HI3ABF | ●Bogota, Colombia | 11 A.M.-2 P.M. 6-11 P.M. |
| 6156 | 48.73 | YV3RC | ●Caracas, Venezuela | Week days 10:30 A.M.-1:30 P.M., 4:30-10 P.M.; Sundays 8:30 A.M.-12:30 P.M., 2:30-10:30 P.M. |
| 6150 | 48.78 | HJ4ABU | ●Pereira, Colombia | Daily 9:30 A.M.-12 Noon, 6:30-10 P.M. |
| 6150 | 48.78 | CJRO | ●Winnipeg, Manitoba | Week days 6 P.M.-12 A.M., Sundays 5-10 P.M. |
| 6150 | 48.78 | GBT | Rugby, England | (P) Phones U.S.A. days |
| 6150 | 48.78 | HI5N | ●Santiago de los Caballeros, R. D. | Daily 6:40-8:40 A.M., 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M. |
| 6150 | 48.78 | CB615 | ●Santiago, Chile | 4-7 P.M. daily |
| 6140 | 48.86 | W8XK | ●Pittsburgh, Pa. | 9 P.M.-1 A.M. daily |
| 6138 | 48.88 | HJ4ABD | ●Medellin, Colombia | Weekdays 10 A.M.-2 P.M., 4-11 P.M. Sun., 11 A.M.-3 P.M., 7-11 P.M. (see 5900 and 5780 KC.) |
| 6137 | 48.88 | CR7AA | ●Lourenco Marques, Africa | Week days 4:45-6:15 A.M., 12:45-3:15 P.M.; Sundays 5:30-7 A.M., 10 A.M.-12:30 P.M. |
| 6130 | 48.94 | ZGE | ●Kuala Lumpur, S.S. | Sun., Tues., Fri., 6:40-8:40 A.M. |
| 6130 | 48.94 | COCD | ●Havana, Cuba | Sunday 11 A.M.-2 P.M., 7-10 P.M. Week days 11:30 A.M.-11 P.M. |
| 6130 | 48.94 | VE9HX | ●Halifax, Nova Scotia | Week days 7:30-10:45 P.M.; Sundays 5-10:45 P.M. |
| 6128 | 48.96 | HJ1ABB | ●Barranquilla, Colombia | 11:45 A.M.-1 P.M., 5:30-10 P.M. daily |
| 6122 | 49.00 | HJ3ABX | ●Bogota, Colombia | Week days 10:30 A.M.-2 P.M., 5:30-11:30 P.M.; Sundays 12-1:30 P.M., 6-11 P.M. |
| 6120 | 49.02 | XEFT | ●Vera Cruz, Mexico | Daily 11 A.M.-4 P.M., 7:30 P.M.-12 A.M. |
| 6120 | 49.02 | W2XE | ●Wayne, N. J. | 10-11 P.M. daily |
| 6115 | 49.06 | OLR | ●Prague, Czechoslovakia | 4 A.M.-9 P.M. daily |
| 6110 | 49.10 | HJ4ABB | ●Manizales, Colombia | 11 A.M.-1 P.M., 5-8 P.M. |
| 6110 | 49.10 | GSL | ●Daventry, England | Not in use |
| 6110 | 49.10 | VUC | ●Calcutta, India | Mon., 8-9 A.M. Wed., 10:30-11:30 A.M. |
| 6100 | 49.18 | Belgrade | ●Belgrade, Yugoslavia | 1 A.M.-5 P.M. daily |
| 6100 | 49.18 | W9XF | ●Chicago, Illinois | 11 P.M.-2 A.M. daily ex. Sun. |
| 6100 | 49.18 | W3XAL | ●Bound Brook, N. J. | Mon., Wed., Sat., 5 P.M.-1 A.M. |
| 6097 | 49.20 | HJ4ABE | ●Medellin, Colombia | 11 A.M.-12 noon, 6-10:30 P.M. daily |
| 6095 | 49.22 | JZH | ●Nazaki, Japan | Irregular |
| 6090 | 49.26 | CRCX | ●Bowmansville, Ont. | Week days 5:30-11:30 P.M.; Sundays 5-11:30 P.M. |
| 6090 | 49.26 | ZTJ | ●Johannesburg, S. Africa | 11:45 P.M.-12:30 A.M., 3:30-7:00 A.M., 9 A.M.-4:45 P.M. |
| 6085 | 49.30 | HJ5ABD | ●Cali, Colombia | 11 A.M.-2 P.M., 6-11 P.M. daily |
| 6080 | 49.34 | W9XAA | ●Chicago, Ill. | 6:30-8:30 A.M., 5 P.M.-12 A.M. daily |
| 6080 | 49.34 | ZHJ | ●Penang, S.S. | 6:40-8:40 A.M. |
| 6080 | 49.34 | CP5 | ●LaPaz, Bolivia | 11:30 A.M.-1 P.M., 6-7:45 P.M., 8:30-11 P.M. week days; Sunday 3:30-6:00 P.M. |
| 6080 | 49.34 | VE9CS | ●Vancouver, B. C. | Week days 9:30 A.M.-2 A.M.; Sun. 12 noon-1 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 |
| 6072 | 49.41 | OER2 | ●Vienna, Austria | Week days 9 A.M.-5 P.M.; Sat. to 6 P.M. |
| 6070 | 49.42 | YV7RMO | ●Maracaibo, Venezuela | Daily 8 P.M.-12 A.M. |
| 6060 | 49.50 | W8XAL | ●Cincinnati, Ohio | Daily 6:30-7 P.M., 10 P.M.-2 A.M. |
| 6060 | 49.50 | W3XAU | ●Philadelphia, Pa. | 8-11 P.M. daily |
| 6060 | 49.50 | VQ7LO | ●Nairobi, Kenya Colony, Africa | Mon. to Fri. 5:45-6:15 A.M., 11:30 A.M.-2:30 P.M. Tues. and Thurs., 8:30-9:30 A.M. Sat., 11 A.M.-3 P.M. Sun., 11:30 A.M.-2:30 P.M. |
| 6060 | 49.50 | OXY | ●Skamleback, Denmark | 1-6:30 P.M. Sunday 11 A.M.-6:30 P.M. |
| 6050 | 49.59 | VPB | ●Colombo, Ceylon | 8-10 A.M. daily |
| 6050 | 49.59 | GSA | ●Daventry, England | Not in use |
| 6050 | 49.59 | HJ3ABD | ●Bogota, Colombia | Daily 9-11 A.M., 12-2 P.M., 6-11 P.M. |
| 6043 | 49.65 | HJ1ABG | ●Barranquilla, Colombia | Daily 11 A.M.-11 P.M. Sun., 11 A.M.-8 P.M. |
| 6040 | 49.67 | HI9B | ●Santiago de los Caballeros, R. D. | Daily 6:10-9:40 P.M.; Sat. 11:40 P.M.-12:40 A.M. |
| 6040 | 49.67 | PRA8 | ●Pernambuco, Brazil | 9:30-11:30 A.M., 2:30-8:30 P.M. |
| 6040 | 49.67 | YDA | ●Tandjong Priok, Java | Week days 5:30-11 A.M., 5:45-6:45 P.M., 10:30 P.M.-1:30 A.M. Sundays 5:30-10:30 A.M., 7:30 P.M.-2 A.M. |
| 6040 | 49.67 | W4XB | ●Miami, Florida | Temporarily off the air. Undergoing repairs. |
| 6040 | 49.67 | W1XAL | ●Boston, Mass. | Mon. & Fri., 7-9 P.M. Sundays 7:15-9 P.M. |
| 6030 | 49.75 | HP5B | ●Panama City, Panama | 12 noon-1 P.M., 6-10 P.M. |
| 6030 | 49.75 | HJ4ABP | ●Medellin, Colombia | 6-10:30 P.M. daily |
| 6030 | 49.75 | PGD | Kootwijk, Holland | (P) Phones Java and E. Indies irreg. |
| 6030 | 49.75 | VE9CA | ●Calgary, Alberta, Canada | Week days 9 A.M.-1 A.M.; Thursdays to 2 A.M.; Sundays 12 noon-12:30 A.M. |
| 6025 | 49.79 | PGD | Kootwijk, Holland | (P) Phones Java and E. Indies irreg. |
| 6025 | 49.79 | HJ1ABJ | ●Santa Marta, Colombia | 11:30 A.M.-2 P.M., 5:30-10:30 P.M. daily |
| 6020 | 49.83 | PGD | Kootwijk, Holland | (P) Phones Java and E. Indies irreg. |
| 6020 | 49.83 | DJC | ●Zeesen, Germany | 11:35 A.M.-4:30 P.M., 4:50-10:45 P.M. daily |
| 6020 | 49.83 | XEUW | ●Vera Cruz, Mexico | 7 A.M.-11 P.M. daily |
| 6018 | 49.85 | ZHI | ●Singapore, S.S. | Mon., Wed., Thurs. 5:40-8:10 A.M.; Sat. 10:40 P.M.-1:10 A.M.; 2nd & 4th Sundays, 5:10-6:40 A.M.—organ |

## Short-Wave Station List

| KC | Meters | Call | Location | Time |
|---|---|---|---|---|
| 6015 | 49.88 | HI3U | ● Santiago de los Caballeros, R. D. | Week days 7:10-8:40 A. M., 10:40 A.M.-1:40 P.M., 4:40-9:40 P.M. Sundays, 10:40 A.M.-1:40 P.M. only |
| 6012 | 49.90 | HJ3ABH | ● Bogota, Colombia | 11:30 A.M.-2 P.M., 6-11 P.M.; Sun. 12-2 P.M., 4-11 P.M. |
| 6011 | 49.91 | HJ1ABC | ● Quibdo, Colombia | Sun., 3-5 P.M., 9-11 P. M.; Mon. to Sat., 5-6 P.M.; Wed., 9-11 P.M. |
| 6010 | 49.92 | VP3MR | ● Georgetown, Br. Guiana | Sunday, 7:45-10:15 A.M. Week days, 4:45-8:45 P.M. |
| 6010 | 49.92 | VK9MI | ● Sydney, Australia "S.S. Kanimbla" | 11 P.M.-7 A.M. Irregular |
| 6010 | 49.92 | COCO | ● Havana, Cuba | 8 A.M.-10 P.M. daily |
| 6005 | 49.96 | HP5K | ● Colon, Panama | 7:30-9 A.M., 12-1 P.M., 6-9 P.M. |
| 6005 | 49.96 | CFCX | ● Montreal, Que. | Weekdays 7:45 A.M.-1 A.M. Sundays, 9 A. M.-11:15 P.M. |
| 6005 | 49.96 | VE9DN | ● Montreal, Que. | Sat., 11:30 P.M.-1 A.M., Fall, Winter & Spring |
| 6000 | 50.00 | XEBT | ● Mexico City, Mexico | 10 A.M.-1:45 A.M. |
| 6000 | 50.00 | FIQA | ● Tananarive, Madagascar | 3:30-4:45 A.M., 7 A.M.-1 P.M. daily |
| 5980 | 50.17 | HJ2ABD | ● Bucaramanga, Colombia | Daily 11:30 A.M.-12:30 P.M., 6-10 P.M. |
| 5975 | 50.20 | XEWI | ● Mexico City, Mexico | Not in use. See 11900 K.C. |
| 59.69 | 50.26 | HVJ | ● Vatican City, Vatican | 2-2:15 P.M., Sunday 5-5:30 A.M. |
| 59.55 | 50.35 | HJN | ● Bogota, Colombia | Daily 11 A.M.-2 P.M., 5-10:30 P.M. |
| 5940 | 50.51 | TG2X | ● Guatemala City, Guat. | Daily 4-6 P.M.; Mon., Thurs., Sat., 10 P.M.-1 A.M.; Sundays, 1-2 P.M. |
| 5910 | 50.76 | HH2S | ● Port-au-Prince, Haiti | 7-10 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.) |
| 5880 | 51.02 | YV8RB | ● 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 | Week days 12-1:30 P.M., 6-7:30 P.M., 8-11:15 P.M.; Sun., 3-5 P.M., 6-7:30 P.M., 8-11:15 P.M. and later |
| 5865 | 51.15 | HI1J | ● San Pedro de Macoris, R. D. | Daily 6:25-7:40 A.M., 11:40 A.M.-1:40 P.M., 4:40-9:40 P.M. |
| 5853 | 51.20 | WOB | Lawrenceville, N. J. | (P) Phones ZFA P.M. |
| 5850 | 51.28 | YV5RMO | ● Maracaibo, Venezuela | Week days 8:45-9:45 A. M., 11:15 A.M.-12:45 P.M., 4:45-9:45 P.M. Sundays 10:45 A.M.-12:45 P.M. |
| 5845 | 51.28 | GBT | Rugby, England | (P) Phones U.S.A. irreg. |
| 5845 | 51.33 | KRO | Kahuku, Hawaii | (P) Tests early mornings |
| 5830 | 51.46 | TIPGH | ● San Jose, Costa Rica | 8-11 P.M. daily ex. Sun. |
| 5825 | 51.50 | HJA2 | Bogota, Colombia | (P) Phones HJA3 afternoons irreg. |
| 5800 | 51.72 | KZGF | Manila, P. I. | (P) Tests A.M. irreg. |
| 5800 | 51.72 | YV2RC | ● Caracas, Venezuela | Sun., 8:30-11:30 A.M., 3:30-9:30 P.M. Week days, 10:30 A.M.-1:30 P.M., 4:15-9:30 P.M. |
| 5790 | 51.81 | JVU | Nazaki, Japan | (P) Phones JZC early mornings |
| 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.) |
| 5750 | 52.17 | XAM | Merida, Mexico | (P) Phones XDR-XDF early evenings |
| 5730 | 52.36 | JVV | Nazaki, Japan | (P) Phones JZC early A.M. |
| 5725 | 52.40 | HC1PM | ● Quito, Ecuador | Tuesdays 9-11 P.M. |
| 5713 | 52.51 | TGS | ● Guatemala City, Guat. | Sun., Wed., Fri., 6-8 P.M. |
| 5710 | 52.54 | YV10RSC | ● San Cristobal, Venez. | 5:30-9:30 P.M. daily |
| 5705 | 52.59 | CFU | Rossland, Canada | (P) Phones CFO and CFN eves.; news, 8:30-8:45 P.M. |
| 5670 | 52.91 | DAN | Nordenland, Germany | (P) Phones ships irreg. |
| 5500 | 54.55 | TI5HH | ● San Ramon, Costa Rica | 3:30-5 P.M., 8-9:30 P.M. daily |
| 5445 | 55.10 | CJA7 | Drummondville, Que. | (P) Phones Australia early A.M. |
| 5435 | 55.20 | LSH | Buenos Aires, Arg. | (P) Relays LR4 and tests evenings |
| 5410 | 55.45 | ZBW | ● Hong Kong, China | 11:30 P.M.-1:15 A.M., 4-10 A.M. daily |
| 5395 | 55.61 | CFA7 | Drummondville, Que. | (P) Phones No. America irregular |
| 5260 | 57.03 | WQN | Rocky Point, N. Y. | (E) Program service; irregular |
| 5140 | 58.37 | PMY | ● Bandoeng, Java | Daily 4:45-10:45 A.M., 5:45 P.M.-2:15 A.M. |
| 5110 | 58.71 | KEG | Bolinas, Calif. | (P) Phones irregularly evenings |
| 5080 | 59.08 | WCN | Lawrenceville, N. J. | (P) Phones GDW evenings seasonally |
| 5025 | 59.76 | ZFA | Hamilton, Bermuda | (P) Phones WOB evenings |
| 5040 | 59.25 | RIR | Tiflis, USSR. | (P) Phones afternoons irregular |
| 5015 | 59.82 | KUF | Manila, P. I. | (P) Phones Bolinas; irregular |
| 4975 | 60.30 | GBC | Rugby, England | (P) Phones ships afternoon and nights |
| 4905 | 61.16 | CGA8 | Drummondville, Que. | (P) Phones GDB-GCB afternoons |
| 4820 | 62.20 | GDW | Rugby, England | (P) Phones WCN-WOA evenings |
| 4810 | 62.37 | YDE2 | ● Solo, D. E. I. | 5:30-11 A.M., 5:45-6:45 P.M., 10:30 P.M.-2 A.M. daily |
| 4795 | 62.56 | VE9BK | ● Vancouver, Canada | Weekdays 11:30-11:45 A.M., 2:30-3 P.M., 7:30-8 P.M. Sat. (same ex. last), 7-7:30 P.M. |
| 4752 | 63.13 | WOY | Lawrenceville, N. J. | (P) Tests irregularly |
| 4752 | 63.13 | WOO | Ocean Gate, N. J. | (P) Phones ships irreg. |
| 4752 | 63.13 | WOG | Lawrenceville, N. J. | (P) Phones Rugby irreg. |
| 4600 | 65.22 | HC2ET | ● Guayaquil, Ecuador | 9:15-10:45 P.M., Wed. & Sat. |
| 4555 | 65.95 | WDN | Rocky Point, N. Y. | (P) Tests Rome and Berlin evenings |
| 4550 | 65.93 | KEH | Bolinas, Calif. | (P) Phone; irreg. |
| 4510 | 66.52 | ZFS | Nassau, Bahamas | (P) Phones WND daily; tests GYD - ZSV irregular |
| 4465 | 67.19 | CFA2 | Drummondville, Que. | (P) Phones No. America; irregular days |
| 4355 | 68.88 | IAC | Pisa, Italy | (P) Phones and tests irreg. |
| 4348 | 69.00 | CGA9 | Drummondville, Que. | (P) Phones ships and Rugby evenings |
| 4320 | 69.40 | GDB | Rugby, England | (P) Phones CGA8 and tests evenings |
| 4295 | 69.90 | WTDV | St. Thomas, Virgin Is. | (E) Weather reports, 8 A.M.-12 Noon; 3-6 P.M. |
| 4295 | 69.90 | WTDW | St. Croix, Virgin Is. | (E) Weather reports, 8 A.M.-12 Noon; 3-6 P.M. |
| 4295 | 69.90 | WTDX | St. John, Virgin Is. | (E) Weather reports, 8 A.M.-12 Noon; 3-6 P.M. |
| 4273 | 70.21 | RV15 | ● Khabarovsk, USSR. | Daily 11 P.M.-10 A.M.; English, 1:30 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 | 12-2 P.M., 6-10 P.M. daily except Monday (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. |
| 3040 | 98.68 | YDA | ● Batavia, Java | Week days 5:30-11 A.M., 5:45-6:45 P.M., 10:30 P.M.-1:30 A.M.; Sun., 5:30-10:30 A.M., 7:30 P.M.-2 A.M. |

—it doesn't hit in the band! And the 20-meter band is off!'

"The opinion was that the chart was all right for rough work but that it was not accurate. And so ALL-WAVE RADIO got a black eye, totally undeserved.

"Checking afterwards, I found that we have no 40-meter band. It is from 41.1 to 42.4 meters. And our 20-meter band is from 20.8 to 21.4 meters!

"To restore confidence in your fine magazine, I would recommend that you announce that the chart was right after all—hi."

And so we announce the fact that the chart is right, and thank the sixth-district ham who so kindly tipped us off to the excitement. But we were very lax in failing to mention that the chart brings to light the very interesting point that the frequency-wavelength relationship repeats itself, with the result that either frequency or wavelength can be carried to any figure desired beyond the limits of the graph, and computed with an accuracy dependent upon the number of divisions on the graph itself and how closely they can be read.

## EDITORIAL QUOTES

[*Continued from page 4*]

# On the Market

## Birco Switch-O-Matic All-Wave Antenna

ANNOUNCEMENT IS MADE of a new high-fidelity, all-wave antenna kit designed to actually improve reception. This has been accomplished, according to the manufacturer, by means of a factory-wired and soldered assembly which eliminates all


possibility of incorrect and poor connections. Man-made interference and background noises have been tremendously reduced, pick-up increased and automatic antenna tuning provided through the Birco Switch-O-Matic system. The antenna transformer matches the antenna to the transmission line impedence without loss of signal strength.

The complete system comes in a newly designed package with unusual eye appeal, a factor of which every dealer will readily appreciate the importance at the point f sale. Complete details are obtainable from the manufacturer, Birnbach Radio Mfg. Co. Inc., 145 Hudson Street, New York City.

◆

## New RCA Tubes

THE RCA RADIOTRON Division of the RCA Manufacturing Company, Inc., has introduced a number of new tubes for use in transmitters and receivers. Also a midget cathode-ray tube, used in the oscilloscope described in this issue.

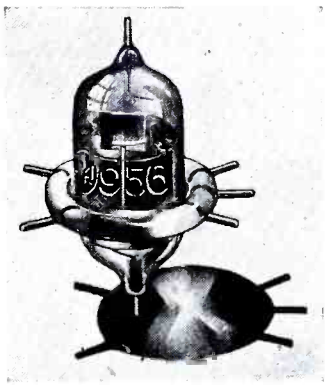
*Type 913 Cathode-Ray Tube*:

This tube is of the low-voltage, high-vacuum electrostatic type. It is constructed like the all-metal receiving tubes except that the end of the metal shell (6L6 type) is replaced with a fluorescent viewing screen approximately one inch in diameter. It is designed for operation with an anode voltage as low as 250 volts and as high as 500 volts, as against 1000 volts or more required for the larger cathode-ray tubes, such as the type 906. It is provided with two sets of electrostatic plates for deflection of the electron beam. The brilliant luminous spot produced by the 913 has a greenish hue.

Because of its low cost, unusually small size, and its ability to produce a bright image at extremely low voltages, the 913 is especially suited for use in compact, portable oscillographic equipment, or as a built-in indicator for amateur transmitters.

*Type 956 Acorn Super-Control R.F. Amplifier*:

The 956 is a companion tube to the acorn type 954 and 955, it is very effective in reducing cross-modulation and modulation distortion over the usual range of signal voltages without the use of antenna potentiometers or auxiliary volume-control systems. This super-control characteristic makes the 956 especially adaptable to the r.f. and i.f. stages of a receiver employing automatic volume control.




Experiments with the 956 indicate that it, like the 954, is markedly superior for ultra-high-frequency operation to conventional pentodes of the 58 and 6K7 types. With the 956 operating at minimum bias, it has been found practical to obtain gains of four or more at one meter.

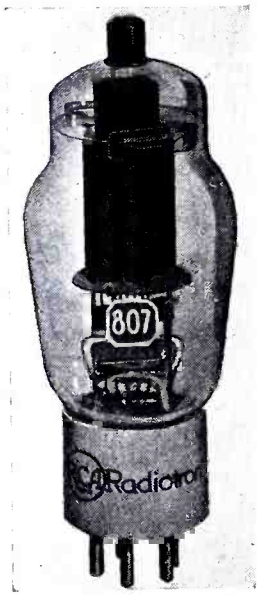
*Type 25L6 Beam Power Amplifier*:

The design of the 25L6 is similar to that of the type 6L6 with the difference that the 25L6 is intended for use in the output stage of transformerless receivers operating from the 115-volt power line, either a.c. or d.c. This new tube has high sensitivity, high efficiency, and high power output. With 110 volts on the plate and screen, the 25L6 is capable of giving an output of 2.2 watts with a maximum signal output of only 5.3 volts r.m.s. Under these conditions, the total distortion is about 10 percent.

*Type 807 Transmitting Beam Power Amplifier*:

The 807 incorporates the beam-power features of the receiving type 6L6, but is designed particularly for r-f transmitting applications.

To meet r-f power service requirements, the 807 has been provided with ceramic base, top cap connections for high insulation and low interelectrode capacities, and improved shielding to minimize the need for neutralization.

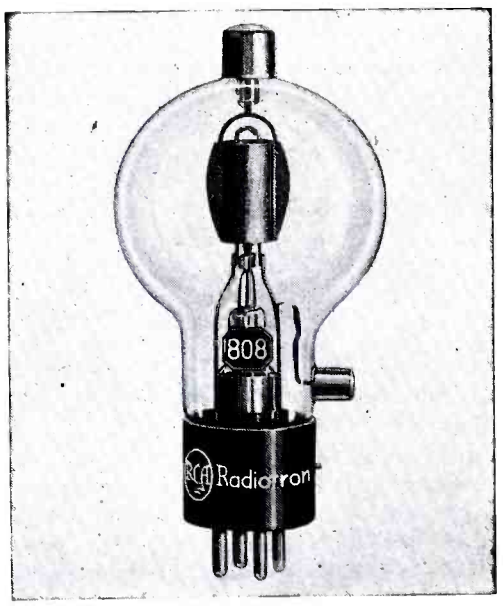



This new tube has a maximum plate dissipation of 21 watts, and high power sensitivity (very low driving power). The high power sensitivity makes it especially suited for use as a crystal oscillator, frequency multiplier, and buffer amplifier. In the output stage, two 807's in Class C telegraph service are capable of giving a power output of 50 watts or better.

*Type 808 Low-Power Transmitting Tube*:

The 808 is designed to operate as an r.f. power amplifier with high plate-circuit efficiency and with maximum rated input at frequencies as high as 30 megacycles. It is also useful as a Class B modulator.

The 808 is rated at a maximum plate input of 200 watts and a maximum plate dissipation of 50 watts. It is constructed in a round bulb of liberal size to insure maximum heat-dissipating ability and freedom of gas evolution from the bulb surface. A large cap on the top of the bulb provides a low-resistance connection for the



tantalum plate, while a cap on the side of the neck provides a connection for the grid. A minimum amount of insulating material together with short leads through the glass wall give the 808 high insulation resistance and low interelectrode capacities.

✦

## New "Super Pro"

A NEW 1937 MODEL of the Hammarlund "Super Pro" professional receiver with many new unusual features, has just been developed by the communication engineering department of the Hammarland Mfg. Co., Inc.

In this latest model eight metal tubes are used in conjunction with eight glass tubes to secure the combined high efficiency afforded by both types.

An outstanding feature of this improved model is a five-range bandwidth, directly engraved on the panel. With the aid of this exclusive tuning device it is possible, for the first time, to accurately select the actual bandwidths required. Another pair of improved features are calibrated audio and calibrated sensitivity gain controls to enable the operator to select the proportionate audio and sensitivity gain actually required for each signal.

Still another feature of the improved "Super Pro" is the special five range, cam switch with its five shielded sections.

With the bandwidth control of the improved "Super Pro" at the minimum setting, the selectivity of a signal 10 times the input, is only 5.5 kc, and at 1,000 times the input, only 11.5 kc.

The sensitivity of the improved "Super Pro" is said to be so great and the receiver noise level so low that weak-signal reception is only limited by the noise pickup of the antenna system. With the aid of a special individual band-spread system, using a 12-gang tuning condenser, short-wave stations are spread out over a wide range for extremely easy tuning. A special audio system affords real high-fidelity reception at all times, it is said.

✦

## New Raytheon Filamentless Tubes

MR. E. S. RIEDEL, General Sales Manager, Raytheon Production Corporation, announces two new Raytheon tubes.

After eight years of research and experimentation, Raytheon has developed and brought out a filamentless auto radio set rectifier, which is embodied in two types, the OZ4, a metal type illustrated herewith,


and its companion, the OZ4G, a tube of the same characteristics, but in glass. The OZ4 and OZ4G are said to be more efficient than the conventional types of rectifier, have no filament to burn out, and reduce battery drain. They possess better regulation, making possible greater undistorted output. High voltage surges, which customarily shorten condenser life in auto-radio sets are considerbly reduced. Much less heat is radiated to affect the delicate parts of the auto radio receiver. The tubes are extremely small in size, representing a considerable space saving in auto radio construction, where space is at a premium. The illustration shows the greatly reduced size as compared with the 6X5G and 6X5, which the new tubes replace.

The OZ4G measures only one inch for the glass envelope above the small base, or two and three-eighths inches from the end of the tip to the end of the glass envelope. The glass envelope diameter is about seven-eighths of an inch maximum. The OZ4 measures two and one-half inches from the end of the tip to the end of the metal envelope. The diameter of the envelope is one inch. Since the OZ4 and OZ4G have no filament, burn-out trouble at high battery or charger voltage is not possible, nor is the customary drop in output at low battery voltage existent. The new tubes are not affected by change in temperature, and are interchangeable insofar as characteristics are concerned with the 6X5 and 6X5G. They can replace the older type 84 by merely changing to an octal base socket. ALL-WAVE RADIO

✦

## New Turner Microphone

THE MODEL VT-73 is a new crystal microphone being announced by The Turner Company.

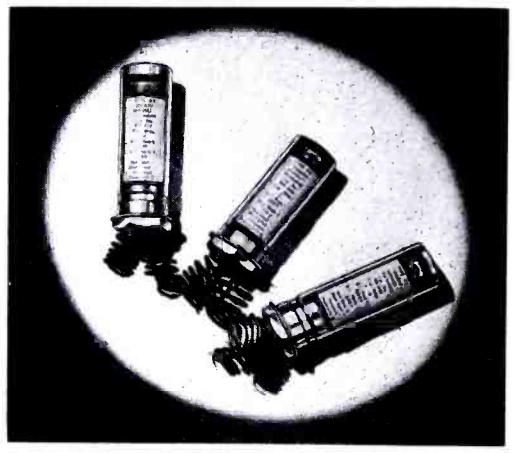
This new microphone has been designed to have the most suitable response for voice transmission. The output level is higher than on any previous model.

Several new constructional features insure the microphone against adverse climatic conditions. ALL-WAVE RADIO.

## Cornell-Dubilier Etched Foil Electrolytics

IN RESPONSE TO demand, Cornell-Dubilier has brought out the Type KR Etched Foil Dry Electrolytic condensers. This type is notable for its extreme compactness and the fact that it utilizes a patented exclusive etched foil process which is said to assure a much better condenser than that made possible by less modern foil etching methods.

An idea of the small size of the Type KR may be gained from the fact that the largest condenser in the series (24 mfd.) is approximately the same size as the average metal tube. This makes for convenient servicing of small receivers, greater symmetry of layout and contributes to the neatness of service jobs.



Full details of this line of condensers are given in a special catalog No. 134A, which is now available and which may be secured by addressing the manufacturer at South Plainfield, New Jersey. ALL-WAVE RADIO.

✦

## Neobeam Oscilloscope

SUNDT ENGINEERING CO., 4238 Lincoln Ave., Chicago, Ill., has brought out a handy instrument, called the "Neobeam Oscilloscope," which makes use of a special glow discharge tube in conjunction with a scanning mirror. The complete unit consists of the oscilloscope tube, the power generator, the amplifier system, the power supply, and the sweep or scanning system.

The sensitivity range of the Neobeam Oscilloscope is one microvolt to 200 volts. The response is linear to all frequencies up to 10,000 cycles. The motor-driven horizontal sweep is directly calibrated. The screen of the Oscilloscope is also calibrated, and is 4 inches in diameter.

The unit is completely self-contained and works from any 110-volt, 60-cycle line.

## NIGHT-OWL HOOTS

*(Continued from page 25)*

### *With the Night Owls*

Night Owl R. H. Tomlinson, of Port Chester, N. Y., reports great reception of the TA's and informs that Radio Cote d'Azur on 1276 kc broadcasts IBC programs in English till 8 P.M. every Sunday evening. . . . Ed Hatch, the Philadelphia Night Owl whose veris you saw reproduced last month says that he can't get steamed up over the contest until he sees some scores in print. All we have to say now that the "early returns" have been made public is—remember the old QRC rule to sleep at least every third night! . . . Thanks to Night Owl Carl E. Sylvester, of Yale, Michigan, for boosting our department and ALL-WAVE RADIO. His boosting has brought a new reader in Walter V. Scholz, of Carlinsville, Illinois, who has logged every state except Rhode Island, Delaware, and Wyoming. We would suggest that Night Owl Scholz try the FCC monitoring checks for those missing states.

As usual we have a letter from E. L. Peters up in Westport, Nova Scotia, where the TA's roll in with the waves. We're beginning to suspect that Night Owl Peters has some sort of trap which absorbs the waves and stops 'em from reaching the "Heart of the Commonwealth," as the TA's are very slow in showing up on the Chief Night Owl's dial this season! . . . A very active Night Owl and consistent reporter is John Gardner of New York City, who has entered the contest with a homebuilt t.r.f. receiver. We quote in part: "I realize just what the competition will be in the contest, and believe it or not, I am not in the least discouraged." If John can win a prize with a set which he built himself he would really have reason to be proud of his accomplishment, say we. . . .

"CMKX are now on the air until midnight on 1090 kc" relates Ray Geller of the GCDXC. Ray also states that a sample copy of the club bulletin will be sent to anyone writing him at 1652 Radcliff Ave., Bronx, N. Y. Reg Vining, Cortland, N. Y., publicity director for the GCDXC says, "Through the cooperation of Ed Lips, the GCDXC tips will be broadcast over KDKA every Friday at midnight."

Another long, but every bit interesting letter from Night Owless Mrs. A. C. Johnson of South Dakota. We quote in part: "I think that if I have to go without coffee until I hear TGW I'll become a teetotaler!" . . . Just before this copy is sent to press the mailman brings us another interesting letter from E. L. (Trans-Atlantic) Peters who has kindly checked our foreign station list with his loggings and finds that the only correction is the ommission of the new Italian station "Radio Marconi" using 50 kw on 1222 kc, located in Bologna.

An interesting bit of information for those who are skeptical concerning TA reception comes from Night Owl Peters' letter: "Altogether about 115 of these BCB TA's have been reported by DXers." The old timer of our group, C. L. Horton, of Athol, Mass., who possesses the famous 6KW veri (the oldest veri we've ever seen) does not want others to be misled regarding his age. He says, "I was still in school when dad gave me twenty-five dollars for Christmas. To me this was a fortune. I sent to a train manufacturing company over in Connecticut and bought their kit—and built my first crystal set back in '20. So you won't imagine me an old man with a long white beard—I'm only thirty now."

The Chief Night Owl also acknowledges correspondence from the following: Bob Beadles of Salt Lake City, George Roche of Amesbury, Mass., Kendall Walker of Yamhill, Ore., and George L. Brode of Philadelphia.

### *Kilocycling Around*

The all-night broadcasting fever has spread into Canada with CKCH conducting the Midnight Rendezvous until 3 A.M. daily. . . . The Chief Night Owl would like a little inside information on the Spanish speaking station occasionally drowning WMAQ's signal evenings. . . . China will have a new 50-kw station on 689 kc . . . A new 60-kw transmitter has been completed and will be installed 16 miles from Wellington, N. Z., to be ready for use by 2YA by the end of the year. . . . According to the NNRC, a special broadcast has been arranged from KHBC, in Hilo, Hawaii, for the last Wednesday of each month from 3-4 A.M. for that club. Reg Vining would also like to have you know that the Globe Circlers DX Club will sponsor a verification contest for its members beginning December 1, 1936. For information send 3c stamp to the club headquarters—address mentioned in last paragraph. . . . Heard the glad news? Cappie Hadley's back! Back where? Why back of the WLAC mike every Sunday morning at 12:45 with his unrivaled DX News period! Listen to Cappie for an up-to-the-minute account of what's doing in the world of DX. . . . Thanks for forwarding information re-

garding HJ1ABE's broadcast band station go to none other than AWR's Globe Girdler, J. B. L. Hinds.

### *Cheers and Jeers*

Three cheers go to Charles A. Morrison for conceiving the plan for an association to be known as the International Radio Journalists' Guild. The plan is an outgrowth of the International DXer's Alliance and the IDA President expects to have the guild fully organized sometime this winter. A feature of the organization will be in the form of an Associated Press Service where editors could send their choice tips to a central clearing house making them available to other columnists who are Guild Members.

Last month we handed out jeers to WAAB but we will have to take back at least one of them, because they have the courtesy to stand by during the week of the FCC monitoring tests. But they're still an all-nighter!

Three hooting jeers to the unknown station who drowned the WPAX monitoring check program by placing their carrier on the air during the entire length of the program. The FCC orta do sumpin about these stations as well as those who refuse to remain silent during the frequency checks—completely disregarding the Commission's rulings!

And while handing out jeers, we can't forget those stations who go through their entire monitoring test without namning any of the musical selections played. We're not very good at guessing 'em, especially some of these jigs and rags which all sound alike to our unmusical ear! We missed a veri on this account—and the signal was R9, too. Grr!

All correspondence intended for this column should be addressed to Ray La Rocque, 135 Highland St., Worcester, Mass. Any time mentioned in the foregoing paragraphs is Eastern Standard Time.

## QUERIES

*(Continued from page 27)*

on five meters between two farm buildings separated about two miles. As it is generally admitted that these short waves do not travel beyond the horizon —certainly could never reach the state border—do I need a license for my purpose? *A C. L., Cooperstown, N. Y."*

### *Answer*

Yes, yes—a thousand times yes! You *do* need a license. This question has been asked many, many times. If one is not used to the "and/ors" of legal phraseology, section 301 of the 1934 Communications Act is so worded as to suggest that no license is required if a signal does not cross a state boundary. Even if this were the fact—which it is *not*—it would be very difficult to prove that a given 5-meter signal would confine itself to a stated territory. Recent developments and tests have shown that these short-wave signals have little or no respect for horizons or theories.

However, even if the power of the transmitter were so low as to make virtually impossible the transmission of signals beyond a very local area, they might still interfere with the reception of signals from some other station outside the state—which would be a violation of Section 301, unless the offending transmitter is licensed. Even if we were to discount the range of a powerful extra-state 5-meter transmitter, the unlicensed station could certainly interfere with 5-meter reception on an airplane flying overhead from a nearby licensed 5-meter transmitter . . . which again is a violation.

The penalty for such a violation may be as high as $10,000 plus two years imprisonment. A license is a lot cheaper.

## AUTO RADIO ANTENNAS

### *Question Number 23*

"I am unable to secure satisfactory results from my Arvin auto radio. Two friends who have exactly the same model set enjoy excellent reception. I have had the receiver checked by a serviceman who tells me that it is in perfect condition. Yet all I can receive are one or two local stations. *R. O. L., Schenectady, N. Y."*

### *Answer*

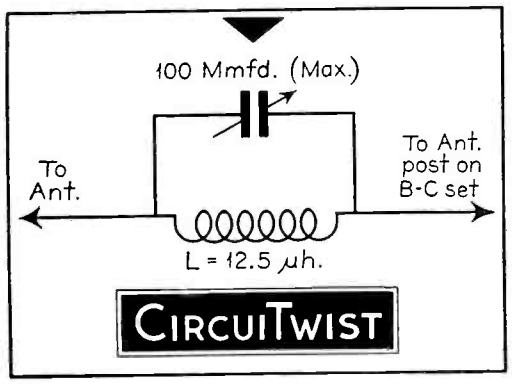
R. O. L. does not state the make and model of his car, nor give any indication of the type antenna he is using with his auto radio. Taking the serviceman's word for the condition of his set, and the fact that he can receive only a few local stations, we'd hazard a guess that his car has an all-steel body with a turret top, and his major trouble is poor pick-up. Roof antennas are useless with such cars, and often under-chassis and running-board aerials are not much better.

Here is a test you can make very easily yourself: If you don't know where your antenna lead connects to the receiver, ask your serviceman. Disconnect the auto aerial, and run about eight feet of ordinary wire—bare or insulated—from the receiver in place of your regular aerial. Run this away from the car, holding it as high as possible, and use it as an aerial. If your pick-up increases considerably, the solution to your problem is simple. Install a fish pole type aerial on the rear bumper.

These are inexpensive and you can put it on yourself. If the experiment with the wire does not greatly improve reception, then there *is* something wrong with the receiver and we suggest that you try another serviceman.

## CIRCUITWIST

A BROADCAST LISTENER complains that his foreign reception on the twenty-meter band is blanketed by a nearby amateur operating between 14 and 14.4 mega-




cycles. The amateur has designed the above trap circuit to eliminate this interference. What is wrong with it? See answer on page 52.

## GLOBE GIRDLING

[*Continued from page 23*]

lister City, Calif. and S. A. Whitt. Itmann, W. Va.

### *"Log of the Month"*

Below is a log of stations received by J. Wendell Partner, Tacoma, Washington, and shows the stations heard on the West Coast during the month of October, which is a very fine record and an interesting report. We extend our thanks to Mr. Partner; Lyle Nelson and Kendall Walker, Yamhill, Oregon; E. H. Clark, Jr., Hollister City, Calif.; R. E. G. Langton, Port Hammond, B. C., Canada, for similar logs furnished and to many other West Coast listeners for their helpful information sent this department.

Asia—JVD, JVF, JVH, JVM, JVN—Japan; XGOX, XGW, CQN—China; PMN, PLP, YDB, YDC, PLX—Java; HS8PJ—(3)—Siam; F3ICD-11730—Indo-China; RV15—Siberia; JIB—Taiwan.

North America—CJRX, CJRO, CRCX, VE9CA, VE9CS—Canada; WXH—Alaska; W8XK—(3), W2XAF, D, W2XE—(4), W1XK, W1XAL, W3XAU—(2), W8XAL, W9XAA, W9XF—USA; XEFT, XEBT, XEWI, XECR—Mexico.

Central America—YNLF, HRN, HRD, TG2X, TGWA—Nicaragua, Honduras and Guatemala, respectively; COCO, COCH, COCQ, COCX, COKG—Cuba; HI3U, HIX, HIZ, HIN—Dominican Republic.

South America—YV2RC, YV3RC, YV4RC, YV6RV, YV8RB—Venezuela; HJ1ABE, HJ2ABC, HJ3ABH, HJ4ABE—Colombia; OAX4D&G—Peru; PRF5—Brazil; LRU, LRX, LSX—Argentina; CB960, CB954, CEC—Chile; PRADO, HCJB, HC2RL—Ecuador.

Africa—OPM—Belgium Congo: SUZ—Egypt; "Radio Algiers"—Algeria; IUC, IUG—Ethiopia.

Europe—GSB, C, D, F, G, H, I, O, P—England; DJA, B, D, E, L, N, P, Q, R, DZA, B, H,—Germany; TPA2, 3, 4—Paris, France; ORK—Belgium; PCJ—(2)—Holland; SPW—Poland; LKJ1—Norway; 2RO4, 3, HVJ—Italy; OLR—(5)—Czechoslovakia; HBO, HBL—Switzerland; EAQ—Spain; RNE, RKI, RAN—U.S.S.R.; TFJ—Iceland; HAS3, HAT4—Hungary.

### *In Appreciation*

I greatly appreciate the interesting reports and letters received from Frank Bantista, San Leandeo, Calif.; Walter E. Bishop, Rensselaer, N. Y.; Tom Copeland, Brooklyn, N. Y.; Wm. James Campbell, New Canaan, Conn.; J. W. Carter, Los Angeles, Calif.; A. F. Dittmann, Brownsville, Texas; Paul W. Dilg, Evanson, Ill.; John A. Farren, East Boston, Mass.; George K. Glass, Detroit, Mich.; Edwin Granger, Syracuse, N. Y.; Henry C. Gephe, Chicago, Ill.; Charles Gerran, Jamestown, N. Y.; E. R. Holmes, Colchester, Conn.; Ed.

Hughes, Long Branch, N. Y.; Harry E. Kentzel, Averill Park, N. Y.; John Losert, New York, N. Y.; Charles Lockhart, Jr., Greenview, Ill.; Bill Levings, Winnetka, Ill.; Hugh J. Leddy, Flushing, Long Island, N. Y.; C. Kenneth Mellor, New York, N. Y.; Thomas W. O'Neil, Jersey Shore, Pa.; J. D. Ralston, Baton Rouge, La.; Fred Van Voorhees, Miller Place, N. Y.; Ralph Walker, Maryville, Tenn.; David T. Wieck, Bronx, New York City, N. Y.; and many others who regularly contribute to this department and extend to all the sincere thanks of ALL-WAVE RADIO and the writer for their assistance and advice. Each reader and listener can assist in perfecting our station lists, address and identification sections by forwarding to me information affecting them, and which may be shown on new veri cards, where it is noted that the time on the air, address, etc., has been changed from that reported.

Address all letters to me at 85 St. Andrews Place, Yonkers, New York, enclosing self-addressed stamped envelope in case you desire a reply. Any questions or information of a technical nature should be forwarded to Queries Editor, All-Wave Radio, 16 East 43rd Street, New York, N. Y.

## AWR OSCILLOGRAPH

*(Continued from page 15)*

### List of Parts

R — 1.5 megohm, ½ watt resistor
R1 — 0.5-megohm potentiometer
R2 — 0.5-megohm potentiometer
R3 — 0.5-megohm potentiometer
R4 — 0.5 megohm, ½ watt resistor
R5 — 10 megohm, ½ watt resistor
C1 — Cornell-Dubilier 4-mfd, 600-volt condenser
T — Kenyon type T-207 cathode-ray transformer
V — RCA type 1-V half-wave rectifier tube
V1 — RCA type 913 cathode-ray tube
1 — ICA type 3825 cabinet
1 — SPST toggle switch - S
1 — SPDT toggle switch - S1
3 — Small control knobs
1 — Swivel mounting for 913 tube (see text)
1 — Isolantite octal tube socket
1 — Wafer socket, 4-prong
4 — Binding posts
1 — Line cord and plug

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



## HAM TRANSMITTER

*(Continued from page 30)*

minus lead to the filter and the center tap of the plate voltage winding.

The filter consists of two oil-filled 2-mfd condensers and a heavy-duty 15-henry filter choke. If all components in the filter are as specified, the ripple voltage should not exceed one-tenth of one percent. The bleeder is a 40,000-ohm, 75-watt vitreous enameled resistor which is provided with variable taps. The taps are connected to their respective terminals on the terminal strips and a short cable is run between the power supply section and the transmitter section. If the values shown in the parts list are adhered to, the voltage regulation will be within 2 percent, which is sufficient to prevent troubles which arise from poor regulation, such as keying chirps and tails, and downward modulation on phone.

It will be noticed that when using the separate transformers the primaries are electrically interlocked. This is done to prevent applying the high voltage to the tubes before first turning on the filament voltage. A short delay before applying the high voltage permits the filaments to come up to their proper operating temperature.

### Performance

The performance of the transmitter far exceeded all expectations. The power output was measured across a non-inductive resistor in the output of the antenna filter. The voltage developed across this resistor was measured by a vacuum-tube voltmeter. The maximum output that was reached was in the neighborhood of 27 watts on c.w. and 12 watts on phone. Excellent stability on phone and c.w., as well as good modulation and clean cut keying, were obtained.

✦

## ANSWER TO CIRCUITWIST

THE AMATEUR HAS not allowed sufficiently for minimum capacity. This trap will tune to the high end of the 14-megacycle ham band only if a minimum circuit capacity of 10 mmfd can be attained—which is impractical if not impossible with ordinary condensers. Using a junk condenser, as the amateur probably would, it is a good idea to allow about 25 micromicrofarads for the total circuit minimum capacity, which includes the minimum capacity of the condenser, capacity of the wiring and the distributed capacity of the coil. The correct value of the coil for this capacity will be 5 microhenries. Such a coil can be wound with three turns of bell wire on a three-inch diameter coil form.

## EMBRYO HAMS

*(Continued from page 34)*

ative grid voltage for each signal cycle has produced a corresponding variation in the flow of electrons from cathode to plate, and therefore a large variation in plate current, as indicated by the graph, P, directly above the plate. So long as proper plate and grid voltages are employed, the variation in plate current will be a magnified or amplified replica of the original voltage. In any event, the plate current so triggered off flows through the primary coil, L-1, in the plate circuit and returns to the cathode via the "B" battery. This flow of current through L-1 develops magnetic lines of force which in turn induce a voltage in a secondary coil (not shown) connected to the grid of another tube where further amplification takes place in the same manner.

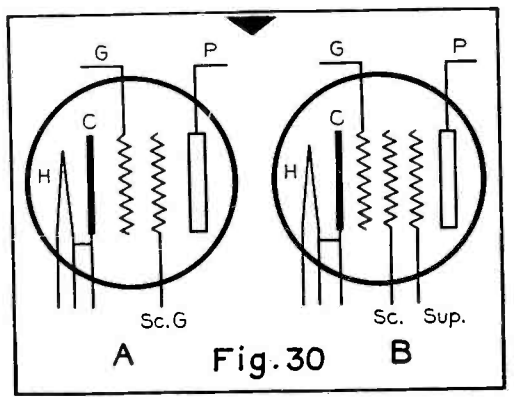



Fig. 30

**The elements used in, A, a tetrode, and B, a pentode.**

The functioning of a triode in an audio-frequency amplifier is exactly the same, the only difference being the value of the circuit components and the character of the voltage.

### *The Tetrode*

The *amplification factor* of a vacuum tube is dependent upon the control the various elements have over the flow of electrons. Some tubes have an amplification factor of only 6 whereas others have values well over 100. One means of increasing this factor is to dissipate as much as possible the space charge around the cathode. We have shown that this can be accomplished by running the control grid positive. but not without undesirable effects. But it can be accomplished in a desirable way by adding a second grid to the tube, placed between the control grid and the plate as shown at A in Fig. 30. This is known as the *screen grid* and the tube as a *tetrode*.

This second grid has two function: First, it is placed at a comparatively high positive potential in order to accelerate the flow of electrons from cathode to plate. Second, it acts as a screen between the plate and control grid so that energy from the plate cannot be fed back to the grid by virtue of the capacity existing between these two elements. This permits the tube to be operated at high amplification levels without developing regeneration or oscillation.

Of course, the screen grid draws current, but this is not objectionable since the screen is not a part of the signal circuit. However, it is necessary to maintain the screen voltage at a value that is always lower than the minimum plate voltage; otherwise the screen, being more positive than the plate, will draw the secondary-emission electrons from the plate. This introduces the odd condition of current flowing in the wrong direction and, of course, a decided increase in screen current at the expense of the plate. The result is serious distortion, loss of power and possible oscillation.

### *The Pentode*

This effect has been overcome by the addition of a third grid between the screen and the plate, as shown at B in Fig. 30. This is known as the *suppressor grid* and the tube as a *pentode*. Most of our present-day voltage amplifiers are of this type.

The purpose of this third grid is to suppress the flow of secondary electrons from plate to screen and turn them back into the plate. By this means the amplification factor of the pentode can be many times that of the triode and tetrode without encountering the operating difficulties previously referred to,

Well, that ought to hold you for the present. In my next letter I'll take up the various types of vacuum tubes and the uses to which they are put. After that we'll get right down to actual circuits—which is what you want.

*Gerald*

## SPEAKER BAFFLES

*(Continued from page 26)*

speaker cone front to cone rear must be 14.125 feet long if our speaker is to reproduce down to 40 cycles.

The baffle can be a box as well as a flat board, as in a radio cabinet. Thus, some of the edges of the baffle can be bent backward to save space. In this

case the baffle area will effectively be the total distance from front to back, but still measured from speaker cone center around the *shortest* side of the cabinet and back to the speaker cone center at the rear. See Fig. 2-B.

Thus a cabinet 15 inches deep, and about 30 inches wide will give a path length of about 45 inches, or 4 feet. Dividing 4 into 1130, we get 282.5, one-half of which, or 141.25, is the lowest frequency that the baffle so provided will reproduce.

### *Cavity Resonance*

Thinking now of your own radio cabinet, and measuring it, you will probably find it smaller than the size given above, yet you know reproduction gets down to below 100 cycles, maybe even to sixty, yet the figures say this can't be.

Frequencies below cut-off are reproduced largely through cabinet resonance, or the resonances caused by the width, height and depth of the cabinet cavity in which the speaker is installed. If these resonances are sharp, as in a thin veneer or a closed-in cabinet, "boominess" results. Thus it appears that cabinet resonance is not undesirable, as is usually thought, but is very necessary to low-note reproduction, if, however, it is obtained from a solid heavy cabinet, and in carefully regulated and controlled degree.

Remember that baffle area is any means of providing a long air path from front to back of a loudspeaker, and that anything preventing this, such as openings in a cabinet, effectively reduce baffle area to the shortest center front-to-back path they provide, and so impair low-note reproduction.

## UNIVERSAL TRANSCEPTOR

*(Continued from page 37)*

When the Transceptor is being employed in the car or operated from a 6-volt storage battery, 12 amperes is consumed in the "transmit" position and 8 amperes in the "receive" position. The power output in the "transmit" position is between 8 and 10 watts, while the audio output circuit in the "receive" position is so designed that it will match into a pair of headphones or a loudspeaker, depending on which is desired.

### *Field Tests*

When testing this unit in a rather poor location in downtown Manhattan, it was possible to contact fellow amateurs within a radius of 25 miles, with very good signal reports on both ends. During these tests, only one antenna was employed, with a jumper connecting the receiving antenna posts to one of the feeders which was disconnected when transmitting.

There is absolutely no difference in the performance of this unit, regardless of whether 6 volts d.c. is used, or the 110-volt- a.c. supply, as these two supplies were interchanged during contacts, with no noticeable difference in signal reports. Also, actual laboratory measurements show that the output remains exactly the same in both cases in view of the fact that the a-c power supply delivers exactly the same voltage, etc., as the 6-volt power supply.

To further test this unit in the field, the author took the sample unit home one Saturday afternoon in his car, and on the way stopped at Tenafly, New Jersey. By merely connecting the two 6-volt leads to any convenient 6-volt source, which in this case was a cigar lighter ground, and the ammeter on the dashboard, and hurriedly erecting two quarter-wave antennae, one on each side of the car, it was possible to contact stations about five minutes after reaching our destination. One of the quarter-wave antennae was used as a receiving antenna, the other as a transmitting antenna, both being fed with a piece of Giant Killer cable. One feeder was connected to the base of the antenna, and the other one grounded to the car body, as near as possible to the base of this antenna. No attempt was made to critically adjust the length of the quarter-wave rods, or the frequency of the transmitter, in an effort to see what results were possible with a hurried installation.

### *60-Mile QSO*

Being a Saturday afternoon, the 5-meter band was rather quiet, so the old amateur pastime of calling CQ was resorted to. Immediately a station in Ridgewood, N. J., approximately 12 miles away, came back with an R9 report, which, of course, was very gratifying. This QSO was made rather short, as it was the author's idea to contact as many stations as possible in an effort to see just what the average range was, under the conditions specified. Upon going over the band, portable W2IYX was heard, who was operating at High Point Park, New Jersey, and who was putting a good R7 to 8 signal into the Baldwin headphones, which were now hanging over the rear vision mirror of the author's car, acting as a loudspeaker.

Realizing that High Point Park was approximately 60 miles away from where we were, we took a long chance and gave portable W2IYX a rather long call, and much to our surprise, he came right back with an R7 to 8 report.

This contact lasted about an hour or so, and it took quite a lot of convincing to assure portable W2IYX that the writer was actually operating portable mobile and was located in Tenafly. He claimed

that we were putting in as loud, if not a louder, signal than the majority of fixed stations he was hearing, and immediately wanted to know all about the Transceptor.

By this time, we turned the car around, so that it was facing downhill, for the storage battery was only three years old, and by this time was showing signs of being a little the worse for wear. Once or twice the car motor was started and left running, and at no time was any trouble experienced in understanding every word that portable W2IYX, 60 miles away, had to say. This may be explained by the fact that the author's car has a shielded ignition system, which of course made good reception possible. The receiving antenna was also erected on one of the rear windows, to get it as far as possible from the motor, which further helped the situation.

Several other stations within a radius of 25 miles were also contacted. The 60 miles range is, of course, explained by the fact that High Point Park is the ideal 5-meter location and a paradise for portable fans. Tenafly, where we were located, is also near the top of the Palisades. Therefore the conditions existing between Tenafly and High Point Park, were practically ideal for 5-meter communication, and in consequence, this range should not be expected unless similar conditions prevail.

We feel quite sure that the range of the Transceptor, when installed in a car, will be approximately 25 miles, and when it is installed in a home, with a good antenna, this range, and possibly better, can be expected.

## CHANNEL ECHOES

*(Continued from page 19)*

fact the intelligence level of the average citizenry will doubtless be raised through a process of elimination. Those who are dumb enough to attempt other than highly scientific cancer cures acceptable to the American Medical Associations and reputable specialists the world over, won't live long enough to do a prolific job of procreation. The Mexican peon has never been quoted for his mental prowess. We've seen them and know. One bright lad had a friend take hammer and cold-chisel and knock out every one of a perfect natural set of teeth just so he could display a couple of second hand upper and lower plates.

Another swarthy paragon of intellectual attainment demonstrated what he had under his sombrero by letting a stick of dynamite go off in his hand on a bet that it wouldn't hurt him. He held the stick of dynamite around the corner of an adobe hut—which was the only thing that saved his life—while his friends grinned from a safe distance. Today he is very proud of his beautiful stump.

✦

OUR 1937 RECEIVERS feature a-v-c (automatic volume control), a-f-c- (automatic frequency control), a-t-c (automatic tuning control—and a host of other automatics. Perhaps some day some genius will invent a really useful gadget, a-a-c (automatic applause control)—a device that will automatically eliminate the barrage which all sponsors apparently deem essential after each selection.

✦

I. A. HIRSCHMANN, Vice President of Saks Fifth Avenue recently stated that, "Most radio programs are an insult to the average intelligence of the American public."

"Twenty Thousand Years in Sing Sing!" Yo ho ho and a bottle of liniment. It's bad enough that Warden Lawes should permit his name to be associated with a program the blatant and misplaced publicity of which cannot possibly be compensated by the excellence of its dramatic continuity. However, that he should permit bad grammar to be written into his portion of the dialogue leaves us in such disgust that we not merely refuse to mention the name of his sponsor but go so far as to suggest that some competing liniment, say Absorbine Jr., is pretty good stuff.

✦

YOU READERS who have taken seriously the recent editorials in AWR concerning the possibilities of constructive and scientific listening, might do well to devote a bit of concentration to New York's high-fidelity station, W2XR. This station is definitely interested in detailed reports over a period of time and many readers can be of genuine assistance in determining the suitability of the bands just above 1500 kilocycles for consistent high-fidelity transmission. This station, as we have previously mentioned, is on 1550 kc, and operates from 2 to 10 P.M. daily. If you can listen to this station every fifteen minutes for two or three hours several days a week, your reports will be gratefully received at 730 Fifth Avenue, New York City—or to the writer care of ALL-WAVE RADIO.

About all you need in the way of extra equipment is an output or intensity meter (a zero to 10-milliampere meter will do nicely) connected in the plate circuit of some i-f tube under a-v-c control. If you happen to possess a barometer and thermometer—so much the better. Keep the volume control in the same position on all tests.

The pertinent data desired are: Time of notations — location of listener — weather conditions—signal strength as indicated on the meter—rapidity of fad-

ing as shown on the meter (meter will kick up as the signal fades, if connected as suggested)—quality of signal, particularly in reference to the presence of mush—the presence of abnormal atmospheric disturbances.

Incidentally, the above data are highly desirable in reports on any station. It will be well to bear in mind that only two circumstances make reports of any value—consistent listening on the part of a single observer, and a correlation of simultaneous listening by many observers. The first condition is probably of the greater importance, for the report of a single individual can be of assistance, and, at the same time, consistent listening makes more probable the obtaining of simultaneous reports.

## TWO-TUBE RECEIVER

*(Continued from page 18)*

### Parts for Receiver

CENTRALAB
1 — Potentiometer, 100,000 ohms, R8

CINAUDAGRAPH
1 — Loudspeaker, CZ-10-10

CORNELL-DUBILIER
2 — Electrolytics, 5 mfd., 50-volt, C7, C9
2 — Tubulars, .01 mfd., 400-volt, C5, C8
1 — Midget mica, .00005 mfd., C3
1 — Midget mica, .0005 mfd., C4
1 — Midget mica, .0001 mfd., C2
1 — Midget mica, .006 mfd., C6
1 — Tubular, 1 mfd., 400-volt, C10

EBY
4 — Binding posts with insulating washers

IRC
1 — Metallized ½ watt, 1 megohm, R1
1 — Metallized ½ watt, .5 megohm, R6
1 — Metallized ½ watt, .25 megohm, R5
2 — Metallized ½ watt, 1,000,000 ohms, R3, R4
1 — Metallized ½ watt, 50,000 ohms, R9
1 — Metallized 1 watt, 1,000 ohms, R2

NATIONAL
2 — Dials, type BM
1 — Cabinet, plain, type CSRR
3 — Coil Forms, type XR6
1 — Tuning condenser, type STHS-15, C1
1 — Tuning condenser, type ST-150, C
1 — Square coil socket
1 — Large 7-prong tube socket
1 — R.F. choke, type R-100, RFC

SYLVANIA
1 — Type 6A6
1 — Type 6F6

UTC
1 — Output transformer, type CS-12, T

WARD LEONARD
1 — Resistor, 10 watts, 500 ohms, R7

MISCELLANEOUS
1 — Octal wafer socket
1 — 4-prong cable plug
1 — 4-wire connection cable
1 — Small knob
Push-back wire
¼-lb. spool No. 24 and No. 30 DSC wire
Assorted nuts and bolts
Assorted rubber grommets

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

## THE HAM BANDS

*(Continued from page 31)*

watts input to his 40-meter final, yet we have consistently heard him get reports that indicated excellent signal strength in all parts of the States and Canada. Just what his best dx is we don't know. But we do know that he has one of the sweetest signals in the band. In addition RSL has one of the smoothest, steadiest fists we have heard sending medium-speed code on any band—and we cover them all for about three hours every night. FB,W9RSL!

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SPEAKING OF 40, LU4BH is coming in with excellent signal strength.

◆

OM WALKER of Yamhill, Oregon, reports receiving K6JLV, Hilo, Hawaii with an R9 signal on 20 meters. He also reports K6NTV, VK2OP and NY2AE.

◆

IF YOU ARE troubled with QRM and you do not already enjoy single-signal results with your super, try regeneration in the first i.f. stage. We are using this in conjunction with a crystal filter and it is a big success. If you have no crystal filter, results comparable to those obtainable with the crystal filter may be expected.

The arrangement is shown in the circuit diagram and is the well-known circuit popularized by Jones. The cathode coil, L, is made by winding 100 turns of No. 30 enamelled wire on a ½-inch dowel pin 3 inches long. Although it is customary to use either a 5,000 or 10,000-ohm tapered resistor to control the regeneration, we found that a 400-ohm variable resistor in series with a 350-ohm fixed resistor resulted in smoother control.

◆

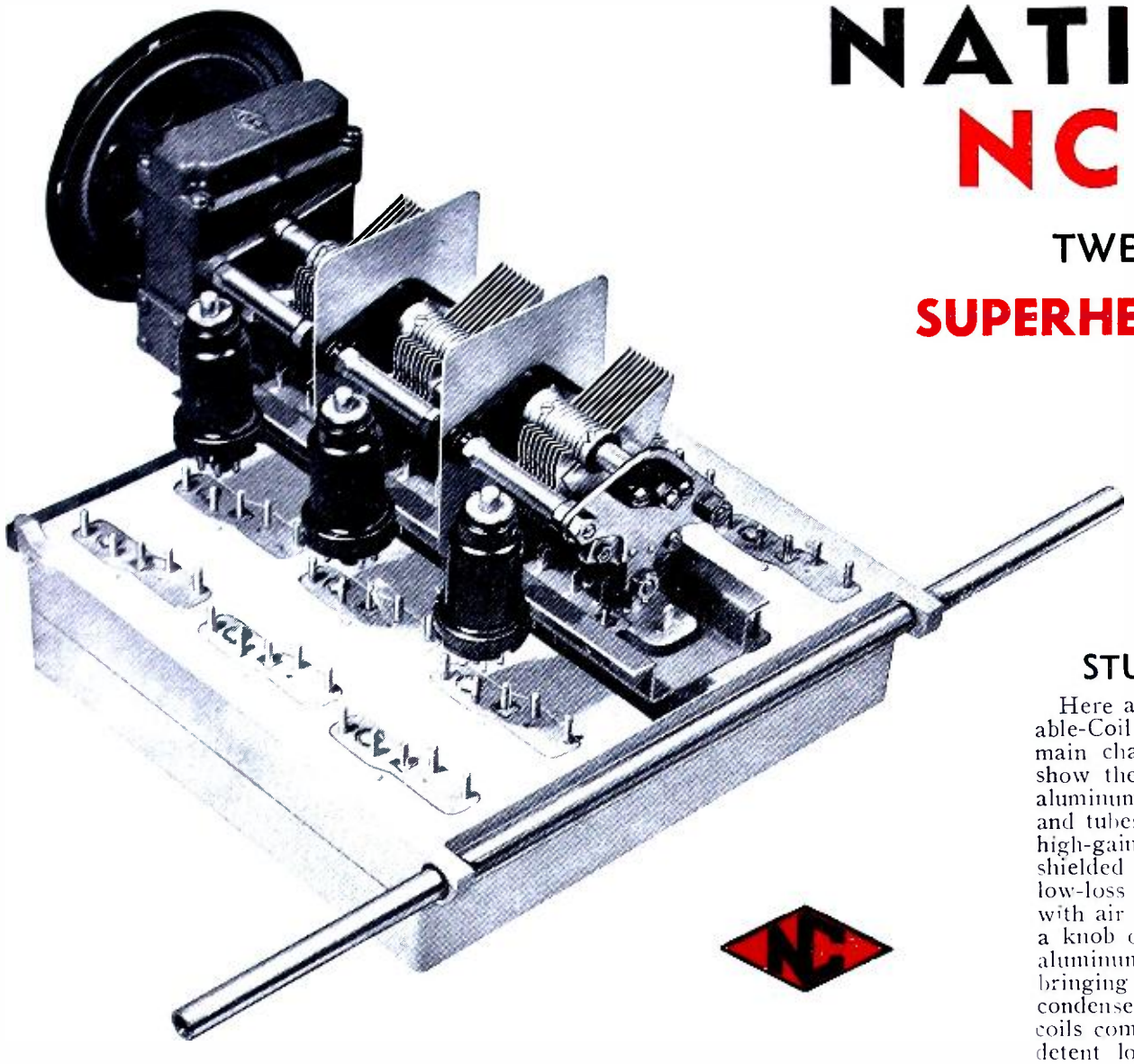
LOCATED IN ONE of Detroit's most congested districts, W8IIP manages to get out on 20-meter phone using four 10's in the final; two 10's work as Class B modulators. IIP lacks only Asia to be WAC on phone.

◆

IF ONLY WE could brag of the consistency that marks W6CIN's operation. Which reminds us, anyone could be WAC if they had the personality-voice of Mrs. CIN. How the boys go back to her CQ's!

◆

W8HJJ will read your horoscope or check your frequency drift if you ask him. 20-meter phone is the band—Detroit the QRA.



# NATIONAL
# NC-100
## TWELVE TUBE
## SUPERHETERODYNE

## STUDY THIS PICTURE!

Here are the essential parts of the Movable-Coil Tuning Unit, removed from the main chassis so that the photograph will show them clearly. Notice the heavy cast aluminum coil shield below the condenser and tubes. Inside this shield are the fifteen high-gain coils, each in its own individual shielded compartment, each insulated with low-loss R-39 insulation, and each padded with air dielectric condensers. The twist of a knob on the front panel slides this cast aluminum shield smoothly along its track, bringing the desired set of coils close to the condenser and tubes, and moving unused coils completely out of the way. A positive detent locks the coils into exact position after each shift. Rugged, silver-plated, side-wipe contacts make dependable low resistance circuit connections.

Notice the precision geared condenser. Backlash is permanently absent from its smooth 20 to 1 ratio, preloaded drive. The Micrometer Dial is direct reading to one part in five hundred, with divisions spread out over an effective scale length of twelve feet. Notice the rigid frame, insulated with moulded Bakelite to prevent noise from circulatory currents. Notice the four point stator insulation of low-loss Isolantite, and the individually insulated rotors.

These are but a few of the features that make the Movable-Coil Tuning Unit so outstanding. Study the illustration carefully. It reveals a layout that takes full advantage of the compactness of metal tubes, a precision that makes logging accurate, and an efficiency that makes performance superlative.

## NEW AS TOMORROW!

The Movable-Coil Tuning Unit is the up-to-the-minute answer to an old problem! It is more than a new design, it is a new invention that combines the efficiency of the plug-in coil with the convenience of the coil switch. Efficient because plug-in coils are actually used. Convenient because the twist of a knob on the panel instantly selects any one of five coil ranges from 540 KC to 30 MC. And its precision and its quality match its advanced design, for the NC-100 was designed to be a superlative receiver in every way.

## PLUG-IN COIL EFFICIENCY

All of the important advantages of the plug-in coil are found in the Movable-Coil Tuning Unit. Leads are short. Calibration is permanent. Idle coils are moved completely out of the way in thoroughly shielded compartments. There are no dead spots in the NC-100 Receiver.

The Movable-Coil Tuning Unit is not like anything you have ever seen in a receiver before; but only a unique design could make possible such results with knob-controlled range changing. Every part from low-loss R-39 coil forms to air dielectric trimming condensers is designed for high circuit efficiency. Every tube—and there are twelve of them—contributes its full share to the high overall performance.

The circuit of the NC-100 is the outcome of over twenty years experience. One stage of RF, first detector, and high frequency oscillator, *all with separate tubes*, are used on all ranges. The two IF stages have air dielectric tuning condensers. A bias-type power detector is transformer-coupled to the push-pull output tubes. Ten watts of clear, undistorted output are available. A separate tube provides amplified and delayed AVC action. The CW oscillator has a front-of-panel tuning control for adjusting the pitch of the beat note. A 6E5 tube acts as an indicator both when tuning and when using the RF Gain Control for signal strength measurements.

## OPERATING CONVENIENCE

Every care has been lavished upon the NC-100 to make it easy to operate even under the most adverse conditions. Even the phone jack has received its share of attention, for it has been carefully placed so that the phone cord will not get in the operator's way!

But of far more importance to the dyed-in-the-wool fan is the completeness of the controls. Separate Audio and RF Gain Controls, Tone Control, and Crystal Filter Controls for Phasing and Selectivity are all brought out to the front panel, as is also the tuning adjustment for the CW oscillator. Switches are even provided for cutting B-voltage during transmission, and for disconnecting the AVC. But most important of all are the precision coil shifting and the Micrometer Dial, which combine to make tuning a pleasure and logging a science.

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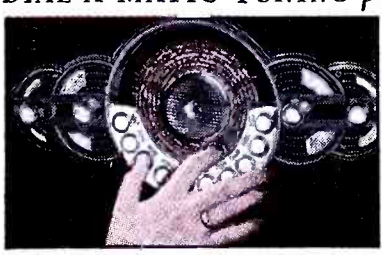
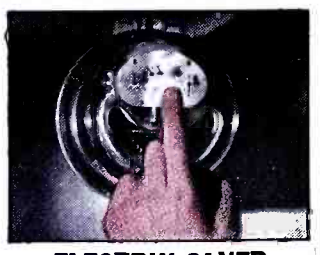
DIAL-A-MATIC TUNING *plus* ELECTRIK-SAVER



**DIAL-A-MATIC TUNING**

Now, even a child can bring in ten perfectly tuned programs in ten seconds! It's a big thrill to whirl the dial... and then hear the station you want... come in instantly, automatically... as fast as you can press buttons!



**ELECTRIK-SAVER**

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